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RAFI IMPACTS: The Terminator File

Civil Society Organizations (CSOs) and the "Third System"

Civil Society Organizations play an increasingly important role in international governance, policy formation and programme execution. It has long been said that they represent a "Third System" counterbalance to the power of governments and industry. A quarter of a century ago, the "First System" clearly described sovereign governments and intergovernmental organizations. The "Second System" referred to the private, commercial sector. Today, however, transnational industries are sovereign and governments are subordinate to their global will. In this environment, CSO's and Peoples' Organizations must strengthen their role in monitoring and shaping policy at all levels. The modern history of Civil Society advocacy has strong roots - in Gandhian civil disobedience, and Human Rights movements (such as universal suffrage and anti-slavery) for instance. More recently, CSO advocacy has spread, to women's, environmental, agricultural, and intellectual property concerns, for example. Are CSO's effective? Do they learn from past efforts and improve their capacity to monitor and motivate policy? With more than twenty years of international advocacy experience, RAFI has a significant history in policy debate. To document this history, RAFI is producing a series of Occasional Papers, to illustrate its work in a number of specific areas. The following case study on "The Terminator" is the first in this series. Readers' comments and opinions are welcome.

The Terminator - In Brief

In March 1998, US patent no. 5,723,765 was granted for a genetic engineering technology that RAFI soon dubbed the "Terminator". If commercialized, it will have a profound impact on agriculture and food security worldwide, and on farmers everywhere who save seed one year to plant the next. The technology was jointly developed and patented by the US Department of Agriculture and US seed company Delta and Pine Land. It's inventors have explicitly set their marketing sights on the millions of farmers of the gene-rich South who now save seeds from one season to the next. The Terminator has no redeeming agronomic value. Its sole purpose is to force farmers back to the commercial seed market every year. This elegant product of misguided science genetically programs plants so their seeds mature, but are sterile. For the patent-holders, it is a biological guarantee that farmers who use it will be forced to buy seed every planting season. On hearing of this insidious invention, RAFI knew it must be opposed. Just a week after the patent was granted, RAFI launched an international campaign to ban it. The following chronology and publications summarize what RAFI has done, with partners, to try to ensure that the Terminator never sees the commercial light of day. It is the chronicle of a "work in progress", which is evolving daily, and whose ending is yet to be written.

The Terminator File - A Chronology

- **March 3, 1998** - US Patent and Trademark Office grants US patent no. 5,723,765 to Delta and Pine Land and the US Department of Agriculture (USDA). Delta and Pine Land and USDA announce the patent to the media. RAFI research reveals that the patent is published at WIPO (The World Intellectual Property Organization - WO 9604393), and is pending in Australia (AU 9532050), Canada (CA 2196410), the European Patent Office (EP 775212) and South Africa. WIPO documents indicate that the patent will be claimed in 78 countries.

- **March 3-10** - RAFI examines the patent, interviews company and USDA scientists who developed the seed sterilizing technology, prepares a written analysis, and sends it to colleagues worldwide.

- **March 11** - RAFI issues Geno-Types: *US Patent on New Genetic Technology Will Prevent Farmers from Saving Seed.*

- **March 13** - Citing reactions from Southern colleagues, RAFI issues Press Release: *Biotech Activists Oppose the "Terminator Technology"*. A Spanish organization translates it into Spanish. By dubbing the new technology the "Terminator", RAFI establishes the terms of the ensuing debate about the new technology.

- RAFI and partners worldwide begin calling for a ban on the Terminator, and argue that governments should reject the patent on the grounds of *ordre public*, or morality.

- International media begin to disseminate news of the Terminator. Colleagues summarize RAFI materials in several languages. By the end of March, the story has been covered by the BBC, US National Public Radio, The New Scientist, and by many special interest periodicals and media outlets worldwide. In the following weeks, press interest heightens. The Terminator story is picked up by Associated Press, Canada's CBC, Swedish Public Radio and the New Internationalist, among others.

- **March 20** - RAFI issues Press Release: *Terminating Food Security? The Terminator Technology that sterilizes seed also threatens the food security of 1.4 billion people and must be terminated.*

- **March / April** - To provide in-depth analysis of the Terminator for regular readers and the press, RAFI publishes RAFI Communique: *The Terminator Technology - New Patent Aims to Prevent Farmers from Saving Seed.*

- **end of April** - Policy Committee of the Consultative Group on International Agricultural Research (CGIAR) meets in Aleppo, Syria, to prepare for the Fourth Conference of the Parties to the Biodiversity Convention (COP IV). RAFI sends information on the Terminator and urges CGIAR to take action. The meeting expresses concern about the technology, and agrees to study it further.

- **May 4-15** - COP IV convenes in Bratislava, Slovakia. Two RAFI staff attend, meet with delegates and NGOs, disseminate information, propose a COP resolution, talk to the press, and continue to call for a ban on the Terminator.

- **May 7, 1998** - With assistance from Genetics Forum of the UK, RAFI organizes a seminar on the Terminator at COP IV, attended by government delegates, civil society observers and press.

- **May 11** - Agribusiness giant Monsanto acquires Delta and Pine Land and Dekalb Plant Genetics, adding $US 4.3 billion to its recent merger bill. RAFI goes to its files, contacts colleagues around the world, and prepares a press release for COP IV.

- **May 14** - RAFI issues Press Release from COP IV in Bratislava: *Monsanto Takes Terminator - It's Now or Never for Agricultural Biodiversity in Bratislava.*

- **May 15** - Despite US pressure, COP IV adopts a resolution to study the Terminator. It reads: *"The Conference of the Parties... Reiterating the precautionary approach, requests SBSTTA,* [its Scientific and Technical body] *to consider and asses, in light of contributions to be provided by Parties, Governments and organizations, whether there are any consequences for the conservation and sustainable use of biodiversity from the development and use of new technology for the control of plant gene expression, such as that described in United States patent 5723765, and to elaborate scientifically based advice to the Conference of the Parties. Moreover, urges Parties, Governments as well as civil society and public and private institutions to consider the precautionary approach in its application.*

- **end of May** - CGIAR Mid-term Meeting convenes in Brasilia, Brazil. The Policy Committee again considers the Terminator, and expresses concern.

- **May - June** - during these and subsequent months, RAFI responds almost daily to requests for information and analysis , from CSOs, governments and journalists worldwide. RAFI hears of dozens of actions to stop the Terminator - by opponents as varied as Brazilian municipalities, the Indian government, CSO networks and concerned scientists.

- **June** - RAFI releases Occasional Paper Vol. 5, No. 1: *Terminator Trends,* deepening its analysis of the Terminator technology, and placing it in the context of other technological and legal developments that undermine Farmers' Rights to save seed, and increase corporate control of agriculture.

- **June 1** - Monsanto and American Home Products announce their $33 billion merger. RAFI again goes to its research files and the internet, and prepares another news update. RAFI dubs the newly- merged "Monster" the "Microsoft of Biotechnology".

- **June 2** - RAFI issues Geno-Types: *Terminator Technology at COP IV,* reporting to readers about the Terminator resolution adopted by COP IV in Bratislava.

- **June 8-12** - 118 governments attend a meeting of the FAO Commission on Genetic Resources for Food and Agriculture in Rome. Two RAFI staff (with FAO consulting status) participate, circulating information, and calling on FAO and all governments to oppose the Terminator technology. In a seminar for delegates on the Terminator, RAFI faces off with Delta and Pine Land Vice President for Technology Transfer.

- **June 11** - RAFI issues Geno-Types: *American Home "Monster"? Implications of the Monsanto/American Home Products Merger*

- **June 26, 1998** - RAFI learns that Monsanto (then fighting an image problem over genetic engineering in Europe) and the Grameen Bank of Bangladesh (acclaimed for its micro-credit loans to poor rural women) have signed a deal to create the "Grameen Monsanto Centre for Environment-Friendly Technologies" in Bangladesh, to promote Monsanto products to Grameen borrowers. RAFI contacts colleagues in South Asia, disseminates information worldwide, digs up information on Grameen, and plans a response.

- **June 29** - Monsanto/American Home Products buys Cargill's international seed operations for $1.4 billion. RAFI again goes to its research files, and plans another news update.

- **June 30** - RAFI issues Geno-Types: *The "Monster" Strikes Again - Monsanto/American Home Products Buy Cargill's Overseas Seeds Operations.*

- **July 3 - 7** - RAFI and Asian CSOs write to Grameen's drector, outlining the dangers of the Monsanto-Grameen deal, and urging him to call it off. RAFI contacts senior people in international agricultural research institutions, voicing grave concerns about the Monsanto-Grameen deal.

- **July 7** - when Grameen fails to reply, RAFI issues Press Release: *Grameen Turns Mean? From Poverty Fighter to Peasant's Pinkerton*

- **July 15** - Monsanto announces its agreement to acquire Plant Breeding International Cambridge Ltd. From Unilever, for about $525 million.

- **July 27** - the BBC, announces that the Grameen Bank has withdrawn from the Monsanto deal, after pressure from "environmental groups".

- **late July** - RAFI and Genetics Forum co-author a feature article for *The Ecologist*, on the science and politics of the Terminator.

- **August 6** - RAFI issues Press Release: *Grameen Bank and the Monster - Grameen Rejects Mean*

- **early August** - Swedish colleagues bring RAFI's attention to other Terminator-like genetic engineering technologies, developed and patented by Britain's Zeneca. RAFI analyses these patents, and prepares a news update.

- **August 24** - RAFI issues Geno-Types: ... *And Now The "Verminator"! Fat Cat Corp with Fat Rat Gene Can Kill Crops*

Note: All RAFI press releases and Geno-Types are sent electronically to about 800 recipients, in over 70 countries. These, like all RAFI publications, are posted on RAFI's website as they appear. The website is accessed at the rate of 12,000 - 15,000 "hits" per month.

What Has Been Achieved?

It is still too early, and the issue is too big to declare any stunning victories. The fight that has been launched against the Terminator, and all technologies that jeopardize food security for profit will be a long one, and an unequal battle if ever there was one. It has pitted a handful of civil society activists, and fewer concerned scientists against a multi-billion dollar corporate giant. It will be a long hard slog before the real outcome is known. But some headway has already been made, and there are hopeful signs.

The Terminator was unearthed and publicized early enough that it can actually be stopped. The technology and its implications have been brought to the attention of the international media, who have picked up the ball, and are running with it. The "issue" has been widely understood, and has taken on a momentum of its own.

Perhaps most significantly, RAFI has established the terms of the debate about this insidious technology, by (accurately) naming it the Terminator. Others, including the press, now use this shorthand.

Importantly, a single patented technology has been moved from the realm of "interesting but obscure scientific advance" into the policy arena, where it is now squarely on the political agenda. Three inter-governmental bodies have agreed to study the Terminator, and are questioning its use. This in turn has had a ripple effect, with governments one by one following suit. All this is cause for optimism.

The Terminator Technology has also been placed into the larger context of agricultural research trends, corporate concentration and market penetration. This, with excellent North/South collaboration meant that CSOs were able to expose and eventually reverse Monsanto's "done deal" with the Grameen Bank in Bangaldesh.

Though we are still too few, opponents to the Terminator have steadily grown in number during the six months since early March. RAFI has played a catalytic role, but is by no means a lone voice. Civil society organizations around the world are independently conducting their own investigations, developing their own strategies in their own countries, and at regional bodies on their own continents. Together, they are putting this issue on the map, and will make sure it doesn't go away. With creativity, and allies among the press and policy-makers, they can stop the Terminator. Stay tuned to RAFI's website (www.rafi.org) for further developments!

August 31, 1998

March 11, 1998

US Patent on New Genetic Technology Will Prevent Farmers from Saving Seed

On March 3 Delta and Pine Land Co. (Mississippi, USA) and the U.S. Department of Agriculture (USDA) announced that they received US Patent No. 5,723,765 on a new genetic technology designed to prevent unauthorized seed saving by farmers. The patented technology, "Control of plant gene expression" would allow seed companies to control the viability of progeny seed without harming the crop. In other words, the new technology genetically alters the seed so that it will not germinate if re-planted a second time.

The patent is broad, applying to plants and seeds of all species, including both transgenic (genetically engineered) and conventionally-bred seeds. If commercially viable, the patented technology could have far-reaching implications for farmers and the commercial seed industry. If the technology is widely licensed, it could be a boon to the seed industry - especially for companies marketing self-pollinating seeds such as wheat, rice, cotton, soybeans, oats and sorghum. Historically there has been little commercial interest in non-hybridized seeds such as wheat and rice because there is no way for seed companies to control reproduction. If commercially viable, the new technology could mean huge profits in entirely new sectors of the seed industry. For farmers, the patented technology will undoubtedly mean greater dependence on the commercial seed market, and a fundamental loss of control over germplasm. If widely utilized, farmers will lose the age-old right to save seed from their harvest.

Many seed corporations have tried to stop farmers from saving or re-selling proprietary seeds by using intellectual property laws (patents and plant breeders' rights) that make it illegal for farmers to re-use or sell harvested seed (for reproductive purposes). Monsanto, for example, now requires that farmers sign a licensing agreement that strictly forbids farmers from saving or re-using the company's patented seed. (See *RAFI Communique* on "Bioserfdom," March/April, 1997.) According to a recent article in *Progressive Farmer* magazine, Monsanto is aggressively enforcing its patents on transgenic soybean seeds, and has recently taken legal action against more than 100 soybean growers who have violated the licensing agreement. (see: http://www.progressivefarmer.com/today/pffile/savedseed.html)

The company has even hired Pinkerton investigators (hired police) to identify unauthorized seed-saving farmers.

If Delta and Pineland's new technology successfully prevents farmers from germinating a second generation of seed, then seed companies will gain *biological control* over seedsthat they have heretofore lacked in non-hybrid crops.

Nobody knows exactly how many farmers save seed from their harvest each year. By some estimates, 20% to 30% of all soybean fields in the US midwest are typically planted with saved seeds; up to 50% of soybeans in the South are planted with farmer-saved seed. Precise statistics are not available, but many North American wheat farmers rely primarily on farm-saved seeds and return to the commercial market once every four or five years.

