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SOUTH AFRICAN PEOPLE AND ENVIRONMENTS IN THE GLOBAL MARKET

BOOKLET 4 OF 5

4

THE SEEDS OF NEO-COLONIALISM

GENETIC ENGINEERING IN FOOD AND FARMING

SOUTH AFRICAN PEOPLE AND ENVIRONMENTS IN THE GLOBAL MARKET

Member of

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With the World Summit on Sustainable Development (WSSD) opening in Johannesburg, this series of five booklets gives an environmental justice perspective on key challenges for sustainable development in South Africa. Development largely defines people's relationship with their environments. Governance is about who decides that relationship. It is a means through which a global contest for control of resources, including environmental and labour resources, is fought out. The booklets report from several 'fronts' of the struggle we call development. They look at how South Africa has adopted critical aspects of international governance, at whose interests are served and at the impacts on people and their environments. They indicate that, while another world is possible, it is not being built in South Africa.

1. The invisible fist: Development policy meets the world
by David Hallowes
Booklet 1 focuses on South Africa's approach to development in relation to the global order defined by the neo-liberal agenda of the 'Washington consensus'.

2. Partners in pollution: Voluntary agreements and corporate greenwash
by Chris Albertyn and Gillian Watkins
The corporate push for self-regulation is part of the neo-liberal agenda. Booklet 2 looks at what advances they have made in South Africa.

3. The cost of living: How selling basic services excludes the poor
by Mark Butler
Booklet 3 picks up on the democratic promise to provide people with services, such as clean water and energy, in relation to global injunctions for cost recovery and privatisation.

4. The seeds of neo-colonialism: Genetic engineering in food and farming
by Elfrieda Pschorn-Strauss and Rachel Wynberg
Booklet 4 looks at the role of South Africa in the global battle over the introduction of Genetically Modified Organisms.

5. Ground-zero in the carbon economy: people on the petrochemical fence-line
by Rory O'Connor and David Hallowes
Booklet 5 touches on climate change, another point of conflict between the northern powers, so as to relate it to the local impacts of South Africa's oil refineries.

1. Introduction

Genetic modification is a lens on the world over the past decade, epitomizing global trends towards corporate control, unbridled free trade, and the angry reaction of civil society to violations of their rights to safe food and secure and sustainable livelihoods. In the ten years since the Rio Earth Summit, genetic engineering (GE) has escalated at a rate considered to surpass that of any other new technology ever embraced by the agricultural industry. Almost 53 million hectares of GE crops are now grown worldwide, equal to an area almost twice the size of the United Kingdom. Billions of dollars are being invested in transgenic trees, fish, fruit and vegetables, and products such as GE soya, canola, maize and cotton now abound on world markets and supermarket shelves.

In South Africa the situation is no less dramatic, with over 350 000 hectares of the country now planted with GE crops - up 50% from one year ago. Permits have been granted for field trials and experiments with cotton, maize, soybeans, apple, canola, wheat, potatoes, sugar cane, eucalyptus trees, grapes, and a host of micro-organisms. This year, a transgenic version of white maize - Africa's staple food - will be commercially available for human consumption, a world first with profound implications for Africa's poor.

This situation represents a drastic change from 1992, when governments met in Rio de Janeiro to negotiate and sign Agenda 21, and the Convention on Biological Diversity (CBD). Then, GE crops were still in the early stages of commercialisation, although concerns were being expressed about the problems and risks of the new technology. These largely went unheeded in the official deliberations, which instead heralded the potential contribution of modern biotechnology to health, food production, and environmental protection. Two years later, at Marrakech, governments concluded the Uruguay Round of the GATT, established the World Trade Organisation (WTO) and began negotiations on two crucial agreements - the Agreement on Agriculture, and the Agreement on Trade Related Intellectual Property Rights. And so followed a decade of "relentless attempts to create a borderless world market where capital and goods could freely move about" (HBS 2002). Together, these agreements have strengthened a global system of trade in food and agriculture that supports large-scale, export-orientated, industrial production, including GE crops, at the expense of small-scale farming and food security. The "Doha Development Round" of negotiations could take us further down this road.

On the eve of the World Summit on Sustainable Development - a meeting that has chosen to deliberately avoid the issue of genetic engineering to "avoid a breakdown" (Olver 2002) - we would do

In the ten years since the Rio Earth Summit, genetic engineering (GE) has escalated at a rate considered to surpass that of any other new technology ever embraced by the agricultural industry. Almost 53 million hectares of GE crops are now grown worldwide, equal to an area almost twice the size of the United Kingdom.

Woman delivering GE cotton after harvesting.Picture: Benny Gool

well to reflect on these developments, many of which directly contradict the 'people, planet and prosperity' objectives of the Summit. While the past decade has witnessed some important initiatives, such as the adoption of a Biosafety Protocol to regulate the import and export of GE crops, it has also demonstrated some disturbing trends. As governments become subservient to corporations instead of citizens, the environmental and health risks of GE are being blatantly ignored. So too are the risks to small farmers, and the broader implications of the wholesale adoption of this new technology. GE crops offer remarkably little in the way of benefits, but have extremely high potential costs, facts that are not lost on the millions of consumers, farmers and civil society groups the world over, including South Africa, that are resisting the introduction of these crops into their lives and livelihoods. In Europe, consumer resistance to the introduction of GE crops has initiated a looming trade war between Europe and the US, with major implications for food security, agriculture and trade. The future of agriculture, it seems, is up for grabs.

This booklet examines these issues in more detail, with a particular focus on the South African situation, and the strategic challenges and opportunities presented for developing countries. We begin by describing the global context of the biotechnology industry.

Box 1.
What is Genetic Engineering?

