Biological Dispossession:
An Ethnography of Resistance to Transgenic Seeds Among Small Farmers in Southern Brazil

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ABSTRACT

For the past decade, seeds have been at the centre of a relentless global war. This is a war of rhetoric—fought in courts, in corporate publicity campaigns, and in international environment and trade negotiations; but it is also a "down-to-earth" struggle, fought in farmers' fields around the world. Indeed, with the advent of plant genetic engineering, seeds have undergone a formidable transformation. Formerly a common good, produced by peasants/farmers and exchanged freely among them, seeds are becoming a tradable commodity on the global marketplace covered by extensive patent rights. As the first link in the food chain and the basis of our food supply, seeds carry tremendous material and symbolic importance. Not surprisingly, these developments have proven highly controversial, and Brazil is one of the terrains where the global struggle over seeds is being played out. This dissertation combines an ethnographic analysis of how genetic engineering is transforming small farmers' seed practices in Southern Brazil with a broader analysis of the Brazilian transgenic seed landscape. It includes a discussion of the recent evolution of Brazilian seed industry, and intellectual property rights (IPRs) and seed legislation; a detailed account of the transgenics controversy in Brazil; and an examination of the role played by civil society in the transgenics debate. I argue that the right of farmers to save, use and exchange their seeds—and not genetic engineering per se—is at the heart of farmers' resistance to genetically engineered organisms in Southern Brazil. Small farmers' response to transgenic seeds does not reflect so much a distrust of a new technology as an acute awareness of the power relations intrinsic to the current biotechnological revolution. Indeed, small farmers are aware that recent technological developments open the way to the heightened commodification of seeds, and that, in this process, they are being dispossessed of the right to seeds, the most fundamental input in farming. I conclude by briefly discussing how these developments have prompted the emergence of "farmers' rights" in an attempt to reassert the age-old practice of seed saving.

RÉSUMÉ

Depuis une décennie, les semences font l'objet d'une lutte acharnée au niveau international. C'est une guerre rhétorique, menée devant les tribunaux, à travers des campagnes de publicité et dans le cadre de négociations commerciales et environnementales au niveau international; mais c'est également une lutte « sur le terrain », menée dans les champs des agriculteurs à travers le monde. En effet, avec l'introduction de plantes issues de l'ingénierie génétique, les semences ont subi une formidable transformation. Auparavant un bien commun, produit par les paysans et agriculteurs et échangées librement entre eux, les semences sont devenues une marchandise sur le marché global, assujetties à des brevets étendus. En tant que premier maillon de la chaîne alimentaire et base de notre approvisionnement alimentaire, les semences revêtent une énorme importance matérielle et symbolique. Il n'est donc pas surprenant que ces développements soient hautement controversés, et le Brésil est l'un des terrains où se mène la lutte globale autour des semences. Cette thèse présente à la fois une analyse ethnographique de la façon dont le génie génétique transforme les pratiques semencières des petits agriculteurs au Sud du Brésil, et une analyse plus ample du paysage brésilien des semences transgéniques. Elle comprend un exposé de l'évolution récente de l'industrie semencière et de la législation en matière de droits de propriété intellectuelle et de semences; un compte-rendu détaillé de la controverse autour des semences transgéniques au Brésil; ainsi qu'une étude du rôle joué par la société civile dans le débat sur les semences transgéniques. Je soutiens dans cette thèse que le droit des agriculteurs de sauvegarder, utiliser et échanger les semences — et non le génie génétique en soi — est au coeur de la résistance opposée par les agriculteurs aux semences transgéniques dans le Sud du Brésil. En effet, leur réaction ne manifeste pas tant une méfiance à l'égard d'une nouvelle technologie qu'une conscience aiguë des relations de pouvoir intrinsèques à l'actuelle révolution biotechnologique. Les petits agriculteurs sont conscients que les développements technologiques récents ouvrent la voie à une marchandisation accrue des semences, et que, ce faisant, ils sont dépossédés du droit aux semences, le fondement même de l'agriculture. Je conclus par une brève discussion de la façon dont ces développements ont entraîné l'émergence des « droits des agriculteurs » comme réaffirmation de la pratique séculaire de la sauvegarde des semences.

« La dictature avait proscrit le mot « paysan » (*camponês*),
qui laissait entendre l'idée de propriété du sol.
Il fallait les appeler « agriculteurs »,
où ne subsistait que la fonction. »

(The dictatorship had banished the word "peasant" (*camponês*),
which implied ownership of the land.
They had to be called "farmers,"
in which only the function remained.)

Daniel Pennac, *Le dictateur et le hamac*

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Karine Peschard

Vancouver, August 2009

LIST OF ABBREVIATIONS AND ACRONYMS

AAO –	*Associação de Agricultura Orgânica* – Organic Agriculture Association
ABPCFlor –	*Associação Brasileira de Proteção de Cultivares de Flores e Plantas Ornamentais* – Brazilian Association for Flower and Ornamental Plant Variety Protection
ABRASEM –	*Associação Brasileira de Sementes e Mudas* – Brazilian Seed Producers Association
ADIN –	*Ação Direta de Inconstitucionalidade* – Direct Action of Unconstitutionality
AGB –	*Associação dos Geógrafos Brasileiros* – Association of Brazilian Geographers
AGORA –	*Associação para Projetos de Combate à Fome* – Association for Projects to Fight Hunger
AGU –	*Advocacia Geral da União* – Solicitor-General of the Union
ANA –	*Articulação Nacional de Agroecologia* – National Articulation of Agroecology
ANBio –	*Associação Nacional de Biossegurança* – National Biosafety Association
ANPA –	*Associação Nacional de Pequenos Agricultores* – National Association of Small Farmers
ANVISA –	*Agência Nacional de Vigilância Sanitária* – National Health Surveillance Agency
APASSUL –	*Associação dos produtores e comerciantes de sementes e mudas do Rio Grande do Sul* – Seed Producers Association of Rio Grande do Sul
APROSOJA-RS –	*Associação de produtores de soja do Rio Grande do Sul* – Soybean Producers Association of Rio Grande do Sul
AS-PTA –	*Assessoria e Serviços a Projetos em Agricultura Alternativa* – Consultancy and Services for Projects in Alternative Agriculture
BRASPOV –	*Associação Brasileira dos Obtentores Vegetais* – Brazilian Plant Breeders Association
Bt –	*Bacillus thuringiensis*
CAPA –	*Centro de Apoio aos Pequenos Agricultores* – Small Farmers Support Centre
CELAM –	*Conselho Episcopal Latino-Americano* – Latin American Bishops Conference
CIB –	*Conselho de Informações sobre Biotecnologia* – Biotechnology Information Council
CIMI –	*Conselho Indígena Missionário* – Indigenist Missionary Council
CNA –	*Confederação Nacional da Agricultura e Pecuária do Brasil* – National Agricultural Confederation

CNBB –	*Conferência Nacional dos Bispos do Brasil* – National Conference of Brazilian Bishops
CNBS –	*Conselho Nacional de Biossegurança* – National Biosafety Council
CONSEA –	Conselho Nacional de Segurança Alimentar e Nutricional – National Council for Food and Nutritional Security
CONTAC –	Confederação Nacional dos Trabalhadores na Indústria da Alimentação e Assalariados Rurais – National Confederation of Agro-industrial and Rural Workers
CONTAG –	*Confederação Nacional dos Trabalhadores na Agricultura* – National Confederation of Agricultural Workers
COOPERAL –	*Cooperativa Regional dos Agricultores Assentados* – Land reform farmers regional cooperative
COP –	Conference of the Parties to the Convention on Biodiversity
CPT –	*Comissão Pastoral da Terra* – Pastoral Land Commission
CTNBio –	*Comissão Técnica Nacional em Biossegurança* – National Technical Commission on Biosafety
CUT –	*Central Única dos Trabalhadores* – Central Workers Union
EIA –	*Estudo de Impacto Ambiental* – Environmental Impact Assessment
EMATER –	*Empresa de Assistência Técnica e Extensão Rural* – Technical Assistance and Rural Extension Enterprise
EMBRAPA –	*Empresa Brasileira de Pesquisa Agropecuária* – Brazilian Agricultural Research Corporation
ENA –	*Encontro Nacional de Agroecologia* – National Agroecology Meeting
ESPLAR –	*Centro de Pesquisa e Assessoria* – Research and Consultancy Centre
ETC –	Action Group on Erosion, Technology and Concentration
FAO –	United Nations Food and Agriculture Organization
FARSUL –	*Federação da Agricultura do Estado do Rio Grande do Sul* – Agricultural Federation of Rio Grande do Sul
FASE –	*Federação dos órgãos para a assistência social e educacional* – Federation of Social and Educational Assistance Organizations
FBSAN –	*Fórum Brasileiro de Segurança Alimentar e Nutricional* – Brazilian Forum for Food and Nutrition Security
FEAB –	*Federação dos Estudantes de Agronomia do Brasil* – Brazilian Federation of Agronomy Students
FETRAF –	*Federação dos Trabalhadores na Agricultura Familiar* – Family Farming Workers Federation
GURTs –	Gene Use Restriction Technologies
IBAMA –	*Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis* – Brazilian Institute of Environmental and Renewable Natural Resources
IBASE –	*Instituto Brasileiro de Análises Sociais e Econômicas* – Brazilian Institute for Socio-Economic Analysis