Impact in the South

A genetic technology designed to prevent farmers from saving seed would have a far greater impact in the South - and that is precisely the market being targeted. Murray Robinson, the president of Delta & Pine Land, told RAFI, "We expect it [the new technology] to have global implications, especially in markets or countries where patent laws are weak or non-existent." The company says its new patent has "the prospect of opening significant worldwide seed markets to the sale of transgenic technology for crops in which seed currently is saved and used in subsequent plantings." (http://biz.yahoo.com/prnews/980303/ms_delta_p_1.html)

Up to 1.4 billion resource-poor farmers in the South depend on farm-saved seed and seeds exchanged with farm neighbors as their primary seed source. A technology that threatens to extinguish farmer expertise in selecting seed and developing locally-adapted strains is a threat to food security and agricultural biodiversity, especially for the poor.

According to USDA spokesman, Willard Phelps, Delta & Pine Land Co. has the option to exclusively license the patented technology that was jointly developed by USDA researchers and Delta & Pine Land. The USDA wants the technology to be "widely licensed and made expeditiously available to many seed companies," said USDA's Phelps. The goal is "to increase the value of proprietary seed owned by US seed companies and to open up new markets in Second and Third World countries," said Phelps.

Melvin J. Oliver, a USDA molecular biologist and primary inventor of the technology, explains why the US government developed a technology that prohibits farmers from saving proprietary seed: "My main interest is the protection of American technology. Our mission is to protect US agriculture, and to make us competitive in the face of foreign competition. Without this, there is no way of protecting the technology [patented seed]." Oliver says that the technology to prohibit seed-saving is still in the product development stage, and is now being tested in cotton and tobacco.

In RAFI's view, the fact that this technology was developed by USDA researchers, with taxpayer funds, should be a real kick in the teeth to US farmers. USDA researchers articulate a greater allegiance to the commercial seed industry than they do to farmers. Publicly-supported plant breeding was once the backbone of US agriculture. Its goal was to deliver superior crop varieties to farmers' fields - not to guarantee seed industry profits. A new technology that is designed to give the seed industry greater control over seeds will ultimately weaken the role of public breeders and reinforce corporate consolidation in the global seed industry (for more information, see RAFI's *Communique* on The Life Industry.)

* **Delta & Pine Land Co.** (Scott, Mississippi) is the largest cotton seed company in the world, with 1997 annual sales of $183 million. Monsanto is a minor shareholder in Delta & Pineland; the two companies have a joint cotton seed venture in China (D&M Intl. LLC).

* **Monsanto** (St. Louis, Missouri) is a major life industry corporation, and the world's second ranking agrochemical corporation. Monsanto's investment and acquisition in seeds and agrochemicals over the past 24 months exceeded (US) $2 billion. Monsanto's total 1996 revenues were (US) $9.26 billion.

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Press Release - 13 March 1998

BIOTECH ACTIVISTS OPPOSE THE "TERMINATOR TECHNOLOGY"

NEW PATENT AIMS TO PREVENT FARMERS FROM SAVING SEEDS.

By the year 2000 - after a 12,000-year history of farming - farmers may no longer be able to save seed or breed improved varieties. The problem is not the Millennium Bug but the "Millennium Seed."

The twelve thousand year old practice of farm families saving their best seed from one year's harvest for planting the next season may be coming to an end. On March 3rd, an American cotton seed company and the U.S. Department of Agriculture (USDA) announced they had received a patent on a technique that genetically-disables a seed's capacity to germinate when planted again. US Patent No. 5,723,765, granted to Delta & Pine Land Co., doesn't just cover the firm's cotton and soybean seed business but potentially all cultivated crops.

Under a research agreement with the USDA, the company has the exclusive right to license (or not) the new technology to others. While only cotton and tobacco seeds have been shown to respond to the new technique, the company plans to have what RAFI's Research Director Hope Shand has dubbed, "Terminator Technology" ready for a much wider range of crops shortly after the year 2000.

According to USDA spokesman Willard Phelps, the primary targets for the Terminator are "Second and Third World" markets. Priority crops include rice, wheat, sorghum and soybeans - crops largely ignored by agribusiness breeders because they aren't readily hybridized (a tried-and-true biological means of forcing farmers back into the seed market every year). By and large, profit-hungry seed companies have shunned these crops because the returns don't match those for hybrid crops like maize and many vegetables. With the patent announcement, the world's two most critical food crops - rice and wheat, staple foods for three-quarters of the world's poor - potentially enter the realm of private monopoly.

The patent has taken plant breeders by storm. The technique - if it works as advertised - has profound implications for agriculture. But the news has also created division. Some of those contacted by RAFI see benefits to the new technology. "For the first time, private companies will be encouraged to invest in the world's most vital food crops. We can look forward to a new flow of investment into crops whose yields have stagnated or even declined in the Nineties. Now such poor people's crops as rice and wheat will get the research support they so desperately need," one crop economist advised. The patent's defenders acknowledge that the Terminator Technology will mean a hefty hike in seed costs as farmers who now only buy seed when they change varieties are forced to make annual purchases. But they defend hiking seed prices by saying farmers will only opt for the "sterile" seeds if they offer a big advantage. Otherwise, farmers will keep with the current publicly-bred varieties.

RAFI's Hope Shand disagrees. "Don't forget, the Terminator was developed by the public sector (USDA) together with the private sector. There will be enormous pressure on public breeders to adopt the technique in order to feed cash-starved government and university research department with corporate dollars." Edward Hammond of RAFI concurs, "Biotech companies that are already patenting specific crop genes and traits will probably insist that other breeders licensing their germplasm use the Terminator to protect their monopoly. It won't take long," Hammond adds, "before farmers run out of choices. Either they pay for the Millennium Seed or they replant older varieties from abandoned breeding programmes."

"This is a patent that really turns on the greed gene," says Camila Montecinos of the Chilean-based Center for Education and Technology, "It's too profitable for companies to ignore. We will see pressure on national

regulatory systems to marginalize saved-seed varieties and clear the way for the Terminator. One point four billion farm families are at risk."

Aside from sky-rocketing seed costs, Neth Daño of the Philippines-based civil society organization SEARICE sees a threat to the environment and to long term food security. "We work with farmers who may buy a commercial variety but its breeder wouldn't recognize it five years later. Women select the best seeds every year and - over time - the rice molds itself to the farm's own ecosystem. Women also cross the commercial variety with other rice strains to breed their own locally-adapted seeds. The Terminator could put an end to all this and increase crop uniformity and vulnerability. It poses a threat to the culture of seed sharing and exchange that is led primarily by women farmers."

"Ultimately, the Terminator technology will severely limit farmer options, says Neth Daño of SEARICE. "Will we be left with rice varieties that taste like sawdust and which pests and diseases love to devour?" asks Daño.

Camila Montecinos of Chile-based CET is calling for a global boycott of the Terminator Technology. "Governments should make use of the technology illegal," she insists. "This is an immoral technique that robs farming communities of their age-old right to save seed and their role as plant breeders. It should be banned." To this, corporate breeders argue that the new technology simply does for hard-to-hybridize crops what the hybrid technique did for maize. Hybrid seed is either sterile or fails to reproduce the same quality characteristics in the next generation. Thus, most maize farmers buy seed ever year. "Poor farmers can't afford hybrids either;" Montecinos points out, "but there's a key difference. The theory behind hybridization is that it allows breeders to make crosses that couldn't be made otherwise and that are supposed to give the plant higher yields and vigor. The results are often disappointing but that's the rationale. In the case of Terminator Technology, there's absolutely no agronomic benefit for farmers. The sole purpose is to facilitate monopoly control and the sole beneficiary is agribusiness."

RAFI will be working with its partners around the world to encourage a global ban on the use of Terminator Technology. "By the time it's ready for market shortly after the year 2000, we hope that the Millennium Seed will succumb to the Millennium Bug," concludes RAFI's Shand.

RAFI is a non-profit international civil society organization headquartered in Canada. For more than twenty years, RAFI has worked on the social and economic impact of new technologies as they impact rural societies.

CET is *Centro de Educación y Tecnología*, an NGO based in Santiago, Chile with a long history of work on rural and agricultural issues.

SEARICE is the Southeast Asian Regional Institute for Community Education - a non-profit international civil society organization based in the Philippines. SEARICE has more than two decades of work on rural development and agricultural biodiversity work at the community, regional, and international level.

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Press Release - 20 March 1998

TERMINATING FOOD SECURITY?

THE TEMINATOR TECHNOLOGY THAT STERILIZES SEED ALSO THREATENS THE FOOD SECUITY OF 1.4 BILLION PEOPLE AND MUST BE TERMINATED.

Advocates for the newly patented "terminator technology" developed jointly by the US Department of Agriculture and Mississippi-based Delta and Pine Land seed company claim that it will not only be an incentive to plant breeding investment but also a boon to food production in the South. This is "nonsense" according to RAFI Research Director, Hope Shand. The new technology (see RAFI News Release "Biotech Activists Oppose the Terminator Technology," 13 March 1998) switches a plant's reproductive processes on and off so that harvested seed will be sterile if farmers attempt to replant it, as they have for the past 12 thousand years. The patent's implications are causing a furor among farmers and breeders around the world.

Poor Customers: "It's terribly dangerous," says HopeShand, "half the world's farmers are poor and can't afford to buy seed every growing season, yet poor farmers grow 15 to 20% of the world's food and they directly feed at least 1.4 billion people - 100 million in Latin America, 300 million in Africa, and 1 billion in Asia. These farmers depend upon saved seed and their own breeding skills in adapting other varieties for use on their (often marginal) lands."

"Private companies aren't interested in developing plant varieties for poor farmers because they know the farmers can't pay," Pat Mooney, RAFI's Executive Director, adds, "even national public breeding programmes tend to focus on high-yielding, irrigated lands leaving resource-poor farmers to fend for themselves. Despite this, patents are being sought everywhere from Madagascar to Mongolia and from Brazil to Vietnam." Proponents of the Terminator maintain that such farmers will be unaffected by the technology while more affluent farmers will have the choice of buying Terminator seed or sticking with standard varieties.

Less Plant Breeding: "That's not how it's going to work,"replies Neth Daño of SEARICE in the Philippines. Daño's organization works with farmers throughout Southeast Asia. "Public breeders wanting access to patented genes and traits will be forced to adopt the Terminator as a licensing requirement," she insists, "The better-off farmers in the valleys will be forced to pay. Their poor neighbours on the hillsides will no longer be able to exchange breeding material with their counterparts in the valleys. Far from improving plant breeding, the Terminator could drive hundreds of millions of farmers out of plant breeding and, since noone else will breed for their needs, out of agriculture altogether."

Spreading Sterility: Camila Montecinos, an agronomist with the Chilean organization, CET, has another concern, "We've talked to anumber of crop geneticists who have studied the patent," she says."They're telling us that it's likely that pollen from crops carryingthe Terminator trait will infect the fields of farmers who either rejector can't afford the technology. Their crop won't be affected that season but when farmers reach into their bins to sow seed the following season they could discover - too late - that some of their seed is sterile. Thiscould lead to very high yield losses. If the technology is transmitted throughrecessive genes, we could see several years of irregular harvests and ageneral - even dramatic - decline in food security for the poorest farm communities."

BioSafety vs. Food Security? "The corporate strategy willbe to argue that the Terminator increases the safety of using genetically-engineered organisms," Hope Shand returns, "They'll claim that since the seed is sterile it is less likely that transgenic material will spread from one crop into related species and wild crop relatives. They'll be tryingto get environmental organizations to back the Terminator." "Biosafety at the expense of food security is no solution," RAFI's Pat Mooney agrees. "First, as geneticists are telling us, there is a real danger that the Terminator will bleed into neighbouring fields anyway, and second, human safety through food security has to be our primary concern."

Terminate the Terminator: "We believe there is a need fora global campaign to prevent the use of Terminator technology," Camila Montecinos says. CET is a highly-respected civil society organization linked to a strong Latin American network of farm and rural development organizations. "Farmers and governments

everywhere should declare use of the technology as contrary to public order and national security. This is the neutron bomb of agriculture."

Terminator Technology / Untangling the Debate

1. "More Investment"

"Good News": Terminator will encourage previously-reluctant companies to invest in traditionally open-pollinated crops and so-called"forgotten" crops.

Bad News: Investment in stage one will focus on ways to circumvent thepatent. In stage two, firms will invest to load already-developed proprietarytraits into Terminator varieties. Stage three investment will be to hype markets to convince farmers Terminator is the wave of the future. By thetime stage four rolls around, the commercial seed industry oligopoly will have little relevant competition from open-pollinated varieties.

2. "More Choice"

"Good News": Farmers will still be able to choose between terminator seed and open-pollinated varieties developed by the public sector.

Bad News: No they won't. Even public breeders will be pressured by cash-starved institutes to adopt the profitable technique. Don't forget, the USDA developed this anti-farmer technology. Look how public breeders are betraying farmers in Australia and New Zealand charging royalties for varieties in the public domain.

3. "More Varieties"

"Good News": More investment means more varieties for farmersto choose from. Terminator will stimulate a diverse and competitive market place of improved varieties.

Bad News: There may be more brand names but there won't necessarily bemore genuinely-distinct varieties. Companies will pack Terminator seed with already-available proprietary traits like herbicide-tolerance.

4. "More Breeders"

"Good News": Terminator will draw more breeders to non-hybrid crops. This has to be good for farmers and food security.

Bad News: The sterility trait will take millions of farmers out of plant breeding, leaving no one to care for their specific agricultural eco-systems.

5. "More Value"

"Good News": Breeders won't make sales unless they can offer superior seed with higher yields and other market traits.

Bad News: It's cheaper for the world's ten dominant seed companies (with close to half the commercial market) to simply put pressure on seed regulatory systems and public breeders in order to eliminate competition from open-pollinated varieties. This is what happened in the EU in the 1980's with their integrated Common Catalogue.

6. "More Safety"

"Good News": Because the second generation seed is sterile, it will be safer to introduce genetically-modified organisms into new varieties. This will speed up biotech advances in agriculture and increase productivity.