Genetically Modified Organisms (GMOs) are organisms whose genetic makeup has been altered by the insertion or removal of small fragments of genes or genetic material (e.g., DNA, RNA, plasmids), in order to create or enhance desirable characteristics. The technology is often called "modern biotechnology" or "gene technology", and sometimes also "recombinant DNA technology" or "genetic engineering".
The term "biotechnology" is often used to promote genetic engineering but this is misleading. Genetic engineering is one kind of biotechnology, and biotechnology is a science where the purpose is to modify the natural and biological processes of living organisms - not necessarily the genes. Biotechnology is not new or revolutionary and includes ancient techniques such as crop selection, the selective breeding of livestock, and more recently, developing vaccines and antibiotics. However, genetic engineering is a new form of biotechnology because it can involve the transfer of genes between species unrelated in nature, resulting in transgenic organisms or crops.

2. Selling Life, Privatising the commons: Big Business and Genetic Engineering

Global economic changes of the 1990s have had major and rapid impacts on food, agriculture and healthcare. Globalisation, and the growing power of transnational corporations, have changed the way we live, eat and communicate, as an increasing monopoly of companies seek to extend their control over seeds, water, chemicals, processing, medicines, and the genetic basis of the world food system. They are aided by new technologies such as GE, and a world trade regime that ensures them open access to markets and the legalized piracy of indigenous knowledge and biodiversity through intellectual property rights (IPRs). Their size and influence is growing as the agrochemical, seed, and pharmaceutical corporate giants converge through takeovers, mergers and alliances. Heavy investments in modern biotechnology have accelerated these trends, together with the granting of patents on living organisms.

Today, a handful of 'Gene Giants'- Monsanto, Aventis, DuPont, and Syngenta (a merger of AstraZeneca and Novartis) - dominate the market. Between them, the 'Gene Giants' account for nearly two-thirds of the $31 billion global pesticide market, almost one-quarter of the $30 billion commercial seed market, and virtually the entire GE seed market. Increasingly, these companies are merging with the $300 billion pharmaceutical industry. In the words of one Monsanto executive, "What you are seeing is not just a consolidation of seed companies, it is really the consolidation of the entire food chain" (Robert Fraley of Monsanto quoted in Christian Aid 1999).

Sales of this magnitude help to ensure such companies' dominance over smaller enterprises and national institutions. In Africa, just ten companies account for 88% of the agrochemical market. Three of the biggest pesticide companies - Syngenta, Monsanto, and DuPont- also dominate the African market in GE seeds and increasingly, the local supply and marketing of seeds. Recent acquisitions by Monsanto of two South African seed companies, Carnia and Sensako, have allowed the company's complete domination of the South African market for GE seed.

IPRs, of which patents are one type, underpin the profitability of the biotechnology industry, and provide the mechanism through which investments are recouped. A mind-boggling array of new opportunities for patenting are provided by GE: for example, 'suicide' or 'terminator' seeds, engineered to be sterile, and thus requiring farmers to repurchase seed each year; 'genetic use restriction technologies', which include modifications to 'junkie' plants that are dependent on the company's proprietary chemicals to flower, seed or sprout; and a Monsanto patent on all GE cotton. The race is on - already patents are pending or have been granted on more than 500 000 genes and partial gene sequences in living organisms, including 9000 patents involving human genes.

The controversial Trade-Related Aspects of Intellectual Property Rights Agreement (TRIPS) of the WTO has accelerated these trends and has created a global regime for IPRs over life. Driven by the biotechnology and pharmaceutical industries, TRIPS begs a crucial question: should private individuals and multinational corporations own the fundamental biological components of life? TRIPS not only facilitates corporate ownership of life, but also raises profound questions about the monopoly control of knowledge. For example, the top five pesticide companies now control some 50% of all agricultural biotechnology patents, including 70% of all patents on genes for wheat and 47% of all patents on genes for sorghum. The potential impacts of monopoly control are well understood in South Africa, where AIDS activists have fought tireless battles to import cheaper anti-AIDS drugs, against the might of drug companies who have challenged the government for infringing patent rights and violating WTO regulations.

3. The South African Situation - A Mirror on the World

South Africa's uptake of GE has been one of the fastest in the world.

In 1999, over 250 000 hectares of the country were planted with GE crops. In 2000, this figure increased by 100 000ha, a 50% increase in one year.

South Africa, as the gateway to Africa, is an attractive option for agribusiness. Its strong commercial seed market has made it easy to introduce new seed varieties, and years of apartheid subsidies and protectionism have built a good agricultural infrastructure. This context, in conjunction with supportive economic, intellectual property, and biosafety policies, the privatisation of public research institutions, and a highly vocal and active scientific lobby, has led to the rapid expansion of GE in the country. In fact, South Africa's uptake of GE has been one of the fastest in the world.

In 1999, over 250 000 hectares of the country were planted with GE crops. In 2000, this figure increased by 100 000ha, a 50% increase in one year. At least 175 field trials are underway, and 5 commercial releases have been approved. The geographical extent of plantings is wide, involving eight of South Africa's nine provinces (Fig. 1). Already, 28% of cotton and 6% of maize planted in South Africa is genetically engineered. Permits have been granted for field trials and experiments with cotton, maize, soybeans, apple, canola, wheat, potatoes, sugar cane, eucalyptus trees, grapes, and a host of microorganisms. This season, GE white maize for human consumption was planted, a global first with significant implications (see Box 2).

The South African government has clearly decided that GE is part of its future path in agriculture and has leaped in where others fear to tread. This is not an isolated strategy, but rather part of a concerted attempt by the biotechnology industry to get a foothold in African markets, especially in the face of increasing rejection by Northern consumers of GE products. It also fits in neatly with NEPAD and South Africa's macroeconomic strategy, both of which favour globalisation, externally-led development, and industrialized agriculture, over and above strategies that are more supportive of locally-led development.