IDEC –	*Instituto Brasileiro de Defesa do Consumidor* – Brazilian Institute for Consumer Protection
INCRA –	*Instituto Nacional de Colonização e Reforma Agrária* – National Institute for Colonization and Agrarian Reform
INESC –	*Instituto de Estudos Socioeconômicos* – Institute for Socio-Economic Research
ISAAA –	International Service for the Acquisition of Agri-Biotech Applications
ITPGRFA –	International Treaty on Plant Genetic Resources for Food and Agriculture
LMO –	Living Modified Organisms
LPC –	*Lei de Proteção de Cultivares* – Brazilian Plant Variety Protection Act
MAB –	*Movimentos dos Atingidos por Barragens* – Movement of Dam-Affected People
MAPA –	*Ministério da Agricultura, Pecuária e Abastecimento* – Ministry of Agriculture, Livestock and Food Supply
MCT –	*Ministério da Ciência e Tecnologia* – Ministry of Science and Technology
MDA –	*Ministério do Desenvolvimento Agrário* – Ministry of Agrarian Development
MMA –	*Ministério do Meio Ambiente* – Ministry of the Environment
MMC –	*Movimento das Mulheres Camponesas* – Peasant Women's Movement
MOP –	Meeting of the Parties to the Cartagena Protocol on Biosafety
MPA –	*Movimento dos Pequenos Agricultores* – Small Farmers Movement
MPF –	*Ministério Público Federal* – Public Ministry
MST –	*Movimento dos Trabalhadores Rurais Sem Terra* – Landless Rural Workers Movement
PGR –	*Procurador Geral da República* – Federal Attorney General
PJR –	*Pastoral da Juventude Rural* – Rural Youth Pastoral
PMDB –	*Partido do Movimento Democrático Brasileiro* – Brazilian Democratic Movement Party
PR –	Paraná State
PRONAF –	*Programa Nacional de Fortalecimento da Agricultura Familiar* – National Program for the Strengthening of Family Agriculture
PT –	*Partido dos Trabalhadores* – Workers Party
PTA –	*Projeto Tecnologias Alternativas* – Alternative Technologies Project
RENAP –	*Rede Nacional de Advogados Populares* – National Network of Grassroots Lawyers
RNC –	*Registro Nacional de Cultivares* – National Registry of Cultivars
RR –	Roundup Ready
RS –	Rio Grande do Sul State

SBPC –	*Sociedade Brasileira para o Progresso da Ciência* – Brazilian Society for the Progress of Science
SC –	Santa Catarina State
SINPAF –	*Sindicato Nacional dos Trabalhadores de Instituições de Pesquisa e Desenvolvimento Agropecuário* – National Union of Agricultural Research and Development Workers
SINTRAF –	*Sindicato dos Trabalhadores na Agricultura Familiar* – Family Farming Workers Union
SNPC –	*Serviço Nacional de Proteção de Cultivares* – National Plant Varieties Protection Service
TDD –	*Terra de Direitos*
TRIPS –	Trade-Related Aspects of Intellectual Property Rights
TSA –	Technology Stewardship Agreement
UNESCO –	United Nations Educational, Scientific and Cultural Organization
UPOV –	International Union for the Protection of New Varieties of Plants
USDA –	United States Department of Agriculture
USPTO –	United States Patent and Trademark Office
WHO –	United Nations World Health Organization
WTO –	World Trade Organization

INTRODUCTION

Land Pilgrimage - Cruz Machado, Paraná, August 22, 2004

After leaving Curitiba, the capital city of the state of Paraná (Southern Brazil), at midnight, I arrive at dawn at Cruz Machado, a small township in the south central part of the state. Founded at the turn of the 20th century by Polish settlers, the township is home to 18 thousand inhabitants, of which the vast majority (80 percent) live in the countryside (IBGE 2002).

An unusual fervour prevails that day in the small town: more than 20,000 people are expected for the 19th Annual Land Pilgrimage, organized by the Catholic Church's Pastoral Land Commission (CPT). In the early morning mist, the modern pilgrims descend from buses arriving from all corners of the state. Both a religious and political event, the Land Pilgrimage is organized that year under the theme "I Believe in Seeds: God's Promise, Our Heritage" (*Creio na Semente: Promessa de Deus, Patrimônio da Gente*).

The opening ceremony is extremely colourful: it begins with the blessing of hundreds of farmer-selected varieties rescued in the community. Farmers bound by chains march before the silent and attentive crowd, bowed under the weight of bags of seeds bearing the logos of multinational companies that dominate the seed and chemical products industry—BASF, Monsanto, Bayer, Dupont, Astra Zeneca, etc. They then rid themselves of their chains and burdens, and set them on fire. The symbolism is unambiguous. Afterwards, the long procession moves on toward a

vacant lot outside the town for a day-long celebration of harvest and seeds (Appendix C).

I did not realize it at the time but already in this vivid staging were all the major themes that turned out to be central to this thesis: the privatisation of seeds, the erosion of biodiversity, the assertion of intellectual property rights (IPRs) over life forms, and peasant dispossession.

Seed Wars

With the advent of plant genetic engineering[1], seeds have undergone a formidable transformation. Formerly a common good, produced by peasants/farmers and exchanged freely among them, seeds are increasingly becoming a tradable commodity on the global marketplace. Seeds are now thoroughly enmeshed with financial capitalism: on March 5, 2005, the *St. Louis Post-Dispatch* ran the following headline, "Monsanto Stock Rises With Passage of Brazil Seed Bill" (Stroud 2005). The seed bill in question was in fact a revised biosafety bill aimed at breaking the deadlock into which had run the government agency responsible for the approval of transgenic varieties.[2]

These developments are proving highly controversial. For the past decade, seeds have been at the centre of a relentless global war. This is a war of

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1 Genetic engineering is only one of the applications of agricultural biotechnology. However, it is by far the most prominent.

2 Several terms are used to refer to the products of genetic engineering in agriculture, the most common being genetically engineered (GE), transgenic or genetically modified (GM). I prefer the first two (which refer to genetic engineering specifically) over the last (which is more vague: the products of conventional breeding are also modified genetically). Here, *genetically engineered* and *transgenic* are used interchangeably. The term *genetically modified* is only used when it is a quote or a set expression, for example in Campaign for a GM-Free Brazil.

rhetoric—fought in courts, in corporate publicity campaigns, and in international trade and environmental negotiations; but it is also a "down-to-earth" struggle, fought in farmers' fields around the world. Canadian farmer Percy Schmeiser and his lawsuit against Monsanto before the Canadian Supreme Court, France's voluntary reapers (*faucheurs volontaires*) and Indian cotton growers have all become powerful symbols of farmers' resistance to transgenic crops. At the heart of these struggles are the extensive patenting of plant materials and the increasing restrictions on farmers' right to keep and re-sow seeds.

These issues are taking renewed importance in the context of global climate change and of the current financial crisis. As history taught us, the more genetically uniform our food supply, the more vulnerable it is to natural or human-made disasters. To guard against such contingency, an unprecedented initiative—the Svalbard Global Seed Vault, nicknamed the "Doomsday Vault"—was inaugurated in February of 2008 in Norway's far north to store duplicates of seed samples from around the world. More recently, the surging food prices in the wake of the financial crisis triggered food riots around the world and rekindled impassioned arguments about agriculture, technology, productivity and hunger.

Brazil is one of the terrains where the global struggle over seeds is being played out. The ongoing controversy over transgenic seeds in Brazil has been marked by the illegal smuggling of seeds, the uprooting of transgenic crops by social movements (and by government officials), public civil lawsuits and court injunctions, political infighting, and renewed mobilization among farmers. Early on in the controversy, Brazilian civil society organizations blocked the commercial approval of Monsanto's Roundup Ready (RR) soybeans in the courts, based on the

lack of environmental impact assessments (EIAs). As a result of this action, RR soybeans were not definitely authorized in Brazil until 2005, a full decade after they were commercially introduced in the United States, Canada and Argentina. During those years in which genetically engineered (GE) varieties remained in a political and legal void, there was a clear sense that what happened in Brazil—an emerging agricultural power and the world's second largest soybean producer after the United States—could tip the balance on transgenic crops.

Roundup Ready soybeans, genetically engineered to tolerate Monsanto's herbicide Roundup, were finally approved in March 2005, at the same time as the first variety of insect resistant cotton (Bollgard, also by Monsanto). Since 2008, another ten varieties of cotton and corn have been authorized, bringing to twelve the total number of transgenic varieties. With 15 million hectares[3] (13 percent of the total GE crop area worldwide), Brazil is now the third largest producer of transgenic crops after the United States and Argentina (ISAAA 2007). The controversy, however, is not over. The increasing costs of royalties, the spread of herbicide resistance and mixed productivity results continue to feed the debate.