Bad News: No way. The sterility trait from first generation seed willinfect neighbouring fields of open-pollinated crops causing crop failures while creating additional markets.

7. "Maybe It'll Fail"

So far, though the patent-holders claim all crops, the Terminator hasonly worked on cotton and tobacco. Maybe it won't work on others or maybeit will perform inconsistently. Hoping for failure isn't as useful as banning the use. First, it might still spread into other crops from cotton or tobacco. Second, even sporadic germination failures will be sufficient to scare farmers away from saving seed that might not grow. The patent holders don't have to have a perfect technique in order to threaten farmers who can't afford risk.

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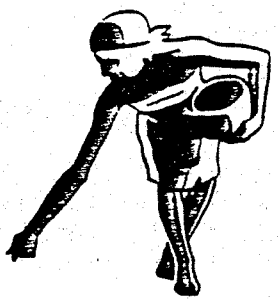

RAFI COMMUNIQUE

RURAL ADVANCEMENT FOUNDATION INTERNATIONAL

March/April, 1998

The Terminator Technology

New Genetic Technology Aims to Prevent Farmers from Saving Seed

ISSUE: On March 3, 1998 the US Department of Agriculture (USDA) and an American cotton seed company, Delta & Pine Land Co., received a US patent on a technique that genetically alters seed so that it will not germinate if re-planted a second time. The technology aims to prevent farmers from saving seed from their harvest to re-plant the following season. Because it is a potentially "lethal" technology, RAFI has dubbed it the "Terminator Technology."

IMPACT: If commercially viable, the Terminator technology will have profound implications for agriculture. It is a global threat to farmers, biodiversity and food security. The seed-sterilizing technology threatens to eliminate the age-old right of farmers to save seed from their harvest and it jeopardizes the food security of 1.4 billion people – resource poor farmers in the South – who depend on farm-saved seed. The developers of the technology say that it will be targeted for use primarily in the South as a means of preventing farmers from saving proprietary seeds marketed by American seed corporations. Delta & Pine Land Co. and USDA have applied for patents on the Terminator technology in at least 78 countries. If the Terminator technology is widely utilized, it will give the multinational seed and agrochemical industry an unprecedented and extremely dangerous capacity to control the world's food supply.

PARTICIPANTS: Although the USDA and Delta & Pine Land (D&PL) jointly hold the patent on the Terminator technology, Delta & Pine Land has exclusive licensing rights. D&PL is the largest cotton seed company in the world. With 1997 annual sales of $183 million, D & PL holds 73% of the US cotton seed market and is a major soybean breeder. Monsanto (US-based agrochemical and seed giant) is a minor shareholder in D&PL; the two companies jointly own a cotton seed venture in China (D&M Intl. LLC).

POLICY IMPLICATIONS: RAFI and other NGOs are calling for a global ban on the use of the Terminator technology. Both the patent and the technology should be rejected on the basis of public morality. NGOs will call on the Consultative Group on International Agricultural Research (CGIAR) to publicly denounce the technology as a threat to food security in the South. The Fourth Conference of the Parties to the Convention on Biological Diversity will have an opportunity to address the issue when it meets May 4-15 in Bratislava, Slovakia. The FAO Commission on Genetic Resources for Food and Agriculture will meet in Rome, 8-12 June. NGOs will urge both intergovernmental bodies to pass resolutions condemning the Terminator technology as a threat to world food security and to Farmer's Rights. In the United States, farmers and farm advocacy groups are expected to protest USDA's anti-farmer research and urge immediate reforms of policies governing the department's research agenda.

Introduction

On March 3, 1998 Delta & Pine Land Co. (Mississippi, USA) and the United States Department of Agriculture (USDA) announced that they received a US patent on a new genetic technology designed to prevent unauthorized seed saving by farmers.[1] The patent is benignly titled, "Control of plant gene expression" (US patent no. 5,723,765). The patented technology enables a seed company to genetically alter seed so that it will not germinate if re-planted a second time. The patent is broad, applying to plants and seeds of all species, including both transgenic (genetically engineered) and conventionally-bred seeds. The developers of the new technology say that their technique to prohibit seed-saving is still in the product development stage, and is now being tested on

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cotton and tobacco. They hope to have a product on the market sometime after the year 2000.

USDA researchers told RAFI that they have spent approximately (US) $190,000 to support research on the Terminator technology over the past 4 years. D & PL, the seed industry collaborator, devoted (US) $275,000 of in-house expenses and contributed an additional (US) $255,000 to the joint research. USDA spokesman, Willard Phelps, told RAFI that Delta & Pine Land Co. has the option to exclusively license the patented technology that was jointly developed by USDA researchers and Delta & Pine Land.[2]

The USDA wants the technology to be "widely licensed and made expeditiously available to many seed companies," said USDA's Phelps. The goal is "to increase the value of proprietary seed owned by US seed companies and to open up new markets in Second and Third World countries," Phelps told RAFI.

Melvin J. Oliver, a USDA molecular biologist and the primary inventor of the technology, explains why the US government developed a technology that prohibits farmers from saving proprietary seed: "My main interest is the protection of American technology. Our mission is to protect US agriculture, and to make us competitive in the face of foreign competition. Without this, there is no way of protecting the technology [patented seed]," Oliver told RAFI.[3]

The USDA stands to earn royalties of about 5% of the net sales if a product is commercialized. "I think it will be profitable for USDA," Phelps told RAFI. The day after the patent was announced, Delta & Pine Land Company's stock rose sharply.[4] **But USDA and seed industry profits will come at enormous cost to farmers and food security.**

USDA researchers interviewed by RAFI expressed a strong allegiance to the commercial seed industry, and an appalling lack of awareness about the potential impacts of the technology, especially in the South.

Impact in the South

A genetic technology designed to prevent farmers from saving seed would have enormous adverse impacts in the South – and that is precisely the market being targeted. Murray Robinson, the president of Delta & Pine Land, told RAFI, "We expect [the new technology] to have global implications, especially in markets or countries where patent laws are weak or non-existent."[5] The company's 3 March 1998 press release claims that its new technology has "the prospect of opening significant worldwide seed markets to the sale of transgenic technology for crops in which seed currently is saved and used in subsequent plantings."[6]

> ***"This is an immoral technique that robs farming communities of their age-old right to save seed and their role as plant breeders. Farmers and governments everywhere should declare use of the technology as contrary to public order and national security. This is the neutron bomb of agriculture.***
>
> Camila Montecinos, CET
> *Centro de Educación y Tecnología*, Chile

Up to 1.4 billion resource-poor farmers in the South depend on farm-saved seed and seeds exchanged with farm neighbours as their primary seed source.[7] A technology that threatens to restrict farmer expertise in selecting seed and developing locally-adapted strains is a threat to food security and agricultural biodiversity, especially for the poor. The threat is real, especially considering that USDA and Delta & Pine Land have applied for patent protection in countries and regions throughout the South – from Madagascar to Mali, from Brazil to Benin, from China to Viet Nam (see list of designated states, p. 5).

If the Terminator technology is widely licensed, it could mean that the commercial seed industry will enter entirely new sectors of the seed market – especially in self-pollinating seeds such as wheat, rice, cotton, soybeans, oats and sorghum. Historically there has been little commercial interest in non-hybridized seeds such as wheat and rice because there was no way for seed companies to control reproduction. With the patent announcement, the world's two most critical food crops – rice and wheat - staple crops for three-quarters of the world's poor, potentially enter the realm of private monopoly. According to FAO, wheat is the world's most widely cultivated crop, covering 219 million harvested hectares in 1995. Rice was cultivated over a harvested area of 149 million hectares in 1995, and had the world's highest total production, 542 million tonnes.

> ***"This patent is profoundly immoral. It will fundamentally change both the biology and economics of agriculture to the detriment of the poor. It must be stopped."***
>
> Farhad Mazhar, UBINIG
> a Bangladeshi CSO and member of South Asian Network for Food, Ecology and Culture

Bioserfdom Plus

In recent decades, the seed industry has attempted to prevent farmers from saving or re-selling proprietary seeds by using intellectual property laws (patents and plant breeders' rights) to restrict the farmer's right to re-use or sell proprietary seed (for reproductive purposes). It is only in the last decade that seed companies have begun to use industrial patents (also known as *utility* patents) to protect proprietary genes and traits. Under industrial patent law there is no exemption for farmers, and it thus becomes *illegal* for farmers to save or re-use patented seed. Monsanto, for example, requires that its customers sign a licensing agreement that strictly forbids the farmer from saving the company's patented, transgenic seed. (See *RAFI Communiqué* on "Bioserfdom," March/April, 1997.) According to a January, 1998 article by Greg Hillyer in the US-based *Progressive Farmer* magazine, Monsanto is aggressively enforcing its patents on transgenic soybean seeds, and has recently taken legal action against more than 100 soybean growers who have violated the licensing agreement.[8] According to Hillyer, the company has even hired Pinkerton investigators (hired private police) to identify unauthorized seed-saving in the mid-western US.

If Delta and Pineland's new technology provides a genetic mechanism to prevent farmers from germinating a second generation of seed, then seed companies will gain the *biological control* over seeds that they have heretofore lacked in non-hybrid crops.

Nobody knows exactly how many farmers in industrialized countries save seed from their harvest each year. By some estimates, 20% to 30% of all soybean fields in the US mid-west are typically planted with saved seeds; up to 50% of soybeans in the South are planted with farmer-saved seed. Most North American wheat farmers typically rely on farm-saved seeds and return to the commercial market once every four or five years. Wheat grown on the Canadian prairies is almost all produced in the communities in which it is grown. The same is true for lentils and peas.

More Options for Farmers?

Proponents of the Terminator technology are quick to point out that farmers will not buy seed that does not bring them benefits. Farmers are not stupid, they make rational choices. We agree. But market choices must be examined in the context of privatization of plant breeding and rapid consolidation in the global seed industry. The top 10 seed corporations control approximately 40% of the commercial seed market.[9] Given that maize seed industry giant, Dekalb Plant Genetics (USA), is now on the auction block, further consolidation is expected in a matter of months. Current trends in seed industry consolidation, coupled with rapid declines in public sector breeding, mean that farmers are increasingly vulnerable and have far fewer options in the marketplace.

A new technology that is designed to give the seed industry greater control over seeds will ultimately weaken the role of public breeders and reinforce corporate consolidation in the global seed industry.

> ***"I was concerned and angry when I read about a new technology that will make it impossible for farmers to save seed from their own crops. This technology will once again bias research to those crops covered by the technology. To remain competitive internationally, farmers will be compelled to work with improved varieties covered by this "Terminator" technology. The technology will ensure that most of the gains from research will accrue to companies owning the varieties and not to farmers."***
>
> Ian McCreary, farmer,
> Saskatchewan, Canada

Advocates of the Terminator technology claim that it will be an incentive to plant breeding investment, and a boon to food production in the South because seed companies will have an incentive to invest in crops that have long been ignored by the commercial seed industry. RAFI rejects that claim. Private companies are not interested in developing plant varieties for poor farmers because they know the farmers can't pay. Even national public breeding programmes tend to focus on high-yielding, irrigated lands leaving resource-poor farmers to fend for themselves. Proponents of the Terminator maintain that poor, seed-saving farmers will be unaffected by the technology while more affluent farmers will have the choice of buying Terminator seed or sticking with standard varieties. They point out that farmers will still be able to choose between Terminator seed and open-pollinated varieties developed by the public sector.

RAFI envisions a very different scenario. Even public breeders will be pressured by cash-starved institutes to adopt the Terminator technique in order to prevent "unauthorized" seed saving and recoup their research investment. After all, it was a publicly-funded institution, the USDA, that developed this anti-farmer technology. It is likely that public breeders wanting access to patented genes and traits controlled by the private sector will be forced to adopt the Terminator as a licensing requirement. In

the long run, it is cheaper for the world's ten dominant seed companies (with 40% of the commercial market) to simply put pressure on seed regulatory systems and public breeders to adopt the Terminator technology in order to eliminate competition from open-pollinated varieties. This is precisely what happened in Europe in the 1980's with the creation of the European Common Catalogue.

> ***"We work with farmers who may buy a commercial variety but its breeder wouldn't recognize it five years later. Women select the best seeds every year and, over time, the rice molds itself to the farm's own ecosystem. Women also cross the commercial variety with other rice strains to breed their own locally-adapted seeds. The Terminator technology could put an end to all of this and increase crop uniformity and vulnerability. It poses a threat to the culture of seed sharing and exchange that is led primarily by women farmers."***
>
> Neth Daño, SEARICE
> Philippines-based South East Asian Regional
> Institute for Community Education

Far from improving plant breeding, the Terminator could drive hundreds of millions of farmers out of plant breeding and, since no one else will breed for their needs, out of agriculture altogether. This represents an enormous threat to world food security. Half the world's farmers are poor and can't afford to buy seed every growing season, yet poor farmers grow 15 to 20% of the world's food and they directly feed at least 1.4 billion people - 100 million in Latin America, 300 million in Africa, and 1 billion in Asia.[10] These farmers depend upon saved seed and their own breeding skills in adapting other varieties for use on their (often marginal) lands.

BioSafety Concerns

The Terminator seed technology could pose a biosafety hazard. Molecular biologists who have studied the patent have mixed views on the potential ecological hazards of the sterility trait. The concern is that the sterility trait from first generation seed will "infect" (via pollen) neighbouring fields of open-pollinated crops and/or wild relatives growing nearby. Some biologists believe that pollen will not escape, and if it does, it would not pose a threat. With certain applications of the Terminator technology, however, even if the sterility gene does not last long in the environment, it could still pose a threat to nearby crop fields or wild relatives of the plant.[11] Given that the technology is new and untested on a large scale, biosafety issues remain a valid and extremely important concern.

BioSafety vs. Food Security?