The industry strategy - which is aggressive, covert, and heavily reliant on the use of public relations tactics to "inform" the public - has been to: lobby and develop close relations with government and research institutions, to undertake philanthropic deeds such as the support of emerging farmers, and to co-opt scientists to influence opinion-makers. This is a strategy well-tested in the US. In South Africa, public relations takes place through Africabio, a consortium comprised of Monsanto, Delta and Pine, Agr Evo, Novartis, Pioneer Hi Breed and several public research institutions. Africabio was formed to promote GE and "provide one strong voice for lobbying the government on biotechnology and ensuring that unjustified trade barriers are not established which restrict its members" (Africabio 2000). Disturbingly, it has a major programme to promote biotechnology in schools, and is also the primary organization setting the agenda for biotechnology research and biosafety capacity-building in the country. The organization presents itself as an NGO in African and international fora but is also quick to join the business or government sector if needed. This seamless switching between roles that represent conflicts of interest is characteristic of the way the industry works. In the US much has been made of this "revolving door' phenomena where people switch effortlessly between government and industry, and in South Africa the pattern is perpetuated. For example, the government official chiefly responsible for drafting South Africa's GMO Act now works for Monsanto in public relations.

Box 2.
Decision on South Africa's Staple Food Hard to Swallow

South Africa has planted its first genetically engineered crop for human consumption this season. The engineered crop is white maize, a staple food for the majority. But while transgenic white maize is being put on their plates with the consent of the South African government, it is done without the consent of the people.

South Africa's first two crops for commercial release had nothing to do with feeding people; one being pest-resistant cotton and another being a pest -resistant maize for animal consumption. This year the scenario has changed and South Africa has quietly released GE white maize for human consumption, assuming that our citizenship will swallow it. A number of countries, including the EU, have banned GE foods for many reasons, one being for fear of health risks from new allergens and toxins forming in 'transgenic' foods. The South African public has had very little exposure to this debate and there was no public consultation. There are no systems in place to segregate GE maize from non-GE maize, nor are there systems to monitor the long-term impact on humans.

South Africa has no labelling legislation in place, so the GE white maize will not be labelled as such. The right to know and the right to choose are basic consumer rights. The unannounced, unlabelled marketing of GE maize is violating the rights of the poor in South Africa, as maize is their staple diet.

South Africa has eagerly embraced GE in agriculture whilst the rest of Africa has sagely applied the precautionary principle, preferring to look at the technology from all angles before giving it the nod. Most African countries are concerned that they do not have the resources to trace, monitor and separate GMOs from non-GMOs.

Edited press release from Biowatch South Africa, March 2002.

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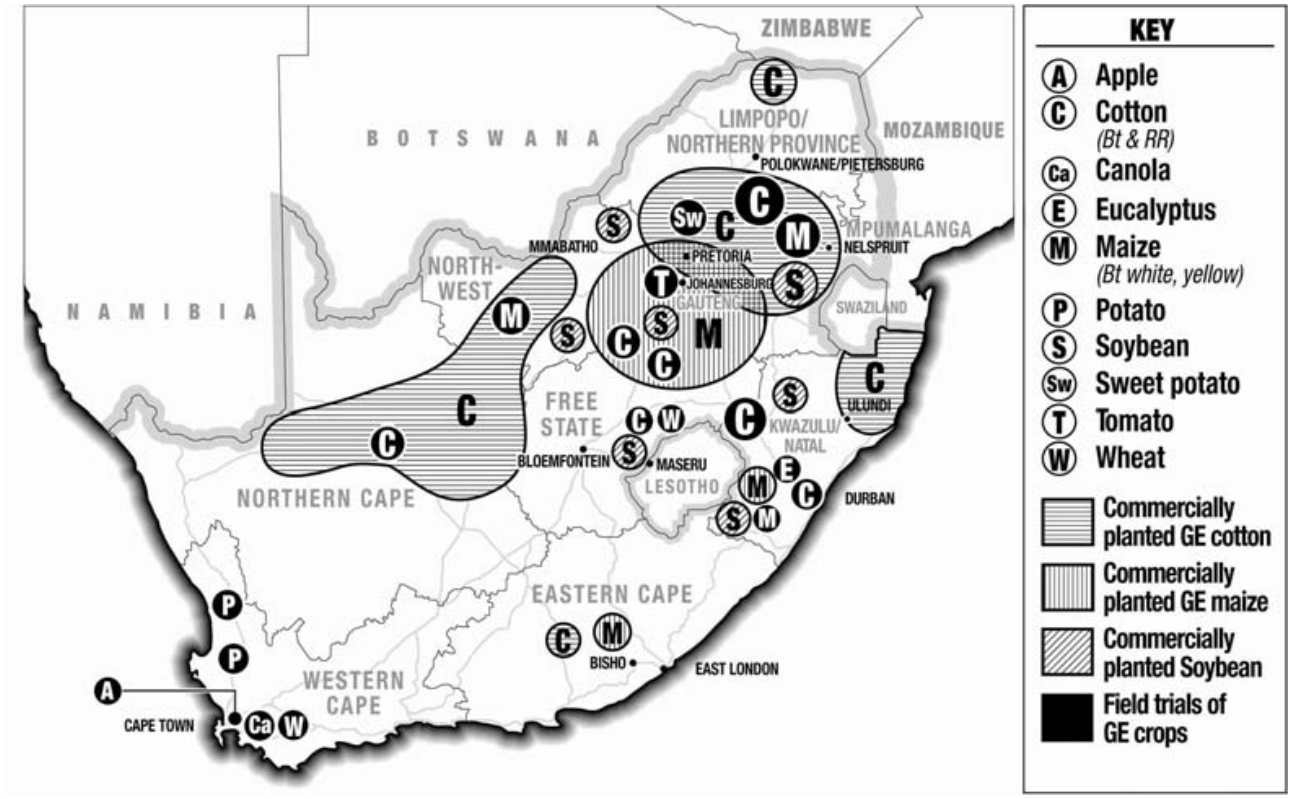
Fig. 1 Genetically engineered crop production in South Africa



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4. Genetic Engineering, Food Security, and Environmental Protection - Setting the Record Straight

"It would be wise for those who feel they cannot resist the 'fatal attraction' of GM crops to remember the old Zambian adage: "If you have to test the depth of a river, do not put both legs into the water" (Chinsembo and Kambikambi 2001).