Coming from Canada, where transgenic varieties were introduced without much fuss, I was struck by the extent of the controversy in Brazil. Why have transgenic seeds met with such resistance and proven to be so controversial in Brazil? Why have small farmers been at the forefront of activism against transgenics? What pushes small farmers to engage in radical acts such as crop uprooting and occupations? What is it that they are resisting—and why? What alternatives to transgenic seeds are they defending and developing?

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[3] The vast majority of these 15 million hectares were planted in RR soybeans (14.5 million hectares), the remainder being Bt cotton (ISAAA 2007).

Within Brazil, the Southern region[4], more specifically the southernmost state of Rio Grande do Sul (RS), stands out as the epicentre of the issue, both as the origin of the controversy and where it has been most intense. Transgenic soybeans were smuggled into RS from Argentina, where they were already cultivated on a large scale in the late 1990s. The state government's project to make RS into a GM-free state eventually failed, but gave prominence to the issue. Moreover, in a country dominated by large properties, the Southern region is distinctive for its strong family-based farming sector. I conducted research with small farmers in Rio Grande do Sul, as well as in the neighbouring state of Santa Catarina. The latter shares a great deal historically and culturally with RS and is home to one of Brazil's most important seed fairs.

In the course of this research, I have been asked repeatedly about those small farmers who do adopt transgenic crops. Indeed, from the time when they were still illegal, transgenic seeds have been adopted by small and medium-sized farmers as well as by large landowners.[5] I offer some insights into why farmers embrace transgenic varieties in chapter five. Let me reiterate, however, that the aim of this research is to understand the reasons behind farmers' rejection of transgenic crops, and not the reasons behind their adoption (which would warrant another research project altogether). Furthermore, what resistance there has been (and it is significant) has come from small farmers. Finally, let me emphasize that I discuss a specific reality in Brazil's complex agrarian landscape—that of small farmers in the Southern

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[4] The Southern region of Brazil is comprised of the three southernmost states: Rio Grande do Sul (RS), Santa Catarina (SC) and Paraná (PR). See map in Appendix D.

[5] Given the activity's illegal nature, there are no official statistics. However, this is common knowledge and was confirmed by several of my informants.

region—and therefore my conclusions cannot be extrapolated to other regions of the country.

Anthropology and Transgenic Seeds

The impetus for this research project came from a marked interest in social movements, global capital and intellectual property rights over life forms. The issue of genetic engineering in agriculture, in particular, emerged as a key site of struggle over contemporary processes of commodification. As I started researching the issue, I was puzzled by the dearth of anthropological research into genetically modified organisms (GMOs); while anthropology is making a decisive contribution to our understanding of medical biotechnologies, remarkably little had been published on agricultural biotechnologies so far.[6] Yet anthropologists can bring a much needed contribution to the debate by providing a critical perspective on some of the unexamined assumptions that underlie discourses around genetic engineering in agriculture.

In *Hazard Identification of Agricultural Biotechnology*, A. van Dommelen writes that "the larger biotechnology debate… is riddled with ideological, ethical, and other normative evaluations…. [As] history keeps teaching us, ideology and world view will not easily be influenced by the results of scientific research" (quoted in Duvick 2001:73). As medical anthropologists have forcefully argued for decades, scientific research is—to turn the above quote on its head—riddled with ideological, ethical, and other normative evaluations, and remarkably resilient to acknowledging that this is so. This quote is typical of the way in which critics of agricultural

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[6] Notable exceptions are Heller (2001a, 2001b, 2002, 2006), Holmes (2006) and Stone (2002, 2005).

biotechnology (hereafter agbiotech) are summarily dismissed as "ideological", that is biased or irrational. This portrayal of science as immune to ideology glosses over the fact that genetic engineering itself has developed hand in hand with the neo-liberal project. Far more than mere technology, the genetic engineering of seeds represents a new way of ordering social and biological life (Heller 2001a:407). This is evident in the fact that the genetic engineering of seeds is accompanied by new bio-legal regimes: the Gene Use Restriction Technologies (GURTs) and Technology Stewardship Agreements (TSAs) discussed in chapters two and three are examples of the ways in which plant genetic engineering is reordering the social and biological life of seeds.

The prevailing assumption that modern biotechnology equals progress—that it is more precise and more efficient, in short, more "scientific"—needs to be examined critically. It is medical anthropology's fundamental insight that there is no culture-free way to think about the body, illness and healing. All medical systems must be placed on an equal footing, and biomedicine is not exempt from cultural analysis (Lock and Scheper-Hugues 1996). This insight applies equally to agricultural systems, whether it is traditional plant breeding by farmers or agricultural biotechnology. Farmers, plant breeders and bioengineers all modify plant materials. They do so using different techniques, and different paradigms or worldviews underlie their respective approaches to plant breeding. There is no reason, however, to assume that one is inherently superior to the other. Farmers do not possess the molecular biology knowledge that allows the genetic engineering of seeds, but neither do molecular biologists possess farmers/peasants' profound knowledge of agriculture. A genetically engineered crop may be resistant to one

herbicide, but this does not necessarily make the plant better adapted as a whole. Plants are complex living organisms, and there is a case to be made that the most efficient way to breed a plant is within the ecosystem in which it is grown.

Anthropology also has a specific contribution to make with regard to practices emerging around agricultural biotechnologies, among biotech researchers engaged in developing transgenic plants in laboratories[7], as well as among peasants and farmers who have first-hand experience with transgenic seeds. In this thesis, I explore the implications of the multiplication of seed fairs, events in which farmers come together to exchange farmer-selected varieties. Seed fairs, I argue, are invented traditions, traditions that take on new forms and meanings in response to contemporary developments; in this case, farmers are reinventing seed saving and exchange practices.

Finally, small farmers do not have the place they deserve in the debate over agricultural biotechnology. While activists' opposition to agbiotech is commonly dismissed as ideological, that of farmers is said to spring from lack of knowledge or innate distrust. The October 29, 2003 edition of *Veja*, a widely read Brazilian weekly magazine, read "Transgenics: The Fear of Novelty" (Appendix F). Implicit in many pro-agbiotech arguments is the idea that farmers will overcome their initial misgivings once they see for themselves the benefits of transgenic crops. However, taking small farmers' questioning seriously—whether they express doubts or outright opposition—reveals that much more is at stake than may appear at first glance.

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[7] There are remarkably few ethnographies of agbiotech laboratories. See Holmes (2006).

The Seed as Ethnographic Object

As the first link in the food chain and the basis of our food supply, seeds occupy a special place in human societies.[8] The seed is both the beginning of crop production (as seed) and its endpoint (as grain); in other words, seeds are both the means of production and the end product for consumption. Seeds carry tremendous material and symbolic importance, as witnessed by the rituals celebrating sowing and harvesting around the world.

Not surprisingly, their genetic engineering raises an array of complex scientific, socioeconomic and environmental issues, from the genetic erosion of agricultural biodiversity to food security and food sovereignty, speculation in grain futures and options markets, international trade regimes and intellectual property rights over life forms. It illustrates the interpenetration of different realms—scientific, social, economic, political, cultural and biological—that is characteristic of our age, and also highlights the imbrication of the local and the global. Let me quote Fowler and Mooney (1990:116) at length to give a sense of the journey of a seed in today's globalized world:

> En route to the cabbage patch, a new variety may begin with a collecting expedition to the Near East funded by a quasi-United Nations agency in Rome. Germplasm from the expedition may be evaluated at a government facility in Warwick, England. Combined with traditional local cultivars, the improved material will be made available to a private breeding concern at King's Lynn in the United Kingdom, which will pass it on to a vegetable-breeding sister company in Enkhuizen, Holland.
> Taking advantage of the different growing seasons, the Dutch concern may contract some breeding work to a partner in Christchurch, New Zealand, or Santiago, Chile. Ultimately, the new cabbage may be multiplied…. by another sister firm in Arusha, Tanzania. Cheap land

[8] For the purpose of this discussion, *seed* refers to every plant structure used in the propagation of a plant variety.

> and labor, a favourable climate, and an absence of disease conspire to make Arusha one of the world's largest growers of vegetable seed, and a home away from home to a dozen international seed companies. Ready for market, the new variety will be licensed by its owners to wholesalers and retailers. Through the services of seed brokers, this "Dutch" cabbage may appear in the catalogue of a Brandon, Canada, mail-order seed house or be sold in grocery stores in Seoul, Korea. Some of it may even be marketed back to gardeners in the Near East.