The seed industry is expected to defend the Terminator technology by arguing that it will increase the safety of using genetically-engineered crops. Since the seed carries the sterility trait, say proponents, it is less likely that transgenic material will escape from one crop into related species and wild crop relatives. The seed industry is expected to argue that this built-in safety feature will speed up biotech advances in agriculture and increase productivity. Based on this reasoning, it is likely that the industry will enlist government regulators and environmental organizations in backing the Terminator. In RAFI's view, biosafety at the expense of food security is no solution. Both must be considered, but human safety through food security must be our primary concern.

How does the Terminator Technology work?

The new technique described in US patent no. 5,723,765 to genetically "sterilize" seed is technically complex, involving both bacterial and plant genes. One molecular biologist who studied the patent said that he "looked at the patent and very quickly got a headache." He also indicated that the technology described in the patent is "neat and elegant from a technical standpoint." What follows is an excerpt from Dr. David Culley's explanation of the technology, as gleaned from the patent. David E. Culley, Ph.D., is a molecular biologist in the department of plant pathology, Washington State University:[12]

"To protect their variety from "seed savers" they are making the embryos in the F2 inviable. To do this they take the coding sequence for a gene that's toxic to the plant and put it behind a promoter that restricts expression to the embryo and, specifically, to late stages of embryo development. (from the Late Embryogenesis Abundant (LEA) genes. Therefore, during late embryogenesis this protein "kills" the embryo. Plant the seed and it just sits there feeling sad.

To allow them to produce seed, they control expression of the toxic protein by putting a spacer between the promoter and the toxic gene to keep it from expressing. On either side of this spacer they placed sequences that are specifically recognized by an enzyme (a recombinase) that can excise the spacer (very precisely). This excision brings the promoter and toxic gene back together so that the toxic protein is produced late in embryo development. Without the recombinase, the spacer stays in place and the gene construct is silent. This is a good thing.

To allow the spacer excision to be controlled, the recombinase gene is placed behind a promoter that is normally expressed during early seed germination. Therefore, the recombinase protein is expressed during germination and that protein goes over and excises the spacer from the toxic protein gene construct. Then later, during late embryogenesis at the end of seed development, that toxic protein is produced and you have a dead embryo. This is a bad thing if you are planning on growing that seed."

– David E. Cully, Ph.D.

Patents on the Terminator Technology

Delta & Pine Land Company and the USDA have received a patent on the Terminator technology in the United States (US 5,723,765).[13] Applications are pending in Canada (CA 2196410), Australia (AU 9532050) the European Patent Office (EP 775212), and South Africa. The patent, "Control of Plant Gene Expression," has also been published at the World Intellectual Property Office (WO 9604393). The inventors have designated the following states for patent application either through WIPO or the European Patent Office.

Patent Applications Pending on the Terminator: Designated States

Armenia
Austria
Australia
Belarus
Belgium
Benin
Bulgaria
Brazil
Burkina Faso
Cameroon
Canada
Central African Republic
Chad
China
Congo
Cote d I'voire
Cyprus
Czechoslovakia
Denmark
Estonia
Finland
France
Gabon
Georgia
Germany
Greece
Guinea
Hungary
Iceland
Ireland
Italy
Japan
Kazakhstan
Kenya
Korea, DPR
Korea, Rep
Kyrgyzstan
Latvia
Liberia
Liechtenstein
Lithuania
Luxembourg
Macedonia
Madagascar
Malawi
Mali
Mauritania
Mexico
Moldova
Monaco
Mongolia
Netherlands
New Zealand
Norway
Niger
Poland
Portugal
Romania
Russia
Senegal
Singapore
Slovakia
Slovenia
Spain
Sri Lanka
Sudan
Swaziland
Sweden
Switzerland
Tajikistan
Togo
Trinidad & Tobago
Uganda
Ukraine
Uzbekistan
United Kingdom
Vietnam

The Terminator Must be Terminated

A genetic technology that aims to sterilize seed threatens to extinguish the right of farmers to save seed and breed new crop varieties, and threatens the food security of 1.4 billion people. The Terminator must be banned.

RAFI and other NGOs are calling for a global ban on the use of the Terminator technology. Both the patent and the technology should be rejected on the basis of public morality.

NGOs will call on the Consultative Group on International Agricultural Research (CGIAR) to publicly denounce the technology as a threat to food security in the South.

The Fourth Conference of the Parties to the Convention on Biological Diversity will have an opportunity to address the issue when it meets May 4-15 in Bratislava, Slovakia. The FAO's Commission on Genetic Resources for Food and Agriculture will meet in Rome, 8-12 June. NGOs will urge both intergovernmental bodies to pass resolutions condemning the Terminator technology as a threat to world food security and to Farmer's Rights. In the United States, farmer organizations and farm advocacy groups are expected to protest USDA involvement and urge immediate reforms of US government policy governing the department's research agenda. (At press time, farmers' organizations worldwide were just beginning to learn about the Terminator Technology.)

Companies mentioned in this *RAFI Communiqué*

* **Delta & Pine Land Co.** (Scott, Mississippi) is the largest cottonseed company in the world, with 1997 annual sales of $183 million. D & PL holds almost three-quarters of the US cottonseed market. Monsanto is a minor shareholder in Delta & Pineland; the two companies have a joint cotton seed venture in China (D&M Intl. LLC).

* **Monsanto** (St. Louis, Missouri) is a major life industry corporation, and the world's second ranking agrochemical corporation. Monsanto's investments and acquisitions in seeds and agrochemicals over the past 24 months exceeded (US) $2 billion. Monsanto's total 1996 revenues were (US) $9.26 billion.

A note about RAFI:
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[1] Delta and Pine Land Company, "Delta and Pine Land Company and the USDA Announce Receipt of Varietal Crop Protection System Patent," March 3, 1998. On the internet: http://biz.yahoo.com/prnews/980303/ms_delta_p_1.html
[2] RAFI interviewed Willard Phelps by phone on March 10, 1998.
[3] RAFI interviewed Melvin Oliver, USDA molecular biologist, by phone on March 10 and March 12.
[4] Anonymous, "Delta & Pine stock up after patent awarded," March 4, 1998. Reuters wire story. On the internet: http://biz.yahoo.com/finance/980304/delta_pine_2.html
[5] RAFI interviewed Murray Robinson, President of Delta & Pine Land Co., by phone.
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[8] Hillyer, Greg, "Saved-Seed Busters ", *Progressive Farmer*, January, 1998. On the internet: http://www.progressivefarmer.com/today/pffile/savedseed.html
[9] RAFI Communique, "The Life Industry," November/December, 1997. On the internet: http://www.rafi.ca/communique/19976.html
[10] FAO, "The State of the World's Plant Genetic Resources for Food and Agriculture," FAO, Rome, 1996.
[11] Doreen Stabinsky, Ph.D., Sacramento State University. Personal communication with RAFI.
[12] Excerpts from David.Culley's comments are used with his permission. The original comments were posted of a tissue culture discussion group, the archives of which can be accessed through: http://www.agro.agri.umn.edu/plant-tc/ The complete text of David Culley's comments are found there.
[13] Users of the World Wide Web can find the text of the patent on the IBM patent server: http://www.patents.ibm.com/details?patent_number=5723765. RAFI obtained information on patent applications pending in other jurisdictions by conducting a database search.

RAFI

Rural Advancement Foundation International

PRESS RELEASE

MAY 14 - FOR IMMEDIATE RELEASE

Its Now or Never for Agricultural Biodiversity in Bratislava

Monsanto Takes Terminator

After a week of silence on the subject, the USA (a country that is not a Party to the UN Convention on Biological Diversity) is lobbying hard to re-write the "Friends of the Chair" report on the Terminator - a technology widely condemned by numerous CBD members. Why the sudden spurt of behind the scenes activity? On May 11th, the giant Monsanto Corporation - a company with close White House connections and major multinational muscle - bought control of the Terminator patent. For Governments fighting to protect agricultural biodiversity in the Convention, its now or never.

Monsanto, the world's second largest pesticides corporation, has vaulted from nowhere to become the world's fourth largest seed company. Between mid-1996 and the end of 1997, Monsanto spent roughly US $2 billion in seed-related acquisitions. Its May 11th announcement that the corporation will take over Dekalb and Delta and Pine Land seed companies adds a staggering US $4.3 billion to its merger bill. By way of comparison, if Monsanto's Monday splurge were spent on public sector research, it would fully fund the entire CGIAR system at 1998 levels for over 12 years. But it is not who Monsanto is buying - but what patents it is acquiring - that has observers alarmed. Monsanto now has the Terminator - and maybe much moreÉ

Monsanto's Cotton is King: Less than 24 hours after the take over announcement, US anti-trust authorities were already admitting concern over Monsanto's control of the US cotton seed market. Sometime ago, Monsanto bought Stoneville Pedigree Seed with 12% of the American market. Monday's purchase of Delta and Pine Land (with 73% of the US cotton seed market) for approximately US $1.8 billion gives Monsanto an overwhelming 85% share in the United States and a dominant position in cotton seed markets ranging from Australia and Mexico to China. Monsanto is also negotiating to introduce its transgenic cotton varieties into Argentina and South Africa.

Maize Monopoly: There is no less unease over Monsanto's maize seed activity. The take-over of Dekalb - the second largest maize seed enterprise in the USA - for a stunning US $2.5 billion is hard on the heels of Monsanto's 1997 acquisition of Holden Seeds. About 25-35% of US maize acreage is based on Holden's germplasm. The two purchases make Monsanto the dominant player in the seed industry's most lucrative market. Monsanto's major domestic competitor is the DuPont - Pioneer Hi-Bred alliance that formed in 1997 when DuPont took a 20% position in Pioneer - the undisputed world leader in maize seed sales. Until the May 11th announcement, rumours were rife that DuPont and Monsanto would merge. Some observers still regard this as a possibility. The US firms have to

face off the in the global marketplace against Novartis - the Swiss behemoth that ranks number one in pesticides, number two in seeds, number three in pharmaceuticals, and number nine in veterinary medicines. In related deliberations in Bratislava, the Swiss government is actively pushing a proposal elaborated in consultation with Novartis to establish a voluntary code of conduct for industry in access to genetic resources. Critics fear the proposal may be used to derail national legislation in developing countries seeking to implement the principal of equitable sharing of biodiversity benefits called for in the Convention.

Patent Power: The Monsanto patent monopolies are worrying delegations in Bratislava. While pundits and politicians are expressing concern about market share, they have overlooked Delta and Pine Land's major asset - the US patent issued to the company and to the US Department of Agriculture (USDA) just two months ago for the Terminator Technology. The patent on the seed-sterilising technology has been applied for throughout the world and is not confined to cotton. The patent inventors claim that the Terminator will work with any crop. Bratislava negotiators who comforted themselves that neither the USDA of Delta and Pine Land would exercise the clout necessary to impose the technology globally must have had a fearful night. Monsanto has a well-earned reputation of being an aggressive "enforcer" when it comes to proprietary interests.

Monsanto may also have its eye on a Terminator technology of another sort. The maize market paradigm shifted perceptibly last January 20th when the USDA (again) won patent #5,710,367 covering "apomictic maize". Briefly put, the apomixis trait in maize creates reproducible plant "clones" that speed and easy hybrid seed production - but also open up Third World markets for commercial maize sales. Until now, poor Third World farmers were not a viable market for maize companies since they couldn't afford to buy essentially sterile hybrid seed every year. Apomictic maize can be regrown but because it is a clone, its disease resistance is likely to break down more often - meaning that farmers will be forced to buy seed more frequently. Observers fear that Monsanto will pick up license rights from the USDA (as with the Terminator Technology) and target the South.

White House Connection: Concern about the Terminator Technology - and the security of agricultural biodiversity imperilled by the technology - surfaced early last week in the Bratislava Convention meeting. By the end of the week, countries took the microphone to attack the neutron bomb of agriculture arguing that it would destroy farmer-based plant breeding; jeopardise the food security of at least 1.4 billion people dependent on the food grown by farmers who save their own seeds; and wipe out the South's remaining in-situ agricultural biodiversity. Negotiations within the "Friends of the Chair" group on agricultural biodiversity led to statements critical of the technology. To the surprise of many, the US delegation sat stoically through last week's debates without actively defending the USDA-supported technology. This lent credence to the rumours that many US government officials were privately horrified by the Terminator development. But following calls back to Washington accompanied by news late on Monday that Monsanto had bought Delta and Pine Land, the US delegation went into action. In the past two years, a number of high-ranking White House and USDA officials have left Washington for the allure of Monsanto's headquarters in St. Louis, Missouri. "In the scheme of things, Delta Pine was a bit player who got lucky with its USDA research connection," Pat Mooney of RAFI says, "the company had little influence in Washington and no knowledge of what was developing in Bratislava." When Monsanto got wind of the move to call for a ban on the Terminator in the Convention, Mooney adds, "it made some phone calls. The result is a country that is an observer to the Convention is throwing its bilateral weight around trying to squelch concerns and amend the CBD's conclusions!"

Lord of the Life Industry: Monsanto's appetite for mergers quickened in January 1997 when Monsanto took a giant bite out of the hybrid maize seed market with the US $1.2 billion acquisition of Holdens Foundation Seeds. At that time, industry analyst Dain Bosworth advised that Monsanto's goal was to get its bioengineered seed products on at least half of the (then) 40 million maize acres that Monsanto had access to through acquiring seed companies. Then, last November, Monsanto acquired a major tropical germplasm base with the acquisition of Brazil's Sementes Agroceres - giving Monsanto an estimated 30% market share in the Brazilian maize seed business. Brazilian farmers are seen as a major target for Terminator and/or apomictic maize.

Monsanto has moved beyond transgenic maize and cotton research. In 1996 the company initiated a plant genomic partnership with a leading human genomic company, California-based Incyte "to generate sequence and expression data from certain plant species, including [maize]". In October 1997, Monsanto and Millenium Pharmaceuticals (another US-based genomics company) announced a 5 year collaborative agreement worth over US $118 million, including the creation of a new Monsanto subsidiary with about 100 scientists to work exclusively with Millenium to use genomic technologies. The exclusive agreement is not limited to a single crop or geographic location - it covers all crop plants in all countries. Monsanto considers the new subsidiary "an integral part of its life sciences strategy" and hopes to gain a competitive edge in the search for patentable - and likely "Terminator-able" crop genes.