"Worrying about starving future generations won't feed them, food biotechnology will" (Monsanto 1998).

One of the most common mantras of the biotechnology industry and its adherents is that there is simply no other means of feeding a growing population and that GE brings with it opportunities that Africa cannot afford to miss. Of course, no one doubts the need to improve African food security and agricultural productivity. But the belief that hunger is due to a gap between food production and human population density is one that has long been discredited. Global food production per person has outstripped population growth by 16% over the past 35 years and the UN Food and Agriculture Organisation (FAO) predicts it will continue to do so for at least the next 30 years, without factoring in genetically modified crops. Aside from the fact that conflicting evidence exists as to the ability of GE crops to deliver increased yields, the main issue with respect to African food security is not insufficient food but rather its distribution and access. This includes the struggles of poor farmers to obtain credit, the lack of storage facilities, and inadequate infrastructure. These in turn are underpinned by global structural defects such as the Agreement on Agriculture of the WTO, which entrenches existing subsidies for agriculture in the North, and prohibits new subsidies to promote food security in the South.

It is also claimed that using GE crops will reduce pesticide and herbicide use and so promote environmental protection. Of course, it makes little business sense to an agrochemical company to reduce a farmer's dependence on chemicals. And it is not the intention. On the contrary, the aim is to create crops that are more rather than less dependent on the use of chemicals. Until now, most research undertaken by the biotechnology industry - a whopping 77% of all genetically modified crops - has focused on making crops resistant to their own 'broad spectrum' herbicides. For example, Monsanto's Roundup-Ready crops are genetically engineered to be resistant to the company's glyphosate herbicide, and Ciba-Geigy's crops are modified to be resistant to its glufosinate-based 'Basta' herbicide. What this means is that a field can be sprayed with chemicals to kill all plants

GE crops - feeding or fooling the world? Bt soya farmer in Mpumalanga. Picture: Benny Gool

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The bottom line, as concluded in a recent review of data on pesticide use throughout the world, is that "genetically engineered crops do not offer sustainable reductions in the use of and reliance on pesticides" (World Wildlife Fund 2000).

and 'weeds' without affecting the resistant crop. It also means that herbicides such as Roundup have guaranteed sales, and that farmers are contractually tied to using herbicide formulations specified by the company. These are important strategies for industry to extend their monopoly control - especially with herbicides such as Roundup coming off-patent in 2001. This, combined with the increased tolerance of plants to herbicides is likely to increase rather than diminish use of these environmentally toxic herbicides, a trend given credence by emerging data showing genetically modified soybean to use up to five times more herbicide than conventional soybean plantings.

A similar story can be told for pesticide use. Through use of a naturally-occurring insecticide produced by the bacterium Bacillus thuringiensis (Bt), crops such as maize, cotton and potato have been engineered with the gene for Bt toxin to give them a built-in insecticide. Some 15% of GE crops are now engineered for this trait. In theory, use of Bt should reduce pesticide use but emerging data shows this to be far from the case. One reason is the build up of resistance to Bt among insects. With increased insect resistance, farmers are forced to use stronger pesticides than before, a reality already being experienced by Bt cotton farmers in South Africa. These problems are likely to worsen in years to come. The US Environmental Protection Agency predicts that most target insects could be resistant to Bt within three to five years. The bottom line, as concluded in a recent review of data on pesticide use throughout the world, is that "genetically engineered crops do not offer sustainable reductions in the use of and reliance on pesticides" (World Wildlife Fund 2000).

In South Africa, an assessment of the types of transgenic crops being developed and commercialised gives some indication of the empty promises being made in the name of food security, poverty alleviation and environmental protection. Reflecting global trends, 91% of applications for transgenic crop testing over the last few years have been for herbicide (40%) and insect resistant (51%) strains. Seventy per cent of these applications were received from transnational "gene giants", including Monsanto, Pioneer Hi-Bred, AgrEvo, Delta and Pine Land, Novartis and DuPont. Developments that could make a real impact on African food production, such as improvements in nitrogen fixation, or drought resistance remain sorely neglected and technically difficult. This situation is unlikely to change. Declining allocations of public funds for research have already resulted in many leading South African universities and research institutions becoming handmaidens to industry. For agribusiness the emphasis is on products that generate sales large enough to recoup investment and generate profits: poverty alleviation, food security, and environmental sustainability simply do not factor in this value system.

Box 3.
Bt Cotton and Small Farmers in Makhatini - A Story of Debt, Dependency, and Dicey Economics

South Africa is under the spotlight as the first country in the world in which small-scale farmers are planting genetically modified crops. Since 1998, farmers in the Makhatini floodplains of northern Kwa-Zulu Natal have been growing Bt cotton, reportedly with high levels of success and adoption. This is now Monsanto's flagship project and no time has been lost in generating propaganda to convince the rest of the world of the alleged benefits of genetic engineering for small farmers and food security. But this project might also be a miscalculated public relations disaster. Here is the other story.

High dependency. The uptake of genetically engineered cotton at Makhatini has been made possible only through strong government backing for the project. Combined efforts of the South African Department of Agriculture, Monsanto, Vunisa (a private company) and the Landbank have guaranteed farmers easy access to markets for their crops and credit to purchase inputs. Farmers have thus become highly dependent on outside actors - and highly vulnerable to the vagaries of the private sector.

Unequal access. The glitz around Makhatini fails to reveal that it is not the most marginalized producers that are benefiting from Bt cotton, but rather the larger cotton producers that have access to land and - most importantly - to credit to enable purchase of the very costly Bt cotton seeds.