This was written in 1990, that is before the advent of genetically engineered varieties added further twists and turns. Transgenic seeds now straddle the world of the infinitely small—molecular biology and new genetics—and global processes such as transnational peasant movements, international environmental policy and global capital. Any comprehensive approach to the genetic engineering of seeds must therefore combine micro and macro approaches. A useful way to approach the genetic engineering of seeds is the notion of "transnational genetic landscapes" resulting from the "novel intersection of genetic knowledge with forces of globalization" and "linking organisms, ecologies, histories and cultures in complex and unprecedented ways" (Heller and Escobar 2003:156-157). This thesis is an attempt at offering such an analysis of the Brazilian transgenic seeds landscape. It combines an ethnographic analysis of how the advent of genetically engineered seeds is transforming small farmers' seed practices with a broader analysis of changing global seed regimes.

These developments have given rise to new biopolitical entities, such as genetically engineered seeds, the product of the application of genetic engineering to plant breeding. As living organisms which incorporate genetic material from other species or even kingdoms, transgenic plants are modern chimeras. In Brazil, these developments have also given rise to *Sementes Crioulas* (literally, *Creole* seeds; for

lack of a better translation, I use the equivalent English expression, farmer-selected seeds). Indeed, in recent years, *Sementes Crioulas* have emerged as a way to question and contest these developments. The expression is above all political, a reassertion of the value and legitimacy of farmer-selected seeds in the face of their growing marginalization. The reality to which it refers has always existed, of course, simply as "seeds." What distinguishes transgenic seeds is the ability to overcome physiological reproductive barriers, but transgenic and farmer-selected seeds also embody different agricultural paradigms and (bio)legal regimes. Both transgenic and farmer-selected seeds are as much biological entities as they are cultural and political ones.

This is not so much an ethnography of transgenic seeds as an a ethnography of *resistance* to transgenic seeds. Resistance is of course a loaded concept. I have no qualms about using the term, however, once it is established that resistance is always ambiguous and ambivalent, and the term stripped of any romantic connotation. I tend to agree with Ortner when she writes that "resistance, even at its most ambiguous, is a reasonably useful category, if only because it highlights the presence and play of power in most forms of relationship and activity" (1995:175). My decision to use the term was comforted by the fact that several of the farmers to whom I talked used it to refer to themselves and what they are doing. As I show, farmers themselves are acutely aware of the power relations intrinsic to the current biotechnological revolution.

The Argument (Biological Dispossession)

The right of farmers to save, use and exchange their seeds—and not genetic engineering per se—is at the heart of farmers' resistance to genetically-modified organisms (GMOs) in Brazil. Small farmers' response to transgenic seeds does not reflect so much a distrust of a new technology as an acute awareness of the power relations intrinsic to the current biotechnological revolution. Indeed, small farmers are aware that recent technological developments open the way to the heightened commodification of seeds, and that, in this process, they are being dispossessed of the right to seeds, the most fundamental input in farming.

This dispossession stands out in small farmers' narratives regarding the meanings and implications of hybrids, and more recently of genetically engineered varieties, on their lives as farmers. When I raised the issue of transgenic, many small farmers shrugged wearily and said that this was not about transgenics, but about seeds: it was the same story that they had experienced with the Green Revolution[9], and this time they knew what to make of it. This insight became the central thread of my thesis, as I sought to explore the multiple facets of the theme of dispossession that was at the centre of many small farmers' narratives about seeds.

In recent years, there has been a resurgence of interest in dispossession among scholars. Andreasson points out that the contemporary extension of property rights "necessarily generates violent, and oftentimes lethal, processes of dispossession" (2006:3). Harvey (2003) argues that so-called "primitive" or

[9] The Green Revolution refers to the post-1945 industrialization of agriculture, based on high-yield varieties, chemical fertilizers and irrigation. See chapter 4.

"original" accumulation is in fact ongoing, and that it would therefore be more accurate to refer to this process as one of "accumulation by dispossession." The extension of intellectual property rights over seeds, for example, represents the privatization of seeds as well as the extinction of the ancestral practice of saving seeds for the following year, and thus amounts to the expropriation of farmers' rights over seeds. As the quote in excerpt suggests, there are striking continuities between historical processes of land dispossession and contemporary processes of seed dispossession. The latter, however, also presents novel dimensions. I use the expression *biological dispossession* to highlight how plants' biological reproductive capacity is at the heart of what is at stake in these processes.

It strikes me that small farmers are, in their own way, saying the same thing as social scientists. When they insist that it is not about genetic engineering but about losing access to seeds, what they are saying is that it is not about the technology itself but the uses to which it is put. Stated differently, scientific breakthroughs opened new possibilities for the commodification of seeds, but the way in which these possibilities were exploited by the emerging life sciences industry was shaped by the broader political context in which they were developed. Indeed, the development of plant biotechnology took place at the height of neoliberal capitalism, with its propensity toward strong intellectual property rights, privatization and deregulation.

The Methods

I first traveled to Brazil in January 2003 to take part in the third World Social Forum, which drew over 100,000 participants in Porto Alegre, RS. At the time, the

Workers Party (*Partido dos Trabalhadores*) had just been elected for the first time, generating tremendous hope among social movements and in the broader society. The controversy over transgenic seeds was at its peak and the election of the Workers Party, which ran on the promise that it would not authorize GE soybeans, created great expectations among advocates of a precautionary approach.

I returned to Brazil in the fall of 2004, this time in the context of an internship organized jointly by the Washington-based Robert F. Kennedy Memorial Center for Human Rights and the Brazilian non-governmental organization *Terra de Direitos*. The research conducted in Landless Rural Workers Movement (MST) settlements and land occupations in the context of this internship was essential in furthering my understanding of the complex reality of the Brazilian countryside. It is during this internship that I participated in the Land Pilgrimage described in the opening paragraphs and that I first came into contact with peasants' mobilization around the issue of seeds. By then, it was clear that the federal government was not holding to its campaign promise, and a struggle over the first commercial authorizations was in the works.

In March 2006, I participated in the three-week long United Nations Conference of the Parties to the Convention on Biodiversity (COP8/MOP3), held in Curitiba, State of Paraná. Social movements' mobilization was unprecedented for such a meeting, a witness to the vitality of Brazilian civil society. A parallel forum was held outside the Congress Center and several actions were conducted in defense of farmer-selected seeds, including a silent protest of the women of the transnational peasant movement Via Campesina against Terminator (a technology to make seeds sterile at harvest) inside the negotiation room. The two direct actions discussed in

chapter six—the occupations of Aracruz Celulose and Syngenta—were held that same month.

Except for short breaks, I lived in Brazil from March 2006 until August 2008. During preliminary fieldwork and the elaboration of my research proposal (April-December 2006), as well as during the main period of fieldwork research (January-December 2007), I was based in Porto Alegre, the capital of the southernmost State of Rio Grande do Sul (RS). I traveled regularly to the interior as well as to the neighboring State of Santa Catarina (SC) to conduct interviews with small farmers. In these interviews, I explored small farmers' views, experiences and practices with regards to seeds, farmer-selected varieties and the genetic engineering of seeds. The farmers and their families whom I interviewed were chosen on the basis of two criteria: being a "small farmer" and having experience with farmer-selected seeds. For logistical reasons and to facilitate first contact, I was accompanied in my visits by an agricultural technician or agronomist who worked in the region, and whose intimate knowledge of the families and broader understanding of local history and politics proved invaluable.

I participated in three seed fairs at the local, state and national level, and conducted interviews with both organizers and participants in these events: a state-wide seed fair in Canguçu (RS), August 4-6, 2006; a national seed fair in Anchieta (SC), April 21-22, 2007; and a local/regional seed fair in Ipê (RS), April 29, 2007. I also participated in a range of related activities, such as a seed workshop of the Peasant Women Movement, and the meeting of a small farmers' seed savers association (see Appendix E for a map of interviews and seed fairs).

Finally, I traveled to other states and major cities, including São Paulo, Rio de Janeiro, Brasília, to conduct interviews with key informants at the national level, including campaign organizers and lawyers at the Brazilian Institute for Consumer Protection (IDEC) and Greenpeace; the coordinator and members of the National Campaign for a GM-Free Brazil, a consultant on agriculture and rural policy for the Chamber of Deputies, a researcher on agrobiodiversity and plant breeding at the Brazilian Agricultural Research Corporation (EMBRAPA), and members of the National Technical Commission on Biosafety (CTNBio).

I wrote part of the thesis while living in Brazil's capital, Brasília, which gave me access to key resources and people, and allowed me to follow more closely the politics of genetically engineered organisms in Congress and the works of the National Technical Commission on Biosafety. I participated in a regular meeting of the CTNBio, in the public hearing on the commercial approval of transgenic cotton (both in August 2007), and in the public hearing on changes to the Plant Variety Protection Act (June 2008).

Overview of the Thesis

Small farmers' narratives regarding the meanings and implications of hybrids, and more recently of genetically engineered varieties, on their lives as farmers are replete with concerns over identity, autonomy, knowledge and culture. These narratives, which form the first chapter of this thesis, reveal a moral economy in which seeds take on a rich variety of meanings (the moral economy of seeds is discussed on page 44 and following). Another recurring theme is dispossession—of the seeds themselves and the knowledge that comes with them. I pay particular

attention to the seed fair, a recent phenomenon through which farmers contest the growing marginalization of farmer-selected varieties by reinventing seed saving and exchange practices.