Need for Action in Bratislava: "Let's be absolutely clear," says RAFI's Edward Hammond from Bratislava, "This is a technology that deliberately sterilises farmers' fields, that offers zero agronomic benefit, that is openly aimed at the South, and that is now in the hands of a giant, aggressive multinational company with more than enough resources to follow through on the plan. If the CBD does not act and the Terminator is widely deployed, we will be facing a crisis for small farmers and in-situ conservation."

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Terminator Trends

The 'Silent Spring' of Farmers' Rights
Seed Saving, the Public Sector, and Terminator Transnationals

The only thing that can keep pace with the rate of agricultural biotechnological change these days is the speed with which the transnational Life Industry is eating itself. In the last couple of years, Monsanto has spent more than $6.7 billion buying seed and other agbiotech companies. Now, American Home Products is merging with Monsanto for another $33 billion. Other massive mergers are inevitable within the next few months. That transnational agri-business wants to stop farmers from saving seeds and conducting their own plant breeding is hardly news. That the battle over Farmers' Rights has come so abruptly to a crisis is news that governments and the scientific community are trying to ignore. We have at best two years, and at worst six months to safeguard the right of farmers as seed-savers and breeders. Rather than coming to their defence, public sector institutions are keeping silent or joining in the attack. Either way, public researchers could be contributing to the destruction of agricultural biodiversity. Who's interests are being served? The 12 thousand year-old right of farmers to save and improve seed could be coming to an end - now. Governments at FAO's Commission on Genetic Resources for Food and Agriculture (CGRFA) could turn this around when they convene in Rome from June 8-12. FAO's "Gene" Commission, which will have to debate Farmers' Rights, offers the last hope for intergovernmental moral leadership.

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Terminator Trends

National and international institutions appear to be facilitating a range of legal and biotechnological measures intended to stop farmers from saving seed and breeding their own plant varieties. In the process, agricultural biodiversity will further erode and the food security of at least 1.4 billion poor people (who depend on the commodities harvested from farm-saved seed) will be imperiled. Aside from the biological and legal terminators at work here, moral terminators are also being applied. It is now postulated as "realistic" for farmers to sacrifice their own food security through plant breeding and, instead, trust their survival to the goodwill of private agri-business and the waning courage (and declining budgets) of public institutions. It is "realistic" for commercial breeders in some OECD countries to expect seed cleaners and conditioners to collect royalties on saved seed. Here is a summary of six Terminator Trends. *Do not adjust your mind, there is a fault in reality!*

The Biological Terminators

Terminator #1 - *USDA Patents 'Neutron Bomb' for Seeds*: On March 3rd, the U.S. Department of Agriculture, a public institution with a mandate to work for farmers, announced that it had received - together with the Delta and Pine Land Company U.S. Patent #5,723,765 - a patent on a technology that renders seed sterile. While the seed that farmers purchase will germinate, any seed they save for a second season will not. The cotton seed company (which had controlled 73% of the U.S. market) was acquired by agribusiness giant, Monsanto for $1.76 billion on May 11th. Monsanto now claims 85% of the U.S. cotton seed market. On announcing the patent which covers all species, USDA researchers said their goal was to help U.S. seed companies profit from the export of proprietary seed to Third World farmers. (For further details, please see RAFI's internet homepage at *www.rafi.ca* and our March/April *RAFI Communique*, "The Terminator Technology".) The USDA and Monsanto are contractually committed to coming to terms on a potentially exclusive global licence on Terminator #1 by October, 1999. Researchers state that the technology can be applied to all crop species. *Governments and UN Agencies should deny patent certification and market access to the technology on the grounds that it is contrary to ordre public (including national food security). The USDA could also be asked to deny Monsanto exclusive monopoly control over the technology.*

Terminator #2 - *USDA introduces 'Trojan Dolly' Crop Patents*: On January 20th, 1998, the USDA won patent #5,710,367 covering "apomictic maize". In late May, USDA was also told it would receive a second U.S. patent covering apomictic millet. The apomixis trait creates genetically-identical plant "clones" (*Dolly* for plants) that reproduce without variation from season to season. Farmers can replant. On another front, in early March, CIMMYT, the publicly-funded International Centre for Maize and Wheat Improvement based in Mexico, in company with the French research institute, ORSTOM, began negotiations with the world's remaining maize-breeding institutions to licence its own pending patent on the apomixis technology. Normally, global maize breeders deal only with hybrid seed (seed that will not reproduce "true" when replanted). Hybrids are the *Terminator Rex* of agro-biodiversity. Developed in the 1920's on the assumption (which many regard as illusory) that widely-crossed inbred lines provide a "hybrid vigour" that makes the inability to save seed worthwhile for farmers, hybrids have taken over the commercial maize market in most OECD countries. Maize multinationals have been frustrated that their market has been limited in the South because most farmers can't benefit from buying seed every season. The revolutionary "apomixis" technology could offer the same (disputed) "hybrid vigour" but make it possible for farmers to re-grow seed. Companies are betting that the apomixis trait will prove to be the "Trojan Horse" that leads more Third World farmers down a company-guided path to old-fashioned hybrids. (See later discussion in this paper.) *The USDA and CIMMYT (within the framework of CGIAR) could be asked to study the potential social and environmental impact of apomixis. Depending on the outcome of these studies, the two bodies could either consider rejecting the trait or developing policies and practices to assist governments and farmers to secure local in situ conservation of their crop germplasm.*

The Legislative Terminators

Terminator #3 - *UPOV '91 Takes Over:* On April 24th, the Union for the Protection of New Varieties of Plants (UPOV), a UN-hosted convention, closed the door on its twenty year-old 1978 accord that left open the possibility for farmers to save seed and breed new crop varieties using seeds "protected" by national Plant Breeders' Rights legislation. UPOV is now advising South governments to adopt its 1991 Convention that prohibits farm-saved seed and further restricts the classic research exemption that historically allows breeders to learn from one another. UPOV, a public institution, is working with the global seed industry against the interests of farmer/breeders. *South countries that have joined either of UPOV's Conventions could take the opportunity of UPOV's October 28th Council meeting to demand special exemptions for at least the South's farmers to save seed.*

Terminator #4 - *TRIPS Traps Farmers:* In 1999, the World Trade Organization (WTO) will begin a limited review of its TRIPS (Trade-Related Aspects of Intellectual Property) chapter concerned with the "protection" of plant varieties. TRIPS obliges signatory states to either allow industrial patents or to legislate an "effective" *sui generis* system securing the monopoly interests of commercial breeders. The *sui generis* option is a possible loophole allowing the South to soften the monopoly impact and to safeguard the right of farmers to save and develop their own varieties. However, some OECD governments have made it clear that they interpret the 1999 review as an opportunity to press for more stringent monopoly mechanisms. The USA wants agreement that TRIPS compliance means either UPOV'91 or plant patents. In either case, farmers would no longer be allowed to save and develop "protected" seed. Depending on their "development" status, South countries will be obliged to entrench plant monopolies either in 2000 or shortly thereafter. *South signatories to the Uruguay Round could use the TRIPS Review to demand that ordre public be available to prevent the "patenting" of any life form - especially food species.*

The Morality Terminators

Terminator #5 - *CGIAR's Wobbly Approach to "Pro-Poor" Political Advocacy:* Although there is growing alarm within the CGIAR Centres that intellectual property is out of control, the System's just-concluded meeting in Brasilia actually endorsed a brain-teasingly offensive "defensive patents" strategy. Then, declaring itself to be firmly "pro-poor" and ready to become "political" and "advocates" for farmers, the same meeting backed an aggressive pro-biotech policy that implicitly encourages the development of transgenic species. Yet, the CGIAR shied away from explicit support for farming communities in their most immediate and vital struggle. Indeed, a direct (if incomplete) plenary proposal stating that "Farmers' Rights" included the right of "resource-poor farmers in developing countries... to save, exchange, and adapt their seed" had to be withdrawn. Only in the closing minutes of the conference did CG Chair Ismail Serageldin, offer a hastily-cobbled re-interpretation of the dismal debate, suggesting that the CGIAR would work to "...empower to the maximum extent possible their [farmers] role in the conservation and improvement of seeds." This left some observers concerned that pro-poor political advocacy in the CGIAR would turn the public-service network into pro-active cheerleaders of dominant political trends. *CGIAR could redeem itself in Washington at International Centres' Week (Oct. 26-30) when the entire System will come together to consider the report of its Third System-wide Review. If the CGIAR takes the cue from its own Policy Committee and the Bratislava Conference of the Biodiversity Convention (also just completed), it would express its reservations about Terminator technology. CGIAR should also formally support the right of farmers to save, exchange, and develop seed without restriction or exception. It would also agree to review the socio-environmental impact of the apomixis trait.* On a closely-related front, CGIAR will have to determine whether or not it will safeguard internationally-held germplasm from "patent" claims by pressing its February proposal for a moratorium on claims on this material. While no one expects suicidal heroics from the CG System, it does carry a moral *cache* with many governments. If the CG does not speak out

for farmers and for public research, few else will. *CGIAR could resolve to take a pro-active pro-Farmers' Rights position at FAO and in the WTO's TRIPS review.*

Terminator #6 - *FAO de-Commissions Farmers' Rights?* When the UN's FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) convenes in Rome June 8 - 12, OECD governments are proposing a deal on access and benefit-sharing over crop germplasm in return for the South dropping its demands for "Farmers' Rights" - the practical recognition that the germplasm governments are haggling over comes from farmers. Spooked by the implications of a legal "right" for farmers to save, exchange, and breed seed, the OECD states are hoping that their South counterparts are only using Farmers' Rights as a bargaining chip to be negotiated away in return for a more favourable deal. If they're correct, the sole remaining international toehold offering farmers a basis for saving seed could crumble away this June. FAO's Commission has been the moral epi-centre of the volatile battle over the right of farming communities to save seeds. Its capitulation, especially if it follows the "silence of the CG lambs", will signal the collapse of intergovernmental resistance to crop monopolies. *In re-negotiating its International Undertaking, FAO Commission members should implement strong Farmers' Rights provisions including the inalienable right of farming communities to save and breed plant varieties.*

More thoughts on

Terminator #2 - "Trojan Seeds"

There are three apomixis patents coming into the marketplace. While it is understood that the CIMMYT/ORSTOM claim is broader than the USDA maize claim, the USDA will ultimately transfer ownership of its maize and millet claims to one or more U.S. multinationals. Thus, the final battle between the competing maize patents may be decided on the basis of which party has the most lawyers, the deepest pockets, and the greatest political clout. CIMMYT's negotiations, at the moment, would keep apomixis in the public domain in the South. Ostensibly, companies would only use apomixis technology to reduce their seed production costs (solving problems of "outcrossing" within a hybrid's inbred lines) and would not develop their own apomixis varieties. Indeed, the companies currently scouting the USDA's apomixis research are more interested in isolating the gene or gene complex for the apomixis trait than licencing the patents.

CIMMYT will develop apomictic maize (perhaps five years down the road) for the South. Since these hybrid-like clones halt genetic evolution (allowing seed to adapt to micro-climates or new diseases over planting generations) even high-yielding and disease-resistant varieties will collapse relatively quickly. This could force more farmers to buy seed more often than today. Poor farmers could be encouraged by companies (or pressured by creditors - directly and/or indirectly) to abandon their own open-pollinated maize breeding practices, leading to a potentially serious loss of crop genetic diversity. Once this door is opened, global seed companies, perhaps subsidized by foreign aid or national credit programmes, will move in to meet the new production and distribution needs for apomixis (and possibly increase the market for hybrid) seed. This could happen despite CIMMYT's best intentions. In order to win for resource-poor farmers, CIMMYT has to steer its way through an ever narrowing number of bigger corporate players; changing patent environments; and national and international political winds. Worse still for the CGIAR, what CIMMYT is facing will soon become commonplace for other international public service institutions.

CIMMYT needs all the help it can get. In the past few days and months, the shape of the global maize industry has changed dramatically. Last summer, DuPont acquired 20% of the assets of the world's largest maize breeder, Pioneer Hi-Bred International. Monsanto, not to be outdone, bought Holden's which supplies more than a third of all US maize germplasm. Then, Monsanto went on to buy Dekalb (Pioneer's most serious competitor) for $2.2 billion this May. On June 1st, American Home Products

merged with Monsanto for $33 billion - the largest merger in the short history of the Life Industry. Throught other acquisitions, the new enterprise (as yet unnamed - RAFI suggests "American Home Monster") controls about one-third of the maize seed market in Brazil and about 40% of the same market in Argentina. The "Monster" will either see apomizis as a threat or as an opportunity.

There are many unresolved issues with respect to the apomixis trait. For example, when farmers use an apomictic clone as a cross in their own plant breeding, will the presence of the trait enhance or constrain their breeding flexibility? Will farmers be left with 'one hand clapping'? Or, will the apomixis trait prove itself to be more opportunistic - as early Swedish research suggested decades ago - and alter its expression depending on environmental stresses? Could companies combine the "killer" gene (Terminator #1) with apomixis? Perhaps most importantly, does the introduction of apomixis set resource-poor farmers on an "industrial agricultural" path that could ultimately destroy their livelihoods and the diversity around them? Since the trait is most likely to be used on white maize (white maize flour is a half-billion dollar market in Meso-America alone) used in the making of tortillas, is there much remaining genetic diversity - or is this market so commercialized already that conservationists have little to fear from apomixis? At present, only about 9% of the tortilla market in the region is highly-commercialized. The availability of affordable clones could be attractive to the major processors and apply added pressure to farmers to adopt the new varieties. The following possible scenario is offered to prompt early discussion - not to draw final conclusions.

A Credible Scenario?