Debt trap. Those farmers able to access credit are locked in a debt-cycle. The Land Bank provides loans to cotton farmers because they get cash in hand as soon as they deliver to the ginneries. In other words there is a ready market for their cotton. This puts the farmers in a very precarious position and a failed crop will mean that they will not be able to buy seed the next season. Moreover, South Africa is in the midst of liberalizing its cotton market and is increasingly vulnerable to price fluctuations. Reductions in cotton prices will be devastating for small farmers already operating under marginal conditions.

Short-lived benefits. Reduced insecticide use is one of the advantages touted by proponents of Bt cotton at Makhatini, although it seems that spraying for bollworms has continued even among farmers that have adopted the technology. While Bt cotton may have initial management benefits, experiences from around the world suggest these to be short-lived. No variety can remain resistant to all pests and diseases and in the province of Mpumalanga, commercial farmers planting Bt cotton are already returning to normal spraying patterns because of outbreaks of secondary insects such as aphids, leafhoppers and stinkbugs. There have also been cases of farmers losing their entire crop because they did not spray. Commercial farmers in South Africa can take this risk, but for small-scale farmers, the loss of one harvest can be catastrophic.

Planting in Ignorance. Farmers planting Bt cotton do so with no understanding of the technology, or of their obligations under the licensing contracts they sign with Monsanto. Biowatch research has revealed that farmers understand their contracts to mean that in the case of a crop failure, the seed will be replaced. They are not aware that they should plant a refuge, that the insects might develop resistance over time, or that during some seasons they will have to spray for unexpected insect outbreaks. Although Monsanto is happy to spend millions of dollars in promoting this case and 'educating' the global public, it is not at all bothered to ensure that the most basic information of all is conveyed to its peasant clients.

5. Why Diversity Matters: Genetic Engineering and Farming

"The modern farmer is only a tractor driver or a poison sprayer. He is only a tiny cog in an enormous and highly complicated techno-bureaucratic structure that begins in the oilfields, goes through the whole chemical industry and the huge agribusiness industry - I'd rather call it the food-manipulating, denaturing and contaminating industry - and ends up in the supermarkets". Jose Lutzenberger (The Guardian 2002.)

The farmer is part of a food chain that determines what he grows and how he grows it - at the far end stands a long, perfectly golden McDonald's fry, demanding one kind of potato (Pollan 1998).

"... when a farmer stores and sows biotech seeds patented by Monsanto, he (sic) should understand that he is in the wrong. This holds true even if he has not signed any contract at the time of procuring seeds (that is, if he recycles or if he buys seeds illegally from a neighbour). He is pirating ... Moreover, this pirating of seeds could cost the farmer hundreds of dollars per acre by way of damages, interest and legal costs, apart from having to undergo the inspection of his fields and records over many years". Monsanto warning released in American newspapers. Cited in de la Perrier and Seuret 2000.

Instead of being a panacea to the problem of hunger in Africa, GE crops threaten rural livelihoods, food security, and local control over a diversity of genetic resources in a suite of different ways. To a large extent these impacts mirror those of the Green Revolution, which was a massive government and corporate campaign to persuade farmers in developing countries to replace their diverse and innovative indigenous cropping systems with a few high-yielding varieties, dependent on excessive inputs of chemicals and fertilizers. In Africa and elsewhere in the world, the Green Revolution was a dismal failure, not because it 'bypassed' the continent, as is believed by some, but because the technologies were unpopular, ineffective, and totally inappropriate for local conditions. Africa has a complex ecology and much of the continent's soils are not suitable to intensive monoculture production. African farmers also lack access to infrastructure, markets and extension support. The World Bank estimates that half of their agriculture projects in Africa fail because they do not take into account the limitations of domestic infrastructure.

We would do well to learn from these failures. The Gene Revolution threatens to repeat the mistakes of the Green Revolution through a new wave of intensified agriculture and the systematic destruction of the livelihoods of millions of small farmers. It does this in a number of ways. Firstly, species-wide patents for crops such as soya and cotton prevent farmers from saving "proprietary" seeds and undermine centuries of slow and steady plant breeding by farmers the world over. They also negate the very basis of food security and survival strategies among small farmers, illustrated by the fact that farm-saved seeds in Africa represent about 90% of total planted seeds on the continent.

Genetic engineering also reduces choice for farmers. In a context where multinationals are buying up seed companies, dominating seed markets in the South, and restricting the choice of varieties available, poor farmers may find they have no choice but to use GE seeds instead of the traditional seeds they have used up till now. In Brazil for example, Monsanto controls 60% of the maize market, and in Argentina 95% of all soya planted is

genetically modified, with Monsanto having monopoly rights to the seed. In South Africa, international seed companies now control 60% of the hybrid maize market and 90% of South Africa's wheat.

Reduced choice is tied integrally to increased dependency and once a farmer decides to plant GE crops, it becomes very difficult to rethink this choice. As is the case elsewhere, farmers in South Africa buying GE cotton have to sign growers' contracts obliging them amongst other things to use the seed for only one season; to plant a refuge as part of an insect-resistance management strategy; not to supply any seed containing Bt cotton to any third party; and to exclusively use the company's chemicals. Many farmers in the US have been forced by Monsanto to destroy their crops for not complying with this agreement and several court cases are pending. This is alarming, especially for small-scale farmers, who traditionally save and exchange seed and, as the case at Makhatini illustrates, are unlikely to be able to read contracts, let alone understand their contents (see Box 3).

Although often touted as an opportunity for job creation (see, for example, South Africa's Biotechnology Strategy, Box 5), modern biotechnology is more likely to result in job losses. Genetic engineering techniques make it possible for crops currently grown in the tropics to be grown in the laboratory or in temperate areas. The International Labour Organisation estimates that GE could result in employment losses of up to 50% in developing countries. In one example, some 70 000 vanilla-growing farmers in Madagascar could be threatened by the laboratory production of vanilla aroma. Another study predicts that the development of GE coffee could threaten the livelihoods of seven million small-scale coffee farmers in developing countries.