Drawing on these ethnographic insights, I explore the contemporary processes—scientific and political-economic, legal and biological—through which a moral economy of seeds is transformed into one in which seeds become a form of biocapital. Chapter 2 offers critical perspectives on the genetic engineering of seeds. I start out by discussing the reductionist assumptions that underlay the agbiotech enterprise. As McAfee (2003) argues, genetic-reductionist arguments about the discrete nature of genes and the precise and controlled nature of genetic engineering feed into economic-reductionist arguments about the intrinsic value of patenting and of the market-based management of biotechnology. Drawing on this insight, I examine the widely-held claim that biotechnology is a solution to hunger. One of the consequences of these various forms of reductionism is to obscure the profound political-economic transformations that genetic engineering, and the patenting that goes hand in hand with it, are imposing upon the social life of seeds and upon farming more broadly. I discuss two such transformations: the restructuring of the global seed industry in the last two decades as it repositioned itself as a life science industry; and the heightened commodification of seeds, epitomized by the development of sterile seed technology. Known as Gene Use Restriction Technologies (GURTs), the latter epitomizes biological dispossession: the centrality of plants' biological reproductive processes in current processes of seed dispossession. The last part of the chapter examines some of these issues and the political economy of agricultural biotechnology in the Brazilian context. In Brazil,

transgenic varieties were introduced in a highly polarized and politicized agrarian landscape; understanding the transgenic seed issue requires addressing the country's complex agrarian politics, emerging soybean complex and changing seed industry.

In chapter 3, I turn to the legal dimensions of seed dispossession. Intellectual property rights are an essential dimension of current processes of seed commodification. After a brief overview of the history of intellectual property rights in plant varieties, I discuss the overhaul of the Brazilian IPR and seed legislation over the last two decades to adjust to new global regimes. In the second part of the chapter, I look at the contracts, known as Technology Stewardship Agreements (TSAs), introduced by biotech companies to strengthen their property rights over transgenic varieties. The combination of legislation and technology contracts has drastically changed farmers' relationship to seeds.

The second part of the thesis historicizes the discussion by tracing the emergence of a consciousness of dispossession among Brazilian small farmers back to the Green Revolution. The development of a movement in defense of farmer-selected varieties during that period is key to understanding the response to transgenic crops among rural social movements and civil society organizations (chapter 4). Having set the background, chapter 5 presents a detailed account of the controversy over transgenic organisms in Brazil from the passing of biosafety legislation in 1995 until 2008. This account is based on interviews with scientists and activists, participation in a regular meeting of the National Technical Commission on Biosafety (CTNBio) and public hearings and secondary materials (legal proceedings and decisions, press coverage, public statements, etc.). Finally, the last chapter explores the innovative forms of activism that develop around transgenic crops

during that period under the umbrella of the National Campaign for a GM-Free Brazil. In the conclusion, I examine how these developments have prompted the emergence of "farmers' rights" as a reassertion of the age-old practice of seed saving.

CHAPTER 1

SEED FAIRS AND THE REVIVAL OF FARMER-SELECTED SEEDS IN SOUTHERN BRAZIL

> If this corn disappears, the way it is cultivated disappears along with it…. Basically, it's about the loss of identity, for me this is the worst damage that GMOs can bring about…. This is all like a spider's web, very intertwined, very interdependent. If the possibility to reproduce seeds disappears, culture disappears and, as a consequence, everything else disappears at the same time.[10]
>
> *Seed fair organizer, April 2007*

Celebrating Farmer-Selected Seeds

April 29, 2007 is a day of celebration in the small municipality of Ipê, which counts 5,000 inhabitants, rural for the vast majority. Ipê is located 188 kilometres north of the capital city of the state of Rio Grande do Sul, Porto Alegre, in a mountainous region known as the *Serra Gaúcha*. This region was settled by Italian immigrants at the turn of the last century and it is still inhabited today almost exclusively by people of Italian descent. Even today, the inhabitants do not identify as Brazilians, but as Italians.[11] They are practising Catholics and speak a dialect derived from Italian—*vêneto* (also called *talian*).

The first Italian immigrants arrived in Brazil in the 1870s, and Italian immigration reached a peak between 1880 and 1930. At that time, Italians emigrated in large numbers, pushed to do so by economic hardship; approximately 1.4 million

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[10] Unless otherwise stated, all translations are my own.

[11] As an elderly woman candidly explained while showing me a picture of her daughter-in-law: "she is not Italian, she is Brazilian. But she is not black, she's pretty."

chose Brazil (IBGE 2000).[12] A third of them were small landowners or rural tenants from northern Italy, attracted to Brazil by government propaganda and the availability of land. The Brazilian government encouraged Italian immigration, viewed favourably because it was Latin, Catholic and white (the government of the time spoke openly of "whitening" the population). The first immigrants settled in the south of the country, where the government donated land to new settlers who would set up "Italian colonies". In Rio Grande do Sul, German immigrants had already settled the best farming land in the lowlands, so Italian immigrants settled the highlands, rugged and less fertile, of the *Serra Gaúcha*. Founded in 1886, Antônio Prado (a municipality neighbouring Ipê) was the sixth and last of the so-called old Italian immigrant colonies.[13]

When these immigrants left, Italy had just been subject to political unification (1870) and there was not yet a common national language. Italian immigrants who settled in the *Serra Gaúcha* and in the neighbouring state of Santa Catarina came mainly from the Veneto (or Venetia) region of northern Italy. The dialect spoken today in these communities is derived from the Venetian language, modified under the influence of Portuguese and other Italian dialects. *Vêneto* is not considered to be an Italian dialect, but rather a Brazilian variant of the Italian language. Its use declined in the forties, when it was forbidden by the nationalist government of Getúlio Vargas (1930-1945). Following the declaration of war against Italy, expressions of Italian culture were considered to be anti-patriotic (as were the

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[12] It is estimated that 7 million Italians emigrated between 1860 and 1920 (IBGE 2000).

[13] Later waves of immigrants were less fortunate: they were sent to work on the coffee plantations of the south-east, where they replaced slave labour after the abolition of slavery (1888).

dialects and customs of German descendants). In isolated rural zones, such as the *Serra Gaúcha*, the use of *Vêneto* was preserved, precisely on account of their isolation. Today, it is spoken by approximately 500,000 people in Southern Brazil.

As in the case of the *Vêneto* dialect, it is the relative isolation of the communities of Italian descent which assured the preservation of local seeds varieties. Indeed, it is in the poorest and most isolated regions—which are also those where the Green Revolution only made late and timid incursions—that we find today the greatest diversity of farmer-selected varieties.

The seed fair takes place at the heart of the small town, in the community hall bordering the village square, across from the Church. When I arrive, the parish priest is speaking to the audience from an improvised stage. In front of him, there are around twenty glass jars filled with local varieties of seeds. Above his head, a banner reads: "Sixth Farmer-Selected Seed Fair: Preserving the Sources of Life" (Appendix G). At the entrance, the participants are greeted with a word of welcome written with seeds and placed above an arrangement of squash and multi-coloured corncobs (Appendix H). All around the hall, there are around forty stands, where farmers exhibit their varieties of seeds (squash, corn, beans, etc.), local farm products (honey, apples, flour) and handicrafts, such as straw hats and seed necklaces (Appendix I). Small farmers and organic agriculture associations present documentation on topics such as alternative farming practices, the preservation of agro-biodiversity and genetic engineering in agriculture. The lunch prepared by the community pays tribute to local products and traditions. Traditional Italian dishes are served, such as polenta and raviolis stuffed with squash, accompanied by juices made from a variety of local fruits. Throughout the day, music and speeches alternate at the microphone.

The hall is full and the atmosphere is one of celebration. According to the organizers, approximately 800 people attended this sixth edition of the event, many coming from neighbouring municipalities.

Seed Fairs as Invention of Tradition

Recent years have seen the multiplication of seed fairs in Brazil like the one in Ipê. In Portuguese, these fairs are called *Festas das Sementes Crioulas*—Farmer-Selected Seeds Celebration. The expression *Sementes Crioulas* has become more and more popular in Brazil in recent years. It literally means "Creole seeds." For lack of a better translation, I use the equivalent English expression, *farmer-selected seeds*, although the political charge of the Portuguese expression is lost in the translation.

Of Spanish origin, the expression has long been used in the "frontier region"—Rio Grande do Sul's southern border—owing to the proximity of Spanish-speaking Uruguay. However, in the remainder of the State, and in Brazil as a whole, it is an expression of recent use, whose popularization is closely linked to the politicization of the debate over seeds. Indeed, under the lead of NGOs and small farmers' organizations, *semente crioula* has become a standard bearer for farmers' rights. The expression is charged with meaning. The origin of the term *criollo* is disputed, but appears to be derived from the Spanish verb *criar* (to breed, rear, from the Latin *creare*, to create) (Schnepel 2004). The word was created to refer to slaves born in the Americas rather than Africa, and to elites born in the Americas as opposed to *peninsulares* born in Spain. It was introduced into Portuguese as *crioulo*, where it came to designate Brazilians of African descent. In the expression *sementes crioulas*, it refers to that which is locally grounded and collectively owned.