1. CIMMYT "invents" apomictic maize together with ORSTOM. ORSTOM, with CIMMYT, applies for a patent covering the technology.
2. ORSTOM/CIMMYT adopt a policy that keeps the technology in the public domain in the South but allows others in the North to licence the technology. The assumption is that the North is only interested in apomixis for hybrid seed production advantage.
3. CIMMYT encourages public and private maize-oriented NARS to develop "local" apomictic maize varieties in the South. CIMMYT also begins developing its own varieties for resource-poor farmers in regions where NARS may not be able to meet the demand.
4. Over time, a public service-oriented approach to the dissemination of the apomixis trait emerges in several countries. Enterprising experiments emerge to work with farmers' cooperatives to preserve traits in Farmers' Varieties that have wider commercial application. Farm yields increase along with on-farm incomes. Many cooperatives are encouraged to develop plant breeding and seed-growing opportunities.
5. Although there are many positive examples to point to, most resource-poor farmers obtaining apomictic maize - while experiencing generally (but not uniformly) positive yield gains - also incur an erosion of their traditionally-diverse seed stocks and an increased dependence upon apomictic and/or purchased seed.
6. Although the demand grows unevenly, it is not long before it appears to outstrip the finite capacity of public service NARS and local entrepreneurs. To meet the demand (farmers are already losing the ability to breed from their own stock), CIMMYT and ORSTOM amend their policy to stimulate larger "for-profit" enterprises (including foreign subsidiaries) to use the apomixis technology in the South. The global companies agree to meet demanding standards for seed quality and pricing.
7. In order to ensure the highest-quality service, companies conduct seminars and provide educational materials for agricultural policy-makers, farm credit managers, and extension workers. As a consequence, access to credit and services becomes predicated upon acceptance of the "modern" apomictic varieties.
8. Before long, companies report an increase in demand for newer and better apomictic varieties. Older apomictic clones succumb to mutating pests and diseases, forcing farmers to buy newer clones. Better-off farmers are offered "premium" up-to-date hybrids. Resource-poor farmers are encouraged to buy the "latest" apomictic varieties. *In situ* genetic diversity declines. Commercial dependency increases. More marginalized farm families move to the cities.

9. As the years go by, plant breeding and seed-saving among resource-poor farmers slips toward extinction. Better-off farmers cling to their land buying high-cost apomictic varieties or hybrids. Resource-poor farmers have migrated to the cities to join the ranks of under-employed slum-dwellers. Hunger and malnutrition increase even though maize production has also increased.
10. There is a major loss of *in situ* genetic diversity; rural livelihoods; and food security. Corporate profits are at record levels.

Apomixis - Advance or Apocalypse?

Advance	Apocalypse
1. Better-off farmers may benefit from a decline in seed costs as hybrid production becomes less expensive and faster.	In an oligopolistic market there is little chance that savings will be passed on to farmers. (Recently, Monsanto bought Dekalb and Holdens while DuPont has taken 20% of Pioneer. Then, Monsanto and Cargill agreed to a collaborative seeds initiative. This leaves only Novartis, AgrEvo, and Limagrain to rank with them among the world's maize leaders.
2. Resource-poor farmers can buy hybrid-quality while still being able to save seed. Their yields and incomes could increase.	The seeds farmers save are clones. There are three concerns: (1) the apomictic clones will not meet the varying needs of all resource-poor farmers within any region and the clones will not adapt to local conditions over time; (2) traditional varieties and *in situ* genetic diversity will disappear; (3) the cooperative breeding systems of farming communities will erode.
3. The South's guaranteed public access to apomixis could attract local and national entrepreneurs/ breeders to develop locally-appropriate varieties and other farm services.	Global maize corporations have South subsidiaries or partners who could claim discrimination if denied access to apomixis. Also, USDA licences will not constrain the trade of U.S. seed companies.
4. This could be an inexpensive and effective way to secure and commercialize Farmers' Varieties within a region or around the world, with the benefits going to the farmer-breeders.	Dream on Sunshine! This theoretical benefit will be overwhelmed by more powerful national and international corporate interests.
5. Resource-poor farmers won't buy apomictic maize unless they can make a profit in the first growing season. Its going to have to be very good before they will buy it.	CIMMYT will offer - and poor farmers will buy - just enough seed for them to test it the first season and have sufficient seed for larger production the second season. The apomictic variety may not have to be "great" - just "better" in order to set the treadmill in motion.
6. Poor farmers use all kinds of maize for all kinds of purposes, apomictic maize will probably only impact the maize they grow for market. The genetic erosion will not be great.	Resource-poor farmers are also power-poor. There could be substantial commercial/ credit/ or political pressure on them to devote more land to market production. History teaches us not to assume that local cultural traditions can always withstand powerful outside forces.
7. Maize multinationals have no interest in the high-cost, low-profit, unreliable market for apomictic maize among resource-poor farmers.	But their national subsidiaries - or their subsidiaries' subsidiaries - may. This is market creation. It could also be good publicity (ie. Monsanto's "Let the harvest begin"). Some companies will also genuinely believe they are contributing to world food security.
8. Every new technology causes displacement and erosion. A highly-beneficial new variety will always supplant traditional varieties and cause genetic erosion. The issue is whether the lives of people will be improved.	This is not a "variety" it is a "technology". This technology could directly constrain the capacity of farmers to do plant breeding and seed-saving. It is reasonable to incur risks if there is a high probability of benefit for the poor - and when the real risk-takers agree. Otherwise, humility should be exercised and studies should be undertaken.

The Bellagio Apomixis Declaration: On May 1st, a group of international researchers dealing with apomixis meeting at the Rockefeller watering-hole in Bellagio, Italy concluded a common declaration expressing their concern that transnational agribusiness would thwart or mis-direct the development of this powerful new technology. *"...We encourage the development of novel approaches for technology generation, patenting, and licensing that can achieve this [open access to new technologies] goal."* This declaration - coming on the eve of the greatest wave of mergers to ever strike the maize-breeding industry - was prophetic. As much as we can admire and agree with their concern, the declaration's conclusion falls well short of the mark. More must be demanded of our public institutions than to always seek the safer road to the lesser-evil! Go to *http://billie.harvard.edu/apomixis* for the full text. To comment on the declaration, contact: endorse@billie.harvard.edu.

What can the CGIAR do?

1. CIMMYT and/or the CG System could undertake an immediate study of all potentially positive and negative implications of the disbursement of apomixis in the South with a view to reporting to ICW'98.
2. In the interim, CGIAR should encourage the USDA to retain control of the Terminator #1 and #2 patents.
3. The results of the study (in #1 above) could be widely-shared via publications and seminars, with governments, NARS, and farmers in the regions that may adopt apomictic maize.
4. As a precautionary measure, and in conjunction with NARS, farmers, IPGRI, and the FAO CGRFA, CIMMYT could consider a pro-active initiative to ensure that the local *in situ* conservation of maize genetic diversity is secured for the use of farmers and researchers.
5. CGIAR could consider the development of a technological impact "early-warning" system that will assist Centres and scientists in drawing the attention of the System to possible negative side-effects associated with the introduction of some new technologies. CIMMYT should be supported in its own efforts to monitor apomictic maize - socially, economically, and biologically.

2 June 1998

RAFI Takes Terminator to COP IV in Bratislava... and COP IV Responds

As a result of solid NGO pressure, the ominous "Terminator Technology" became a topic of substantive discussion and debate at the recent meeting of the Conference of Parties to the Convention on Biological Diversity (COP IV) in Bratislava, Slovakia, 4-15 May.

For background on the newly patented technique, see the March/April RAFI Communique on the Terminator Technology: http://www.rafi.ca/communique/19982.html

RAFI and NGOs from around the world campaigned actively in Bratislava to inform government delegates of the Terminator technology and its potentially devastating impacts on farmers, food security and biological diversity. Edward Hammond and Hope Shand of RAFI, together with Ricarda Steinbrecher of Genetics Forum (UK), Adriano Soares of the Confederaçao Nacional dos Trabalhadores na Agricultura (Brazil), and Farida Ackter of UBINIG (Bangladesh) conducted a seminar on the Terminator technology for delegates and press, distributed background documentation, and urged government delegates to pass a resolution condemning the technology. When news of Monsanto's takeover of Delta & Pine Land Seed Co. and the terminator technology was announced on 11 May, RAFI distributed a press release on the agribusiness giant that now controls the seed-sterilizing technology.

What follows is the text of RAFI's intervention in Bratislava, and the COP IV decision that resulted from the discussion of this menacing Terminator technology.

Intervention by Hope Shand, RAFI, at COP IV in Bratislava to the Agricultural Biodiversity Working Group, 7 May 1998

Thank you Mr. Chairman. I speak on behalf of RAFI and many other NGOs. We strongly support the resolution to oppose the Terminator technology as called for by the delegate from the Philippines, and supported by delegates from Kenya, Zambia, Pakistan, Rwanda and Sri Lanka.

The Terminator technology has profound implications for agriculture, biodiversity and food security. I refer to a newly patented technique that genetically alters seed so that it will not germinate if re-planted a second time.

The Terminator technology is designed to prevent farmers from saving seed from their harvest to re-plant the following season. It presents an imminent threat to in situ conservation and the rights of farmers.

The inventors say they will apply for patents on the Terminator technique in 78 countries worldwide, mostly in the South.

Unlike hybrid seeds that were introduced earlier in this century, the Terminator technique brings NO agronomic benefit to farmers, it is simply a mechanism to capture greater profits for the commercial seed industry. The patent owners say they are aiming their product at

the South. The Terminator technology is not technology transfer, it's ANTI-technology transfer.

The Terminator technology jeopardizes the food security of 1.4 billion people - resource-poor farmers in the South who depend on farm-saved seed and on whom we depend for in-situ conservation, a core objective of this Convention.

Poor farmers are responsible for feeding 15 to 20% of the world's population, and for on-farm conservation of crop genetic diversity.

The Terminator technology is not yet commercialized - so COP IV is in the enviable situation of being able to stop its impact before it causes destruction. This is what the CBD should be about, action to conserve biodiversity; not to applying bandages after the fact. What is the point of researching pollinators if there is nothing left in the field to pollinate?

The Terminator technology is contrary to the objectives of this Convention. This is a technology which endangers the rights of farmers, indigenous peoples and local communities to conserve and develop their genetic resources.

The Terminator has nothing to do with conserving biodiversity and everything to do with destroying it.

For these reasons, we urge the Parties to pass a resolution, here and now, to stop this technology.

COP IV Decision on Terminator Technology

COP IV adopted the following decision related to the Terminator Technology:

The Conference of the Parties,

11. Reiterating the precautionary approach, requests SBSTTA, to consider and assess, in light of contributions to be provided by Parties, Governments and organizations, whether there are any consequences for the conservation and sustainable use of biological diversity from the development and use of new technology for the control of plant gene expression, such as that described in United States patent 5723765, and to elaborate scientifically based advice to the Conference of the Parties. Moreover, urges Parties, Governments as well as civil society and public and private institutions to consider the precautionary approach in its application;

What Next?

By calling for a study on the Terminator by the Convention's scientific and technical body, this resolution ensures that debate on this insidious technology is kept alive within the COP, and that governments will assess its implications for agricultural biodiversity worldwide.

Complete text of the decisions adopted by the Fourth Meeting of the Conference of the Parties to the Convention on Biological Diversity (Bratislava, Slovakia, 4-15 May) can be found at: http://www.biodiv.org/cop4/FinalRep-/

11 June 1998

Implications of the Monsanto / American Home Products Merger

American Home "Monster"?

Monsanto's Last Round-up spells High Noon for High-tech. Its $33 billion mega-merger with American Home Products will force the Life Industry's Top Ten into a race to see who will become the Microsoft of microbiology. A new challenge for anti-trust and anti-monopoly law enforcement.

The June 1st announcement that high-roller Monsanto (St. Louis, Missouri) will merge with American Home Products (New York, NY) - a lesser-known but much larger conglomerate - will have far-reaching repercussions throughout the entire Life Industry. The new enterprise (name not yet determined) instantly becomes the world's leading crop chemicals corporation, the third (possibly second) largest seed company, fourth biggest pharmaceutical concern, and fifth or sixth largest veterinary medicine enterprise. The merger also gives the monster multinational a powerful position covering all forms of biotechnology research and related patents. The AHP/"Monster" will have assets of $96 billion and annual sales of $23 billion. It is the sixth largest corporate merger in business history.

American Home Products is a longstanding but little-known veteran of the Fortune 500. Twenty years ago, the company eschewed publicity (it had no public relations department) and answered its New York telephones merely by repeating the number. Its best-known products were canned spaghetti, wart removers, and Chapstick. The company ventured a few major mergers in the late Eighties and, in the Nineties, took aboard its most famous acquisition - the high-profile American Cyanamid, a chemical major with heavy interests in herbicides and herbicide-tolerant crops. Nevertheless, this month's merger with Monsanto tops the charts.

Pharmaceuticals: The new AHP/"Monster" will rank number four in global pharmaceutical sales behind Glaxo-Wellcome, Novartis and Bristol-Myers Squibb. The company will be third in prescription drugs. While Monsanto could only add the limited sales of its G.D. Searle subsidiary (with less than $2 billion in turnover), AHP was already comfortably ensconced among the drug industry's top ten. Among its best known products: Anacin and Advil for headaches and the anti-hemorrhoid Preparation H for aches at the other end. The new entity will certainly be able to do better than make ends meet, however. The "Monster" is expected to invest $2 billion in annual pharmaceutical research. In 1997, worldwide pharmaceutical sales reached $317 billion.

Crop Chemicals: The Monster marriage will force competitors to re-evaluate their own life expectancy in agricultural inputs. Together, the companies will leapfrog over the Swiss giant, Novartis, who seemed to be unassailable in its role as the world's top pesticide pusher.

Plant Breeding: But the real monopoly bonanza may come from plant genetics. From nowhere three years ago, today's US farmland has half of its cotton; 40% of its soybeans;

and 20% of its maize sown to transgenic seeds. The total area worldwide seeded to Monsanto's biotech breeding material this year is roughly 22.2 million hectares, an area the size of Guatemala and Honduras combined. Monsanto predicts that we'll see nearly twice that area planted to genetically engineered crops by the year 2000. In the past three years, Monsanto has single-handedly spent more than $6.7 billion acquiring strategic seed and ag. biotech companies. In the United States, the "Monster" now has 85% of the cotton seed market and ranks second in the highly-profitable maize market. Internationally, the seed subsidiaries are also well positioned in Europe and have one-third of the large Brazilian and almost one-half of the equally substantial Argentinean maize seed business. Monsanto and AHP combine several key crop "species" patents and the infamous "Terminator" technology (a genetic technique that renders farmer-saved seed sterile) that promises to put a headlock on the world's seed supply. The merged entity will take a commanding lead in the lucrative herbicide-tolerance and B.t. (insect-resistance) markets. The "Monster" is expected to spend $1 billion on agricultural research next year.