Just as the Green Revolution resulted in huge losses in genetic diversity so too will the 'Gene Revolution', not only through forcing reliance on monocultures and so reducing agrobiodiversity, but also through 'polluting' wild crop species with the genes of their engineered relatives. For organic farmers and those not planting GE crops, the concern is that transgenic crops planted nearby will cross-pollinate with their own. This is borne out by a string of recent incidents in Mexico, the United States and Canada. An official EU study recently published by the European Environment Agency, concludes that genes will inevitably escape from genetically modified crops, contaminating organic farms, creating superweeds, and driving wild plants to extinction. These experiences sound alarm bells for South Africa, especially given the country's well-known susceptibility to invasive alien species and high levels of biodiversity.

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Harvest time for GE cotton in Makhatini. Women do most of the work in the cotton fields, but often have little decision-making power
Picture: Benny Gool

Box 4.
Worlds Apart: Industrialised and Traditional Farming

Two fundamentally different types of food systems exist in the world today: industrialised agriculture, and traditional farming. Industrialised agriculture, a product of the Green Revolution, is aimed at increasing efficiency and yields and relies heavily on the centralised knowledge and technology of a few institutions. It typically requires high inputs, such as hybrid seeds, chemical fertilizers, herbicides, pesticides, and irrigation, and is based upon variety-specific monocultures and seed which must be purchased anew each season from corporations.

Traditional farming, on the other hand - the system practiced by the majority of the world's poor - is based on multiple cropping, farm-saved seeds, low chemical inputs, rainfall, and on-farm crop selection. Ownership of resources, seeds, and knowledge is usually held collectively, "shared with pride and given away as a great honour". While industrialised agriculture is promoted and subsidised by governments worldwide, locally-adapted food systems receive little political or technical support and are often met with hostility. The real reason for this is that traditional farming does not conform to the requirements of the corporate food chain. This kind of farmer buys very little - some seed, compost and maybe some ladybugs - and draws largely on local experience and knowledge.

In South Africa, industrialised and traditional farming systems exist side by side. However, years of apartheid protectionist policies for white farmers, combined with the legacy of highly inequitable land distribution have led to vast discrepancies in the agricultural sector. Presently, about 50 000 commercial farmers utilise 80% of South Africa's scarce agricultural land, whilst 1 million subsistence farmers eke out a living on the remaining 20%. Subsistence farmers have suffered and continue to suffer from years of neglect, with the result that traditional practices and varieties have all but disappeared. Today the focus is on supporting black farmers to become commercial farmers, with very little attention paid to preserving agrobiodiversity and supporting approaches based on diverse livelihood systems.

6. Managing Unmanageable Risks

"The genetically engineered crops now being grown represent a massive, uncontrolled experiment whose outcome is inherently unpredictable. The results could be catastrophic." (Commoner 2002).

"South Africa's GMO Act shows a cynical disregard for contemporary international and national environmental principles, as well as for the development imperatives of South Africa". (Statement by prominent environmental and human rights lawyers at a Biowatch South Africa workshop, February 2000.)

Whether or not this complex array of risks is being adequately managed - or being managed at all - is the central question. Certainly the risks require significant funding and capacity to manage and monitor.The estimated cost, for example, of determining the risk of Bt maize to monarch butterflies alone is some US$2-3 million. Can we justify similar costs to the South African taxpayer and if not, can we leave risk analysis in the hands of corporations and Northern research institutions? These questions are all the more urgent with the recent adoption of the Cartagena Protocol on Biosafety, a historic agreement providing an international regulatory framework for the import and export of "living modified organisms", and with the object of protecting biodiversity and human health from adverse impacts.

While South Africa played an active role in negotiating the Protocol, it has yet to sign or ratify this important agreement. Although a national biosafety law is in place, this is widely considered to be badly out of step with both the Constitution and National Environmental Management Act, as well as legislation providing for access to publicly held information.Its provisions for the assessment and monitoring of environmental and social risks and impacts are wholly inadequate and it blatantly contravenes basic principles of public participation and transparency in decision-making. Incredibly, liability for any damages caused through the introduction of transgenic crops is placed on the user of the product - the farmer or consumer - rather than the proponent of the technology.

Civil society involvement in decision-making for approving field trials and commercial releases of GM crops is totally lacking, and repeated requests for information from the Department of Agriculture have been refused.

In a country ranking as the third most biologically diverse in the world, it is a sobering thought that not a single environmental impact assessment has ever been undertaken on any of the field trials or commercial releases of GMOs approved in South Africa. Studies to demonstrate the social and economic worth of introduced crops are similarly lacking. Risk assessments, such as they are, comprise desktop assessments, and are based on an ad hoc set of guidelines - as yet unavailable to the public - and developed in 1996 by a self-appointed committee of scientists.

Government's recent drafting of a Biotechnology Strategy makes no attempt to address these deficiencies but reinforces its dogged determination to push GE ignoring the substantial risks, dubious benefits and high costs involved (see Box 5).

Public research to serve private interests? GE potato trials at the Agricultural Research Council's Vegetable and Ornamental Plant Institute at Roodeplaat.
Picture: Benny Gool

Monsanto test farm in Petit, South Africa.
Picture: Benny Gool

Box 5.
South Africa's Biotechnology Strategy

In May 2001, the Department of Arts, Science and Technology (DACST) published a Biotechnology Strategy, and proposed a R182 million annual budget towards its implementation. The strategy, the process by which it was developed, and the way it is being implemented, indicate how GE is being promoted by government and how taxpayers' money is propping up and promoting the interests of multibillion dollar corporations. The thrust of this strategy is that GE will 'leapfrog' South Africa into a new global economy and create jobs simultaneously.