With the development of commercial seed breeding, farmer-selected varieties were marginalized, so much so that they were no longer even considered seeds, under the seed legislation, but "grains." This was made possible by redefining a cultivar as being distinct, uniform and stable in its characteristics. Farmer-selected varieties, by contrast, are genetically unstable, which is precisely what makes them highly adapted to specific soils and cultivation systems. The marginalization of farmer-selected varieties, which is also the denial of farmers' historical contribution to plant breeding, is another, subtle, aspect of dispossession. Today, some plant geneticists in Brazil deny the very existence of farmer-selected varieties. When, at one of the CTNBio's meeting, a plant geneticist from EMBRAPA declared that there was no such thing as farmer-selected varieties, the representative of the Ministry of Agrarian Development (MDA) replied: "But were these hybrids spontaneous generation? How did you make these hybrids? From lines extracted from farmer-selected varieties".[14] I will return to hybrids in a moment; for now, let me simply note that the majority of commercial seed varieties are hybrids and that these were obtained from genetic material developed by farmers.

This changed with the passing of the 2003 Seed Act, which recognizes local, traditional or 'crioula' varieties (*cultivar local, tradicional ou crioula*) as a:

> Variety developed, adapted or produced by family farmers, land reform settlers or indigenous people, with well-determined phenotypic traits that are recognized as such by the respective communities and which, in the understanding of the [Ministry of Agriculture], and considering sociocultural and environmental descriptors, are not substantially similar to commercial cultivars (Brasil 2003a Art. 2, XVI).

[14] Interview with Rubens O. Nodari, Anchieta (SC), 04/21/07.

Wilkinson and Castelli offer the following alternative definition: "A *Crioula* (or native) variety is a variety (or animal race) bred, cultivated, maintained and sometimes improved by agricultural communities outside the influence of institutionalized breeding practices. It is often used as raw material for breeding programs in public or private institutions" (2000:12).

Two other expressions—traditional and local—are also used to designate farmer-selected varieties. According to Machado et al. (2008), a variety, in order to be considered *traditional*, must have been managed within the same ecosystem (that is, within a family or community) for at least three generations. A variety is considered *local* if it has been under farmers' management practices, within the same socioeconomic and agroecological environment, for at least five cultivation (and, possibly, selection) cycles.

In seed fairs, farmer-selected seeds are available in small quantities, and varieties are exchanged one for another (Appendix J). Seeds can also be given away rather than traded if, for example, the other farmer does not have seeds that are of interest. However, seeds are sold only exceptionally, and a stong emphasis is put on keeping seed fairs in the non-market sphere. Participants often insist that they are not there to sell or make money, but to offer varieties that others have lost and, conversely, find varieties that they are looking for. They describe the excitement experienced when finding varieties they had known years ago but which they thought had been lost.

Seed fairs are a vivid example of the invention of tradition. Indeed, until recently, seeds were not exchanged in fairs, but informally among neighbors and farming communities. There was, quite simply, no need for seed fairs. As a small

farmer from Ipê explains: "it was a custom, here in the region, for women to pay visits and bring some seeds along to exchange." Magda, a small farmer from Santa Catarina describes how these seed exchanges took place on the farm where she grew up:

> We did this a lot, exchanging peanuts, beans, rice, popping corn (*pipoca*), even lettuce seeds. For example, my mother had seeds of a kind of lettuce that another woman – my aunt, or my godmother – didn't have, so we would give it to her, and she would give us another variety that we didn't have, that was very common. It was also common among women to exchange tea and flower seeds.

Both men and women took part in the exchange of seeds, but while men were usually responsible for cash crops, women were in charge of subsistence crops. Beatriz describes the process through which her father selected corn seeds, as well as the division of labour between men and women:

> I remember my father, he selected and set aside corn for seeds in the shed. He never bought corn seeds. His entire life, he would put aside corn and say "this corn is for seeds." He removed the husks and cut off the tips. On rainy days, when we were kids, we would all go to the shed to husk corn for sowing…. The following year, he would go to his neighbour to choose some corn and the neighbour would do the same. Spontaneous trading. And it wasn't only corn, they also exchanged other seeds, my mother always traded *batatinha* and sweet potato tubers with her neighbours.

With the introduction of commercial varieties, starting in the 1970s, these practices were severely weakened. Magda, a small farmer and a leader of the Peasant Women's Movement (MMC[15])[16], explains how these changes came about with the introduction of hybrid varieties:

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[15] English translations of proper nouns are followed by their Portuguese acronyms.

[16] The Movement originated in the 1980s in the interior of Chapecó, far west of Santa Catarina, as the Women Farmers Movement. In 2004, it merged with other women's movements to form a unified national organization—the Peasant

> It was only later that the idea came up that you didn't need to trade seeds with neighbours anymore because you could buy them at the store. But the women began to realize that the seeds bought at the store could only be sowed once; even if you set aside a few seedlings for seeds, they didn't produce well. This is how women lost their varieties of carrots, radish, lettuce…. Then women started to complain "why is it that I can't anymore?" Well, it's because these are hybrids, whose seeds sprout but don't produce much. They are meant to be sowed only once, and so they don't produce as well after that.

Hybrids are obtained through a method of breeding called heterosis, which combines inbreeding (breeding from closely related members of a species) and outbreeding (i.e. from more distant members of a species). While hybrids have higher yield, their production declines after the first generation.[17] This creates an incentive for farmers to return to seed companies each year to buy seeds (in order to maintain the same levels of productivity), thus giving up the practice of saving seeds. Notably, her statement also hints at an incipient awareness of dispossession—"why is it that I can't anymore?"

When the Peasant Women's Movement (MMC) decided to launch an initiative in defence of farmer-selected varieties, in 2002, they did not know where to start. As one of the coordinator recalls: "But then we thought: 'But which seeds? Where do we get these seeds?' We didn't know if the women were buying seeds at the store or if they still had seeds." In order to find out, the MMC asked every woman who came to its 2002 state congress to bring along some seed varieties produced on the farm. Approximately 850 women participated, and they came up with more than 130 varieties (this includes different varieties of the same plant

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Women's Movement (MMC). While other rural movements have women's sections, the MMC is distinctive for being an autonomous women's movement.

[17] Curiously, the genetic basis of heterosis is unknown to this day.

species). As the coordinator quoted above concludes: “So then we knew that the seeds were in women’s hands. That was comforting.”

The Experience of the Peasant Women’s Movement (MMC)

Starting in the 2000s, the MMC developed a participatory methodology to promote the recuperation, production and breeding of farmer-selected horticultural varieties among women (MMC 2005; MMC n.d.). This takes the form of “seed workshops,” local groups of ten to fifteen women, with each woman responsible for maintaining certain varieties. The programme focuses on horticultural varieties because they represent the basis of family subsistence and are the ones about which women have most knowledge. The groups meet on a regular basis to share seeds and, more importantly, experiences about how to grow them. As one of the coordinator explains, the idea was “to seek women’s knowledge. It wasn’t written in any book. We searched and searched—‘My grandma used to do it this way’ or ‘my mother did this or that….’ So we retrieved the knowledge from the women themselves.” This was possible because the practices and knowledge sought had been lost not long ago; in fact, within a generation: “the loss is very recent, you know. This devastation, what we call the Green Revolution, started 40 or 50 years ago. So there’s knowledge from 60, 80 years ago, that we are retrieving now, very important knowledge that our grandparents had.”

Women are in fact reinventing traditional seed practices. In addition to the emphasis on continuity with the past, another characteristic of invented traditions is their strong symbolism. As one woman who leads the seed workshops says: “And this trading, it takes place in a very mystical and beautiful way, within the workshop

groups, this is where the exchange takes place." *Mística* is a practice of Catholic origin, central to Brazilian social movements. It consists in artistic and dramatic performances—singing, poetry, silence, offerings, body movements, etc.—aimed at reasserting certain identities and values as well as a sense of belonging to the movement.[18] While the themes and symbolism are recurrent, the *místicas* themselves are continually being reinvented. In the workshop I attended, the women held hands, chanting before solemnly exchanging seeds. The state assembly of the Movement featured several such *místicas*: one was an elaborate layout of flowers, seeds, objects of daily life and Movement insignia. Another one staged a fork between two paths: the one leading to "Sr. João Felix's private property" was littered with junk and industrialized foodstuffs, while the other, symbolizing peasant agriculture, was strewn with plants, seeds and flowers (Appendix K). At the Fourth National Farmer-Selected Seed Fair, in Anchieta (SC), youth from the various rural social movements formed a guard of honour with their scythes, small farmers' tools and favourite symbols (Appendix L).