Human Genomics: All life industry powerhouses are players in high-tech genomics research - and AHP and Monsanto are not exceptions. In 1997, Monsanto and Millennium signed a $343 million alliance, creating the premiere plant genomics firm, Cereon. Monsanto recently inked another genomics deal with Incyte. AHP has alliances with more than 200 biotech firms, including its 1996 acquisition of Genetics Institute and its 55% investment in Immunex. Together, AHP and Monsanto have staked a major position in human and plant genomics.

Livestock: By itself, AHP scored number six among the top ten veterinary medicine companies. Although Monsanto is a minor player, it has dabbled significantly in livestock genetics of late and - on the eve of its nuptials with AHP - formed a livestock feed liaison with the largest private company in the world - Cargill. The world's largest grain-trader, Cargill is also among the top seed and fertilizer companies and has a long history in livestock genetics. With annual sales of $56 billion (more than twice that of even the "Monster") Cargill has plans for livestock development that could make the common enterprise Top Doc very quickly.

The Microsoft of Micro-biology: Most threatened by the "Monster" mating is Novartis - the prodigy of the 1996 conjugation of two Swiss Life Industries - Ciba-Geigy and Sandoz. In 1997. Novartis was first in crop chemicals, second in seeds, third in pharmaceuticals and ninth in veterinary medicines. It was also the overall front-runner in biotech R&D. The Swiss will undoubtedly feel that the American challenge has to be answered. A likely candidate for takeover include Hoffman-LaRoche, Novartis's pharmaceutical/biotech neighbour in Basel, Switzerland. Other possibilities include France's Rhone-Poulenc and Britain's Zeneca BioSciences. Both companies offer significant opportunities in seeds, pesticides, and pharmaceuticals. None - on their own - will easily survive he rutting rituals of the Nineties on their own.

"DAMND" if You Don't: There are other players who will not want to leave the "Monster's" move unanswered. RAFI has paid particular attention to the five "DAMND" life enterprises - DuPont, AgrEvo, Monsanto, Novartis, and Dow. Look for changes among all of them. DuPont, for example, bought 20% of the world's top seed company, Pioneer Hi-Bred, last summer. Given the sudden market shift, both Pioneer and DuPont may be interested in moving beyond the "just-good-friends" stage. Indeed, until the sudden entrance of AHP, DuPont was touted to be courting Monsanto itself. Some Wall Street match-makers still

don't rule out the "mother of all mergers" - the earth-shuddering union of DuPont and the "Monster". This union may or may not be more likely as DuPont continues its quest for the world's largest independent biotech company - Amgen. Rumoured to be looking for a $25 billion dowry, this conjugation could render DuPont more interested in picking up Pfizer's Viagra than batting eyes at the "Monster".

On the other side of the pond, Glaxo-Wellcome, Bristol-Myers Squibb, Zeneca and the German Brothers Grimm (Bayer and Hoechst) will all want to exercise their Spring mating rites. Most vulnerable to change might be AgrEvo - the Life Industry offspring of Hoechst and Schering. 1998 may not see the single "Microsoft of micro-biology" emerge - but it may signal the end of RAFI's annual Top Ten report on the Life Industry. The Top Five would seem a safer bet.

Trillenium Mergers: 1998 will be another banner year in total global mergers. At the beginning of June - with seven months to go - the global tally had reached more than $1 trillion on its way to something more than a predicted $2 trillion for the year. Last year's record-smashing total was $1.6 trillion. The new merger binge hitting the Life Industry, however, poses a special challenge for law-makers increasingly concerned with anti-trust or anti-monopoly legislation. Microsoft may wind up in court over its alleged monopoly in computer software (at least with respect to internet access). And Monsanto may have a tough time convincing US regulators that 85% control of the cotton seed market is good news for consumers. But how can governments prevent a patent monopoly on the wide gamut of life technology patents? The sweeping nature of some of the latest patent claims by the "Monster" and others cuts across species and kingdoms well beyond the normal horizons of corporate watchdogs. Hang onto your genes!

30 June 1998

The "Monster" Strikes Again

Monsanto/American Home Products Buy Cargill's Overseas Seeds Operations

"Terminator" technology opponents consider yesterday's announcement that the Monsanto/American Home Products "Monster" will buy Cargill's international seed business for US $1.4 billion as an ominous sign. The latest seed industry takeover is particularly alarming in South America, where the addition of the Cargill assets gives the company massive market share to deploy a technology called anti-farmer and anti-poor by farmers' groups and NGOs around the world.

The newly patented Terminator technology (US #5,723,765) sterilizes and renders useless farm-saved seed by irrevocably halting a plant's reproductive process. Providing no agronomic benefit, the Terminator's sole goal is to force farmers to return to the commercial seed market every year and thereby fatten industry profits.

The transformation of the Terminator from cause for concern to imminent threat in muscular multinational hands has been astoundingly swift. Comparatively small Delta and Pine Land Co. (US) patented the Terminator in March 1998. In May, DeltaPine was swallowed whole by Monsanto for $ 1.76 billion. Then, on June 1, Monsanto announced a mega-merger with American Home Products (AHP) for $33.5 billion.

DeltaPine &ndash and its hottest asset, the Terminator - haven't been Monsanto's only seed company targets. Since 1996, Monsanto has spent a staggering $8.1 billion buying seed companies. After the binge, the seemingly insatiable "Monster" is approaching monopoly market share in several major food crops. But anti-trust matters should be a secondary concern now. The real threat is to global food security.

The June 29th announcement that it would purchase Cargill's international seed operations for $1.4 billion gives Monsanto a giant boost in its ability to insert its proprietary seed technologies into overseas markets. The company estimates that its potential to deploy genetically engineered seeds outside the USA is twice that of its domestic market.

DeltaPine's president, Murray Robinson, recently told Seed & Crops Digest that his company's seed-sterilizer could be applied to at least 400 million hectares (1 billion acres) of cropland - an area approximating the land mass of South Asia. Murray speculated that its value could run to US $3.70 per hectare ($1.50/ac) for higher-value crops.

First aimed for commercialization in maize and cotton, the Terminator's owners say it will probably work in any agricultural species and have talked about crops like wheat and rice in countries such as India, China and Pakistan. The major barrier in reaching this vast market, according to analysts, has been that neither DeltaPine - or its new boss (the "Monster") - has had a viable seed distribution and multiplication system in the Third World. The Cargill deal solves this problem.

The purchase gives Monsanto plant breeding and seed testing establishments in 24 countries and seed multiplication and distribution operations in 51 countries. Cargill's maize and oilseeds business

is especially strong in Latin America and Asia where it dominates tropical maize seed sales. Through other acquisitions, Monsanto already controls about a third of the Brazilian maize seed business and half of the Argentinean market. With Cargill's 2,200 seed subsidiary employees scattered about the globe, the "Monster" is now a serious rival to Pioneer Hi-Bred International. Pioneer continues to be the world's largest seed enterprise and (until now) the unchallenged leader i maize breeding.

Mega-Mergers: Since the beginning of May, Monsanto has acquired two of the world's top ten seed companies with combined global sales of about $688 million. The "Monster's" purchase of Holden's Foundation Seeds last year, combined with this year's takeovers of Dekalb and Cargill, have taken the giant from nowhere to number two in global maize seed sales. When Monsanto's other seed company acquisitions are added up &ndash the 'Monster' may now occupy the number two position in the sale of all crop seed worldwide.

Will the Empire Strike Back? Although Monsanto's seed company takeovers are worrying enough, it was the merger with AHP in June that really shook up competitors. The $33.5 billion deal instantly created the world's largest crop chemicals company. Put this together with the "Monster's" number two post in seeds, its number seven rank in pharmaceuticals, and its fifth position in veterinary medicines, and the Life industry will never be the same. It is only a matter of time before DuPont, Novartis, or Glaxo-Wellcome strike back.

Life Industry Snapshot (*)

Global Control of Seeds, Ag Biotech and Agrochemicals (mid-1998 ranking)

1. DuPont $39,700
2. Hoechst AG (incl. AgrEvo) $33,000
3. Monsanto/American Home Products $23,600 (**)
4. Novartis $21,300
5. Dow Chemical $20,000
6. Rhone-Poulenc $16,500
7. Rohm & Haas $ 3,900
8. Grupo Pulsar/Empresas La Moderna $ 1,800
9. Pioneer Hi-Bred $ 1,800

* Given the pace of industry consolidation in recent days and weeks, any life industry ranking is temporary and short-lived. The above chart ranks major life industry players who are active in seeds, biotech and agrochemicals.

** Estimated, includes recent seed company acquisitions.

Adapted from AgBiotech Reporter, June 1998 & RAFI Communique, Life Industry Update (December 1997)

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Press Release - 7 July 1998

GRAMEEN TURNS MEAN?

FROM POVERTY-FIGHTER TO THE PEASANTS' PINKERTON

Is Bangladesh's fabled Grameen Bank turning mean with its Monsanto deal... or is the "Monster" turning farmer philanthropist?

The Grameen Bank's June 25th announcement that it will accept US$150,000 from Monsanto Corporation (St. Louis, MO. USA) to launch the Grameen Monsanto Center for Environment-Friendly Technologies is stirring up a storm of controversy throughout agricultural and rural organizations around the Third World. The surprise move was unveiled jointly by Muhammad Yunus, Managing Director of the Grameen Bank and Robert Shapiro, Monsanto's Chair and CEO. The company's initial grant is for soft loans to Bangladeshi farmers. The loans are available to buy agricultural and rural technologies including Monsanto's own proprietary herbicides, hybrid rice, hybrid maize, and cotton seeds. Monsanto is the world's largest crop chemical company and third largest seed enterprise. Monsanto, which is completing a $33.5 billion merger with the conglomerate, American Home Products has spent $8.1 billion in the past two years buying agricultural biotechnology companies. Its most recent acquisition - the international seeds operations of Cargill Inc. (for $1.4 billion) together with its May takeovers of U.S. maize and cotton seed firms makes the "Monster" the world leader in cotton seed sales (an important Bangladesh export crop) - and number two in maize seed - a crop with growth potential in South Asia. (For further details on these and other Monsanto-related mergers, please see RAFI's homepage at www.rafi.ca.)

BioSafety Pressure: While Monsanto has stated that it will not provide transgenic crop seed because Bangladesh does not have a regulatory framework for the approval of genetically-modified organisms, the Grameen/Monsanto announcement is expected to put political pressure on the government to adopt biosafety rules amenable to Monsanto's extensive line of herbicide-tolerant crops. Yunus and Shapiro have said, however, that the joint venture will begin by selling hybrid seeds to poor farmers. Hybrid rice and maize are biologically incapable of breeding "true" in the second generation. The seeds are either sterile or they produce often unwelcome genetic "throwbacks". Although some scientists regard hybrids as a boon to crop yields, there is a growing opinion that the real advantage is that farmers are forced back to the market every year to buy new seeds. Traditionally, Bangladeshi rice farmers - among the poorest of the poor - not only save seed for replanting, but women breed diverse seed types in order to have varieties suited to their immediate ecosystems and economies. Hybrid seeds could more than quadruple seed costs as well as end forever the process of poor farmers adapting plants to their resource-poor soils. "It doesn't take many years of buying new seed before the traditional varieties lose their germination level or are eaten," Pat Mooney, RAFI's Executive Director notes, "Trying to get off the Grameen-Monsanto treadmill of seed purchases is impossible once the old seeds die." Hope Shand, RAFI's Research Director agrees, "We'll lose both farmers and a lot of crop genetic diversity."

Offers that can't be refused? "The Monster's grant could simply subsidize the sale of its own products," Shand says. "Because the Grameen Bank operates in 36,000 Bangladeshi villages and is often the farmers' only route to credit, poor farmers could find themselves under intense pressure to buy Monsanto's seeds and herbicides," Mooney adds.

A Bankers' "Mother Theresa": Since its founding in 1983, the Grameen Bank has pioneered the concept of "micro-credit" whereby the Poor - very often women, obtain small loans (often less than $100) without collateral. Muhammad Yunus, the Bank's founder, has shown that the poorest of the poor will repay their debts 98% of the time - a rate far superior to the record of commercial banks either in the South or in industrialized countries. Today, about 8 million families obtain micro-credit to launch tiny but profitable ventures such as the purchase of chickens to sell eggs. Almost half of the micro-credit activity continues to centre around the Grameen Bank in Bangladesh. The Bank's success has made it a hero in the developing world and turned Muhammad Yunus into a kind of bankers' Mother Theresa. A World Bank-sponsored conference on micro-credit in Washington last year accorded Yunus rock-star status and corporate gurus from George Soros to Ted Turner have flocked to his side. "They see him as the proof that a kinder, gentler capitalism can work for the poor," says Pat Mooney.

But now, concerned environmentalists such as Vandana Shiva of the Research Foundation for Science, Technology and Ecology in New Delhi, fear that Grameen has turned mean - or lost sight of its founding goals. In an open letter to Yunus dated July 4th, Shiva, wrote, "Monsanto's technologies are not environment friendly or sustainable. They pose a threat to ecosystems and agriculture.".

Pinkertons for peasants: This kind of capitalism can also turn poor but independent farmers into poorer and dependent peasants. "If farmers are pressured to stop saving and developing their own plant varieties, their costs will sky-rocket. The crops they plant will be those designed for the large fertile lands of big farmers - not for their own fragile ecosystems," Hope Shand points out. According to critics like Shand, the Grameen connection is a great deal for Monsanto, "They've bought a cheap distribution and finance system that not only reaches into half the villages of Bangladesh but also guarantees that the poor will repay their loans." In North America, Monsanto has hired Pinkertons (private police) to enforce farm contracts and technology licencing agreements. The "Monster" has gone after farmers threatening criminal charges wherever they suspect them of trying to save patented seed. "In Bangladesh, the Grameen credit network can do Pinkertons' work for the company at no cost," Mooney argues.