The strategy - which reads like a funding proposal from the biotechnology industry to the South African government - makes the bold assumption that modern biotechnology will deliver major benefits for agriculture, rural development and job creation. Its main aim is to motivate for the allocation of government resources for developing 'regional innovation centres' as platforms for biotechnology, strengthening links between academia and industry, and stimulating "the creation of new intellectual property" (DACST 2001). To "solve health problems", it also proposes mapping the gene profile of the South African population, without considering the ethical and human rights issues this entails. The strategy ignores the developmental and market access problems of GE farming, as well as the ecological and health risks of genetic engineering, and the wholly inadequate legal framework to deal with these concerns.

The process of developing this strategy was highly problematic, with no public process to identify 'experts' for a government advisory panel and to draft the strategy, and extremely limited opportunities for comment by public interest groups. The composition of the panel was extremely skewed in the interests of industry and not balanced to represent public concerns about the social and environmental impacts of agricultural biotechnology in particular. Many members of the panel had a direct or indirect interest in promoting the industry and they were clearly not able to make an unbiased contribution. The implementation of the strategy is presently steamrolling ahead without taking any of these concerns into account. This exercise is paying lip service to the principle of public participation, in the belief that the public lacks understanding about the scientific basis of the technology. Yet the strategy implies the use of scarce funds from public coffers to bolster expensive research and development on biotechnology in South Africa.

7. Whose Knowledge Counts?

"Detractors will no doubt say that I have a vested interest in the acceptance and use of GM crops, and this is obviously correct". Jennifer Thomson, Professor of Microbiology at the University of Cape Town (Thomson, J.A. 2002)

Initiatives such as the biotechnology strategy are symptomatic of a much greater malaise that has taken hold in South Africa and elsewhere in the world. Increasingly, South African public research institutions - including the Agricultural Research Council (ARC), CSIR, and many of the country's universities - are experiencing state funding cuts and are being forced into contractual relationships with industry to support their work. This undermines capacity for research to serve public needs. The ARC, for example, a parastatal organization that is intimately linked to Africabio, receives 50% of its funds from private sources, and features Monsanto as one of its primary clients, for whom it does Bt cotton research. All of this information is classified as 'confidential' and is not available to the public. So if the 'public' research institutions carry the interests of industry, where does this leave the farmer to go for advice?; and who is responsible for independent monitoring and assessment of biotechnology and its intrinsic risks and uncertainties?

The privatisation of public research in biotechnology has further implications. Increasingly, scientists are becoming the public voice of the industry, promoting the virtues of agricultural biotechnology and its ability to feed the world. South Africa is no exception: from the World Economic Forum in Davos to parliaments the world over, South African molecular biologists seem to have become development experts overnight. Real concerns are being swept under the carpet. In South Africa, many geneticists and agricultural experts privately admit their fears of expressing concerns about GE, saying that by asking the 'wrong' questions they would put their careers in jeopardy. Elsewhere in the world, government and industry have colluded to suppress scientific illustration of the risks of GMOs.

Dr. Puzstai, for example, found to his surprise that mice fed on GE potatoes developed birth defects. He lost his job and very quickly an orchestrated campaign was mobilised to discredit him, his research and put pressure on the journal Science, not to publish his research. A publication in the prestigious journal Nature by two Berkeley researchers, revealing contamination of Mexican maize, immediately led to a campaign - reportedly by Monsanto's PR company - to canvas scientists to discredit the research. As a result Nature retracted the publication. Scientists are being ostracised and their credentials attacked by any discovery of a discordant fact. Known risks are being ignored. Meanwhile, recent discoveries raise serious questions as to the theoretical basis of GE, and point to the complexities of environmental factors in determining genetic information: "[these new discoveries] ... destroy the theoretical foundation of a multibillion-dollar industry, the genetic engineering of food crops, where it is assumed that a bacterial gene for an insecticidal protein, for example, transferred to a maize plant, will produce precisely that protein and nothing else" (Commoner 2002).

The privatisation of public research in biotechnology has further implications. Increasingly, scientists are becoming the public voice of the industry, promoting the virtues of agricultural biotechnology and its ability to feed the world.

As governments the world over are pressurised to accept GMOs, civil society actions have sprung up around the globe like veld fires that cannot be put out. Consumers, farmers, human rights organisations, NGOs, churches, scientists and many governments are unequivocal in their grave concern for the rapid commercialisation of a technology that is not adequately tested or assessed. More than 410 scientists from 55 countries around the world have recently called on all governments to declare a moratorium on GMO releases.

8. Preparing the Battleground: Consumer Resistance, Food Safety, and Trade

"The hope of the industry is that over time the market is so flooded [with genetically modified organisms] that there is nothing you can do about it. You just sort of surrender." Don Westfall, biotech industry consultant, Toronto Star, January 9, 2001 in ETC Group 2002.

"One of the ironies of this issue is the contrast between the enthusiasm of food producers to claim that their biologically engineered products are different and unique when they seek to patent them and their similar enthusiasm for claiming that they are just the same as other foods when asked to label them." Julian Edwards, Director General of Consumers International, representing 235 consumer organisations in 109 countries.

Not only is there increasing scientific doubt about GE in food and farming, but also much less euphoria. Despite an increase in global acreage, this has been mostly in the US and Argentina, and the growth of the industry has fallen significantly: "The [GE food] industry has overstated the rate of progress and underestimated the resistance of consumers", according to a leading chemical industry analyst with Lehman Brothers (Vasnetsov 2001). Monsanto South Africa puts it more bluntly: "... consumer resistance has prevented us from making a killing" (Bennet 2002).