The MMC's seed program currently reaches close to 1,000 women in 59 municipalities of the State of Santa Catarina, who produce farmer-selected varieties from 27 different horticultural species. Farmer-selected seeds have become one of the MMC's emblematic demands: "one of the movement's role is to fight for food sovereignty, based on the preservation of farmer-selected seeds, the common heritage of humanity" (Munarini and Mendes 2007:265). It follows from the MMC's critique of the productivist model in agriculture: "with the introduction of the use of

[18] Each movement has its own banner, anthem and insignia: small farmers, for example, use the straw hat, landless peasants a red cap, and peasant women a mauve scarf.

agrochemicals, chemical fertilizers and hybrid or transgenic varieties, a culture has developed that leads to the abandonment of the production of farmer-selected seeds" (Munarini and Mendes 2007:262).

The National Farmer-Selected Seed Fair – Anchieta (SC)

During the same period, similar experiences were taking place in the municipality of Anchieta—in the far west of the State of Santa Catarina, close to the border with Argentina—which were to give rise to one of the largest farmer-selected seed fairs in Brazil today.

Until the beginning of the 20th century, the western region of Santa Catarina was inhabited by an Indigenous people, the Kaingang. Being nomads, they lived off hunting and fruit-picking, but also cultivated corn, beans, sweet potatoes, cassava and squash. They had already suffered a long process of exclusion and decimation, when, in the first decades of the 20th century, descendants of European immigrants moved massively into the region in search of lands to settle. In consequence of the colonization process and mountainous landscape, the region continues to be characterized today by small rural properties (Canci and Canci 2007:219).[19]

Anchieta is a small and predominantly rural municipality; 60 percent of its 6,000 inhabitants are small farmers. In 1996, the local Family Farming Workers Union (SINTRAF) began to work with 150 families from various communities of the municipality on the ecological production of seeds. With the technical support of the union, families started to produce their own seeds. At the same time, the union initiated work aimed at the recuperation of farmer-selected varieties, with an

[19] Nearly 70 percent of the 75,000 rural properties have less than 20 hectares, and 94 percent have less than 50 hectares (Canci and Canci 2007:219).

emphasis on corn, later expanded to cereals, vegetables and medicinal plants (Garcia 2004).

These experiences were successful and, in 2000, a First State-Wide Farmer-Selected Corn Fair (*Festa Estadual do Milho Crioulo*) was organized by small farmers and agricultural technicians. The event was sponsored by the local union, the Small Farmers Support Centre (CAPA—an organization linked to the Lutheran Church that provides support to small farmers) and the Catholic parish. It brought together 17 exhibitors and attracted 5,000 participants (Canci et al. 2007). One of the organizers explains the name of the event: "we called it the national farmer-selected corn fair because, at that time, corn was, let's say, the only symbol we had, and it was and still is, the symbol of the natural patent." Hybrids are often referred to as "natural patents" because their declining productivity after the first generation provides an incentive for farmers to return to the seed company to buy seeds every year. Corn was the first hybrid crop to be produced on a large scale.

Bolstered by the event's success, another and larger fair was organized two years later (2002). The First National Farmer-Selected Corn Fair (*Festa Nacional do Milho Crioulo*) took on an international dimension with the participation of the transnational peasant movement Via Campesina. It attracted 64 exhibitors and 15,000 participants from twenty different states as well as other Latin American countries; 228 farmer-selected corn varieties, 33 of which were produced in Anchieta, were displayed, as well as 943 varieties of other species (Canci et al. 2007). Two more editions of the event took place in 2004 and 2007. Participation has gone up steadily, and Anchieta's seed fair is now well established as one of the most important such events nationally. It can count on the active participation of rural

social movements, such as the Small Farmers Movement (MPA) and the Peasant Women's Movement (MMC). In the latest edition, in which I participated (April 2007), farmers had come from as far as the State of Bahia, in the Northeast (some three thousand kilometres away) to take part in the weekend-long seed fair.

Small Farmers and Peasants in Southern Brazil

Who are these small farmers? According to the National Policy on Family Farming, a family farmer is one who runs his farm with his family, uses predominantly family labour rather than hired labour, and derives his income mainly from the farm (Brasil 2006a). In order to avoid the inclusion of unproductive large estates (*latifúndios*) in this category, the legislation also establishes a limit to the size of the property. With few exceptions, the family farmer is also a small farmer.

Beyond the legal definition, there is a strong small farmer identity, as witnessed by contemporary rural social movements. Alongside the internationally renowned Landless Rural Workers Movement (*Movimento dos Trabalhadores Rurais Sem Terra*, or MST)[20], two other nationwide rural social movements represent small farmers' interests: the Small Farmers Movement (*Movimento dos Pequenos Agricultores*, or MPA), and the Peasant Women's Movement (*Movimento das Mulheres Camponesas*, or MMC). All three movements are members of Via Campesina and are actively involved in the National Campaign for a GM-Free Brazil.

[20] The MST is only one of about forty landless social movements. It is, however, by far the largest and the one with the highest organizational capacity, hence its prominence.

As scholars of contemporary rural social movements point out, we are witnessing a process of repeasantification, one dimension of which is the reclaiming of the term "peasant" (Desmarais 2007; Edelman 1999, 2002, 2003). Historically connoting conservatism and parochialism, the term is now being reclaimed and endowed with new meanings, such as that of local expert on food, culture and the environment; guardian of genetic resources; participant in public policy debate; proponent of alternatives to industrial agriculture; and activist in transnational networks (Edelman 2003; Heller and Escobar 2003). The term peasant—in Portuguese, *camponês/camponesa*—is also being reclaimed in Brazil. Notably, when the MST was founded in 1984, it chose the designation "landless *rural workers*" rather than peasant. Today, the term "peasant" is increasingly used, a reflection of the Brazilian rural social movements' close interaction with Via Campesina. The term encompasses a remarkable diversity, the common denominator being that the reference is to small scale food producers. A leader of the Peasant Women's Movement (MMC) explained to me how they decided on the term peasant when the movement was founded in 2003:

> The name "peasant" can be translated as follows: the women and men who in one way or another produce food. So the one who owns land, the one who doesn't, small fisherwomen… they also produce food, though differently. They are not exactly farmers, or rural workers, because they may live in a neighbourhood, but their work is to produce food from traditional fishing. There are also the women who live in riverbank communities (*ribeirinhas*) and the coconut breakers (*quebradeiras de coco*)…. So these are all very different, but they had to be included in this word.

The small farmers interviewed in the course of this project are quite diverse. The majority own small properties passed down from one generation to the next, but others are landless peasants who either managed to save enough to buy a small plot

of land or were resettled through the MST. Land size ranges from four hectares to sixty hectares. Except for the land reform settlement, where production is collective, the land is worked individually by families. These small farmers' families are of Portuguese, Italian, German, Polish and *caboclo* descent (in Brazil, the term *caboclo* designates people of mixed European and Indigenous descent). They are of Catholic or Lutheran faith, and religion is very present in their daily life.[21]

As to production, the small farmers' families interviewed rely on family labour and low level of mechanization. Production is organic or agroecological, and extremely diversified, integrating vegetables, fruits, cereals and livestock. Families meet most of their own needs (butter, cheese and bread are homemade, and they produce their own milk, eggs, meat, cereals, fruits and vegetables). Remarkably little is bought outside the property, mostly things that are not produced in the region such as salt, coffee and sugar. Surpluses are sold on local markets, often through organic producers or marketing cooperatives. All small farmers interviewed produce some or all of their seeds, especially beans and corn, but also soy, rye, wheat, rice, onion, lettuce, tomato, cucumber, peas, lentils and melon. Some maintain up to 50 varieties, including as many as 30 different varieties of beans.

Formal education is limited—usually no more than eight years of schooling. However, the farmers often have considerable political experience gained in their participation in rural unions, local politics, with the Pastoral Land Commission, NGOs or rural social movements. Through these activities, they often have acquired a sophisticated political understanding of the transnational processes affecting agriculture. While they may not grasp the intricacies of intellectual property

[21] For example, among Italian descendants, a portable altar of the patron saint circulates in the community, each family keeping the altar for one week at a time.

agreements or biotechnology, they have a broad understanding of these issues. Some community leaders have travelled extensively in Brazil with peasant organizations, and some have even travelled abroad through NGOs; but even those who have not had a chance to travel are aware of what is happening elsewhere. For example, upon learning that I am Canadian, many small farmers would ask me about Percy Schmeiser, the Saskatchewan farmer who went to court against Monsanto, and whose story went round the world, disseminated by transnational peasant networks.[22] Today's peasants are both solidly rooted in local communities and global in their awareness of, and engagement with, transnational processes. This stands out in small farmers' narratives regarding the meanings and implications of hybrids, and more recently of genetically engineered varieties on their lives as farmers.