The Loan Terminator: The "Monster's" strategy goes beyond Bangladesh and well beyond increasing sales for Roundup, its flagship herbicide. Once Grameen uses its prestige to make South Asia's governments tow the line on biosafety legislation (the company believes that transgenic crops are perfectly safe for consumers and the environment) the region will become an important new market for agricultural biotechnologies. Indeed, Civil Society Organizations in South Asia fear that poor farmers will become the guinea pigs for untried new biotech products and processes. As of May this year, the "Monster" is co-owner (with the US Department of Agriculture) of the Terminator Technology. (For further information, please see RAFI's homepage) The Terminator can render the seed of any crop infertile in the second generation whether or not it is a hybrid. This makes it the ideal platform for companies to introduce patented genetic traits they don't want farmers to save from season to season. Monsanto's own genes for Roundup-tolerance or insect-resistance can all be loaded onto the Terminator "platform" and sold to farmers with Grameen Bank loans. The Terminator's inventors have already suggested that the vast rice and wheat lands of South Asia are ideal for the Terminator (known formally within the Monster as the "Technology Protection System"). Both the intergovernmental Convention on Biological Diversity and the Consultative Group on International Agricultural Research (CGIAR) have expressed their concern about the impact of this technology on farmers and the environment.

Re-Green Grameen: On July 3rd, RAFI wrote to Muhammad Yunus asking him to reconsider the Monsanto relationship and to come out clearly against any linkage between corporate grants and the purchase of the grant-giver's products. RAFI also asked Grameen to join the opposition to Terminator Technology and to support the traditional right of farming communities to save, exchange, and develop plant varieties. RAFI asked for a response by Tuesday, July 7th. "Grameen has been crawling all over our website," Hope Shand of RAFI comments, "but they have not given any indication that they will reply." "For the sake of the credibility of the micro-credit movement," Pat Mooney adds, "and to protect the independence of Civil Society Organizations, we have to speak out against deals such as this. We have no choice but to work with partner organizations among farming and rural communities to challenge the Grameen/Monsanto strategy. Hopefully, this is just a clumsy mistake that can be corrected quickly. We want a green and not a mean Grameen." In her July 4th letter to Yunus, Vandana Shiva concluded, "We call on you to withdraw from this partnership with Monsanto and invite you to join the growing worldwide movement of people against Monsanto and against genetic engineering and patents on life."

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RAFI is a non-profit international civil society organization headquartered in Canada. For more than twenty years, RAFI has worked on the social and economic impact of new technologies as they impact rural societies.

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Press Release - 6 August 1998

GRAMEEN BANK AND THE MONSTER

GRAMEEN REJECTS MEAN

The American Home "Monster" is held at bay in Bangladesh; but who is going to monitor the micro-creditors? Since when is "empowerment through indebtedness" a solution for poor farming communities?

On 27 July Muhammad Yunus, managing director of the Grameen Bank of Bangladesh was reported by the BBC to have cancelled the Bank's planned relationship with Monsanto Corporation (often referred to as the American Home "Monster" following its announced merger with American Home Products earlier this year). The abandoned arrangement would have given the micro-credit bank U.S.$250,000 to provide loans to poor farmers to buy Monsanto's agro-chemical and biotechnology products. Grameen's capitulation follows a month of intense international pressure that began June 25th when Yunus announced the Monsanto grant together with the Corporation's CSO, Robert Shapiro.

RAFI's actions: On July 2, RAFI wrote to Yunus calling upon him to drop the deal and to throw the Bank's support behind the right of farmers to save, exchange, and develop their own plant varieties - a right that would be curtailed if farmers were forced to accept Monsanto's controversial Terminator Technology. See RAFI homepage www.rafi.ca/misc/terminator.html When there was no reply from the Bank, RAFI released its July 7th news release ("Grameen Turns Mean?"). RAFI also copied its letter and news release to a number of persons influential to the Grameen Bank or with a history of agricultural cooperation with the Bank and Prof. Yunus. The list included a senior World Bank official. In mid-July, Prof. Yunus let it be known that he was consulting the World Bank official and that he would take the advice he received. Shortly thereafter, Grameen announced that the Monsanto agreement would be cancelled due to pressure from "environmental NGOs". "We believe that RAFI's move to involve key World Bank people in the negotiations was pivotal to Grameen's abandonment of the agreement," Pat Mooney, executive director of RAFI says. "The Bank was politically savvy enough to realize that the Monsanto connection was a blunder. It was in their own interests to get Grameen out of the mess," Mooney adds.

Wide opposition: Among those most prominent in persuading the Bank to change its tune was Vandana Shiva of the Research Foundation for Science, Technology and Ecology (New Delhi) who wrote personally to Muhammad Yunus on July 3rd eloquently urging the professor to reconsider his actions. Shiva's call was supported by a wide range of civil society organizations in Asia and beyond, including Diverse Women for Diversity and Britain's Gaia Foundation.

Empowerment through indebtedness? While Grameen's immediate problem over Monsanto and Terminator Technology may be coming to a close, the furor rekindled a range of much wider concerns regarding the role of micro-credit in community empowerment and in particular, in the empowerment of poor rural women. Although most critics would agree that the concept of providing micro-credit on reasonable terms to allow poor women to develop small incoming generating enterprises is a useful development "tool", many are concerned that the hype stirred by the World Bank in its call last year to extend micro-credit to more than 100 million poor families by the year 2000 turns the "tool" into a panacea for poverty alleviation. "Only the World Bank could term the act of placing a hundred million families in debt as 'empowerment'", Farhad Mazhar of UBINIG (a prominent Bangladeshi Civil Society Organization) asserts. "Unless it is handled with extreme care and sensitivity as part of an integrated community strategy, micro-credit in the hands of such clumsy characters as the World Bank will only extend the IMF's structural adjustment campaign to the family level. This is not a good thing."

CIDA/IDRC call for caution: Two recent academic studies give rise to concern for the impact of micro-credit on women. One doctoral study financially supported by the International Development Research Centre (IDRC, Ottawa), conducted among villagers in Bangladesh, suggests that about two-thirds of the micro-credit loans made to women are ultimately controlled by their husbands, fathers or other male family members. In many cases, the stringent pay-back requirement (that has allowed lenders such as Grameen to report a 98% loan repayment rate) has forced the women to meet their micro-credit obligations be resorting to usurious

money-lenders, thus driving them further into poverty. The doctoral thesis was defended by Aminur Rahman at the University of Manitoba on July 23 and a short description of the study is available at the IDRC home page. A Masters thesis from Corey Huntington at Carleton University, in Ottawa, this time based on research in Tanzania, has drawn almost identical conclusions.. Coincidentally, this study was also defended in July at the height of the Grameen debate.

In response to the growing concern over micro-credit, some senior aid officials such as Huguette Labelle, President of the Canadian International Development Agency (CIDA, Ottawa) have called for caution in pursuing micro-credit as a solution to poverty and reminded other development aid agencies that true community development and poverty alleviation requires a holistic range of community initiatives. Says LaBelle, "We've got to be careful that we don't put everything we have in that [micro-credit programmes] and neglect the fact that... children in developing countries need to be immunized as well. That... you do need those rural roads otherwise the poor will... increase their agricultural yield, but they won't be able to take it to market".

UBINIG is a Bangladeshi civil society organization working with a wide range of practical and policy issues throughout Bangladesh and South Asia. UBINIG coordinates in the South Asian Network on Food, Ecology and Culture - a network dedicated to sustainable food security and rural development.

RAFI is a non-profit international civil society organization headquartered in Canada. For more than twenty years, RAFI has worked on the social and economic impact of new technologies as they impact rural societies.
Huguette Labelle quoted from CBC Radio World Report interview August 3, 1998

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News Release - 24 August 1998

More on the Terminator Trend...

... and now, the "Verminator"!

Fat Cat Corp. with Fat Rat gene can Kill Crops

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Europe's answer to the American Home "Monster" Terminator Technology is the Verminator, a new chemically activated seed killer. The Verminator kills seeds - in one of the invention's claims - by switching on rodent fat genes that have been bioengineered into crops. Zeneca BioSciences (UK) is vying with the "Monster" (Monsanto) to become Top Cat in the global seed industry even if it means playing cat and mouse with farmers and destroying their age-old practice of saving and breeding crop varieties.

Zeneca, the life industry spin-off of the old ICI (Imperial Chemical Industries), says it will apply for patents in 58 countries for its invention that renders it impossible for farmers to save "protected" seed from growing season to growing season (WO 94/03619). The technology, which activates a "killer" gene (or prevents the expression of genes crucial to normal plant development), weighs in whenever a chemical "trigger" is applied to seed at a desired point during plant maturation. For example, genetically engineered seed could be produced that would not germinate unless exposed to Zeneca's private chemical trigger. Or, plants growing in the field could be genetically programmed to become stunted, not properly reproduce, or not resist disease(s) unless sprayed with Zeneca's chemical formula.

In the patent description, Zeneca described the source of one such "killer" gene as coming from "mammalian uncoupling protein isolated from the brown adipose tissue of Ratus ratus" - or the "Fat Rat" gene. The move by the British firm is hard on the heels of the US patent (US 5,723,765) granted in March to the US Department of Agriculture (USDA) and Delta and Pine Land Company for what RAFI dubbed "Terminator Technology". Within weeks of that patent announcement, the US agrochemical behemoth Monsanto bought Delta and Pine for US$1.76 billion. Then, in June, Monsanto and American Home Products, one of the biggest cats in the chemical jungle, announced that they would merge. The union instantly created the world's largest pesticide firm, second largest seed enterprise, and a giant that ranks in the top ten in pharmaceuticals and veterinary medicines. Zeneca is currently the world's fifth largest seed company with annual sales of US$437 million in 1997. It is also an important crop chemical and drug company.

"The Verminator is a broader and more pervasive variation on the Monster's Terminator," says Pat Mooney, Executive Director of RAFI. "It looks like Zeneca can either choose to sell seeds that are already incapable of replanting - or trigger the "killer" by chemical spraying at a later date." RAFI's Edward Hammond adds, "Zeneca may also be in a position to attach its genetic 'bomb' to destroy specific genes or gene sequences within the plant. This could allow the seed to be regrown while still eradicating key genetic traits."

A major objective of both the Verminator and the Terminator (which Monsanto euphemistically describes as a "Technology Protection System") is to provide a technological platform (or Trojan Horse) upon which any number of proprietary genes can rest with impunity. The traits will function for the bought seed but either not rejuvenate (in the case of both Verminator and Terminator) or (for Verminator alone) not function in subsequent generations.

Camila Montecinos, an agronomist coordinating the Latin America-wide Community Biodiversity Development and Conservation (CBDC) Programme based in Temuco, Chile, is incensed. "The patent absurdly suggests that the Verminator will benefit farmers by being a 'container' for genetically-engineered varieties or by preventing seed sprouting before harvest," she says (seeds of small grain cereals like wheat or rice sometimes germinate on the plant when conditions are too hot or humid or the harvest is delayed. This can lead to a loss of market quality.) "But the real goal is to hook farmers on genetically 'mutilated' seed that does not properly reproduce. Farmers will lose their 12,000 year-old right to save seed. This is biological warfare."

The UN Food and Agriculture Organization (FAO, Rome) estimate that 1.4 billion poor people depend on farm-saved seed for their food security. The farmers involved often grow their food under unfavourable conditions of little commercial interest to global seed companies. Thus, the farmers adapt or breed their own varieties that meet their own conditions and needs. Verminator and Terminator can make it impossible for these farmers not only to save seed but to create the varieties they need to feed people.

Half a world away, Monica Opole of Kenya, the CBDC's project coordinator in that country, agrees. "The flexibility of the Verminator is scary," Opole says, "In practice, farmers could buy seed believing it can be reused a second season only to find that it cannot or that it is debilitated by inherited Verminator genes. Worse still, the farmer could find that their neighbor bought the Verminator and it outcrossed into their field, leaving them with dead seeds. The farmer loses her crop, the family loses their food. Who knows how the Verminator will interact with nature, especially as it spreads out over time and inevitably crosses with farmers' varieties. This kind of patent is a threat to family food security."

In her office in the suburbs of metro Manila, Neth Daño, executive director of SEARICE (Southeast Asian Regional Institute for Community Education) is furious. "Monsanto and Zeneca have a large chunk of the global seed industry. Where they lead, others will follow. Farmers are under attack. Acting like God, these companies are pulling farmers to their knees to pray 'Give us our daily bread' by forcing them to buy seeds every season. This is grossly immoral and perverse! Our governments have got to come to our defense. Both the Terminator and the Verminator should not be accepted for patenting on the grounds that they violate *ordre public*."

RAFI's research director, Hope Shand has been tracking the Terminator Trend for some time. "It's not just these two technologies," Shand asserts, "Monsanto and Pioneer are also developing new wheat hybrids they believe can take over the market." Hybrids are the "Terminator Rex" of crops. The second-generation seed will either not breed true - or it will be sterile. Until recently small grain cereals such as wheat and rice were difficult to commercially hybridize. "Now, that seems to be changing," says Shand, "The opportunity to force farmers back to buy seed every season has led the multinationals to focus on hybrid terminators too."

"With hybrids, the critical technology is CMS - cytoplasmic male sterility," Rolf Johnsson of Sweden's Friends of the Earth reports. "The Terminator Trend is becoming so wide spread, we need to form a global coalition to fight for the right of farmers to save seed." When studying the Terminator, Johnsson spotted an oblique reference to the Verminator and alerted fellow NGOs to the patent. Together with a large number of civil society organizations, RAFI is studying a number of other patents and technologies associated with the Terminator Trend.

For background on the Trend and on the activities of the global seed trade, please visit RAFI's homepage at http://www.rafi.ca.