Indeed. As governments the world over are pressurised to accept GMOs, civil society actions have sprung up around the globe like veld fires that cannot be put out. Consumers, farmers, human rights organisations, NGOs, churches, scientists and many governments are unequivocal in their grave concern for the rapid commercialisation of a technology that is not adequately tested or assessed. More than 410 scientists from 55 countries around the world have recently called on all governments to declare a moratorium on GMO releases. In New Zealand, 10 000 people took part in a GE-free march, the biggest public rally seen in the country in twenty years. In the Phillipines, protesters have burned and uprooted crops and demanded the closure of Monsanto's offices. In Indonesia, a 72-member strong NGO Coalition has taken legal action against the Ministry of Agriculture for release of Monsanto's Bt cotton in South Sulawesi. In France, Indonesia and India farmers have uprooted and burned Bt cotton. In the UK,

dozens of local authorities supply GE-free school lunches, while the House of Commons has banned GE food from its canteens. In Germany and England, churches have banned GM crops from their lands. All is not well in the GMO heartland either as US consumers and farmers wake up to the realities of converting their entire agricultural systems to GM crops. The National Farmers Union, which represents nearly 300,000 farmers and ranchers in 26 states, recently demanded a moratorium on the issuing of all patents for GMOs in crops and animals.

Public resistance to GMOs is also growing in South Africa where a broad network of civil society organisations and individuals - SAFeAGE, the South African Freeze Alliance on Genetic Engineering - is calling for a five-year freeze on GE. This call has strong support from churches, labour unions, farmer organizations, consumer groups and NGOs. For example, the 19 000-strong Food and Allied Workers Union of South Africa (FAWU) has charged that the import of GM food poses a health hazard and has threatened a national strike if government does not ban the production and sale of GM foods. The African Farmers Union has stated emphatically that they will not support GM crops if their introduction affects the livelihoods of South Africa's 1 million farmworkers. With no compulsory labelling of GM food or seed, consumers remain vulnerable and effectively have no choice.

Traditional healers join the demand for a moratorium/freeze on GE crops
Picture: Benny Gool

Governments too are taking actions against genetic engineering, in an attempt to protect their markets and the rights of their consumers and farmers. Thailand and Sri Lanka, for example, have banned GE crops and seed imports, as have Bolivia, Paraguay and a host of African countries. Many states and municipalities have declared GE-free zones, and in Europe a de facto moratorium exists on the introduction of new GM crops.

These actions have had serious impacts on trade in GM products and have affected the US in particular, the world's biggest producer of GM crops. Through the WTO, the US is exerting considerable pressure on Asian countries such as Thailand, Sri Lanka, China and Korea to lift their bans and scrap labelling laws, under the guise of contravening WTO rules and "hiding behind unfounded scientific claims to block further commerce in agriculture" (Glickman 1999). Pressure is also being placed by Washington on the European Union (EU), for its moratorium on new GM crops, and a decision to introduce strict legislation on the labelling and tracing of GM food and products. The United States is concerned not only with its trade exports to the EU but also that "labels could mislead consumers by implying that there is a risk" (Environmental News Service 2002). The concern underpinning this is that once the labelling of GM products becomes mandatory, the EU guidelines could become a model for developing

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Peter Komane from the Wilgespruit fellowship Centre demonstrating the viability of organic farming. Picture: Benny Gool

countries, significantly limiting the reach of the technology. Resolution of this issue is thus likely to set the tone for the adoption of GE worldwide, a significance that is not lost on the US, which plans to take the matter to the WTO.

Trade issues are also paramount within southern Africa. Most African countries are taking a precautionary approach to GE, urging for the establishment of a common biosafety regime in Africa before the planting of GM crops. The calls seem to have fallen on deaf ears in South Africa, which has yet to sign and ratify the Biosafety Protocol and seems oblivious to regional concerns of contamination and trade impacts. Namibia, for example, in a bid to protect its beef market, has sent back South African yellow maize, for fear of it being genetically modified. Zimbabwe has banned the importation of GMOs or GE products without the approval of its Biosafety Board. Botswana too has taken a precautionary approach to the introduction of GM crops. The imminent introduction of South African GM white maize in the region will have profound implications, not only for the millions of refugees and consumers who have no choice, but also for regional trade relations and markets: little capacity exists to segregate GE from non-GE maize, and as the Mexican case demonstrates, fears of contamination are very real.
In fact, companies like African Products, one of South Africa's major maize processing companies, already pay farmers to grow non-GE crops to ensure that their maize is GE-free and their markets are secure. These concerns extend to other crops. Last year, South African farmers in Middelburg decided to keep their area GE-free to protect their markets and cancelled their orders for Round Up Ready soybean. The concern, expressed throughout the country in a myriad of ways, is that those pushing GE will destroy alternative markets, including the rapidly growing organic market, and the economic and labour opportunities that these bring.

9. Another World is Possible - The Road Ahead

So is there an alternative? Proponents of GE would have us believe that there is no alternative for feeding the world, and that the millions of voices opposing GE are Luddites, who have been swept into hysteria by the media and populist groups, and who have no real knowledge or understanding of the issue. Yet viable alternatives to GE, and in fact to the overall model of industrial agriculture do exist and are becoming a visible reality. A recent review of the potential of sustainable agriculture to feed Africa concluded that in 45 projects spread across seventeen different African countries, 730 000 households substantially increased food production and their household food security with sustainable agricultural systems. In Cuba, the entire country is fed on locally-based small-scale agricultural systems. In Kenya and elsewhere, innovative approaches to insect control have been demonstrated without chemicals, and without any extra costs for the farmers. Slowly, but steadily, farmers in South Africa too are seeing the benefits and appropriateness of sustainable agriculture as a viable production approach. Certainly there are hurdles, including the noticeably absent support from government to promote such models. There are also difficult choices and trade-offs to make, between producing food for the lucrative organic export market, or for own consumption. What is clear is the possibility and indeed opportunity of doing things another way. There is no need to 'copycat' the mistakes of the industrialized world; as the Johannesburg Memo puts it - there is a chance to turn "underdevelopment" into a blessing (HBS 2002).

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