Tales of Dispossession: Small Farmers' Views on the Genetic Engineering of Seeds

Luiz cultivates rice on five hectares of land in the metropolitan region of Porto Alegre. Fifteen of the twenty-five varieties he grows are sold at the city's weekly organic farmers market; the remaining varieties are maintained for agricultural biodiversity's sake.

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[22] Canadian farmer Percy Schmeiser became famous after refusing to settle out of court when Monsanto accused him of patent infringement. Schmeiser argued that he had never sowed RR canola and that his fields had been contaminated accidentally. The case went all the way to the Supreme Court, which ruled in 2004 that, no matter how RR canola had landed into Schmeiser's fields, Monsanto had a valid patent and therefore owned the genes on Schmeiser's property. However, Schmeiser did not have to pay anything to Monsanto as he did not profit from the presence of RR canola in his fields (he did not spray Roundup herbicide). The judgment was criticized as relieving companies of any responsibility or liability for genetic contamination.

One of six siblings, he was the only one to remain on the land. He explains how he was attracted to the Green Revolution model in the mid-60s: "hearing this, I thought that what my father did was old-fashioned and, as a modern farmer, quote unquote, I embarked head first into this market, into this world of productivism, with hybrid seeds, agrochemicals and mechanization." After seventeen years, he started to question his situation: "I realized that I was becoming poorer, and that I was quickly losing my health… and I said 'no, this is no good for me, this model doesn't do me any good.' If I'm dying slowly, at age 45, I'm dying as a human being, I'm getting poorer and wherever I go I leave destruction, this does not make any sense. And so I was able to say 'no, that's enough, enough, I won't give up farming—that never came across my mind—but I'll do it differently.' And I started to do differently. I went from farming with all industrial inputs to farming with nothing, nothing—not even experience." Not even experience, because, as he explains, "I had thrown away the way my father had practiced farming."

The first years were trying. Production fell sharply, but Luiz started to learn from others and from his own experiments: "in organic agriculture, we exchange a lot with one another…. These exchanges made it possible for me to bring together resources and practices that I could use in my own farming activity. And also to retrieve fragments of my father's farming practice, including from my own memory." This, in turn, profoundly transformed his practice, as he came to perceive himself as "engaged in a process, as the subject of the process. This is completely different from chemical agriculture, where you only carry out [technological]

packages[23], and the practices that you're being taught one year are already outdated the next… and thus we are only passing on technologies that we don't know. [Chemical agriculture] destroys the environment, it destroys the culture of farmers, who I no longer call farmers but producers." Organic agriculture, in contrast, is dignifying: "I, involved in a process…. The smallest gesture becomes constructive. This, for me, was what was most stimulating."

His involvement with farmer-selected seeds was a logical outcome of his transition to organic agriculture: "just like, as a farmer, I have a commitment to take care of the earth, I also have a commitment to take care of seeds." And he adds: "seeds have always been a source of enchantment for peasants." He points out how the names of farmer-selected varieties, for example, reflect farmers' affective relationships, whereas commercial seeds are identified by impersonal lab numbers. As Luiz makes clear, deeper issues of autonomy, agency, culture and identity are involved.

Luiz's trajectory is representative of that of many small farmers who first embraced the Green Revolution but, after a number of years, started to reconsider their choice and moved toward agroecology. This is the case of the majority of the small farmers I interviewed. Some—but they are the exception—rejected technological packages at the time they were introduced. Others still were "bypassed" by the Green Revolution because they were too isolated and too poor to fall within the reach of rural extension programs. Long stigmatized as backward, they are respected today because they have maintained varieties and knowledge that

[23] "Technological package" refers to the set of inputs—hybrid seeds, chemical fertilizers and pesticides—used in industrial agriculture.

have been widely lost. Most often, what triggers the shift away from industrial farming are the effects on health and the environmental consequences of the use of agrochemicals, and the household's growing indebtedness to the banks. Farmers are in the best position to know the ailments caused by exposure to chemicals, from skin irritation to respiratory and digestive problems. Less talked of are cases of suicide among farmers owing to the neurodepressive action of agrochemicals such as organophosphates.[24] As a rule, even small farmers who grow conventional crops have a small organic garden, tended by women, for their own family's needs.

When asked about transgenic crops, small farmers/seed savers are more inclined to talk about financial markets and corporate concentration than about religion or morality: "When, so to speak, it is the financial market that influences, that dictates what the earth must produce or stop producing, something's wrong. And that's what's happening in this world of genetic modification." Contrary to prevailing ideas, references to the new technology as a transgression of the natural order—saying, for example, that one shouldn't "play God" or "fiddle with life"—are few and far between, and often merely rhetorical. One small farmer of Italian descent, for example, says: "if God, and our ancestors, lived like that, why do we need transgenic seeds?" but then goes on to explain his concerns with genetic contamination and the loss of farmer-selected varieties.

Interestingly, small farmers do not view genetically engineered seeds as something fundamentally new or different, but rather as "more of the same"; that is, as the logical extension of the Green Revolution and its hybrid varieties. They are quick to associate the disappearance of farmer-selected seeds with technological

[24] There is little research on this topic, but a number of farmers I talked with raised the issue.

developments. As one farmer notes, "all technology that is introduced entails a loss," and adds "the evolution of technology has made our seeds worthless, so a lot has been lost." With the advent of commercial varieties, farmer-selected varieties were deemed inferior, and many were abandoned. An agricultural technician related that, when asked what varieties they have, small farmers often say that they do not have anything of interest. However, upon insisting, he finds out that they maintain quite a few varieties, including sometimes varieties thought to have been lost in the region. The strengthening of such "on-farm seed banks" (*Bancos de sementes caseiros*) is an important strategy for the preservation of farmer-selected seeds (Appendix M). It reflects the belief that *in situ*, or on-farm, conservation (as opposed to *ex situ* – off-farm) is the most efficient way to preserve agricultural genetic resources, since it is a dynamic process in which varieties are continuously adapting to changing environmental conditions, and in which knowledge about their production is also preserved.

Small farmers fear that the loss of farmer-selected varieties may be accelerated with the introduction of genetically engineered varieties. Concentration in the seed sector following the advent of genetically engineered varieties has led to a marked reduction in the number of varieties in circulation. The case of soybeans is telling: just a few years after Roundup Ready (RR) soybeans were introduced, conventional varieties of soybeans became hard to come by. According to the President of the Soy Producers Association of Rio Grande do Sul (APROSOJA-RS): "here's the truth: the [soybean] varieties that we had in Brazil were practically extinct. So on the question of Monsanto royalties… there's no going back" (Agência Radiofônica Pulsar/AS-PTA 2009). The loss of farmer-selected varieties is

compounded by risk of genetic contamination from transgenic varieties, especially in the case of corn, an open-pollinated crop. This is one of the main reasons put forward by small farmers for opposing transgenic seeds.

The cost of seeds is another reason put forward by small farmers for producing their own seeds. The cost of buying seeds varies a lot depending on the size of the farm, type of production, etc. It is relatively more important for small farmers, for whom it represents between 10 to 30 percent of production costs (Cordeiro et al. 2007). According to them, some farmer-selected corn varieties are as productive as hybrids. On average, commercial seeds are more productive but, on the other hand, local varieties are better adapted and more resistant, and consequently more reliable. As they say, local varieties of corn "wait for the rain" (*o crioulo espera a chuva)*, meaning that it withstands better periods of drought, a recurrent problem in the Southern region in recent years. All in all, small farmers who experimented with commercial seeds say that the cost of seeds and agricultural inputs means that, even with increased productivity, the farmer loses out.

The issue of royalties, in particular, provokes indignation. When asked about royalties, Piotr says:

> This is absurd…. The seed belongs to nature, God made it so it could be planted. So to take possession, through speculative capital, to try to profit from this, I think that's nonsense…. Capitalism wants a monopoly over seeds because then the package is complete, they program the plant to grow in so many days and to flower in so many days, how much and which fertilizer to use…. To pay royalties to companies is nonsense.

The concerns voiced—regarding the cost of seeds, dependence on seed companies, the shrinking number of varieties available on the market or the disappearance of farmer-selected varieties—touch in one way or another on the issue

of autonomy. As one farmer puts it: "many people think [GMOs] are their salvation, but before they know it, they'll be caught up in the system." By contrast, when you produce your own seeds, "you know what you're producing, where the seeds come from…. It is not someone else who plans your work and your life." According to Almeida (1999), the search for autonomy was already at the centre of small farmers strategies' in the mid-1970s. As he writes: "farmers who seek to experience these more autonomous systems are in fact in search of something that involves more solidarity and to which they can identify, in other words, a system that fulfils their personal attempts to recover the 'coherence' of the peasant model" (Almeida 1999:151). The movement to retake control of seed production is clearly part of this search for autonomy, just as seed fairs represent the search for new forms of solidarity.

What is at stake here is not only their autonomy as producers, but their very existence as small farmers or peasants. Let me quote at length Ivo, a seed fair organizer[25] who discusses what is at stake in a particularly vivid way:

> If this corn disappears, the way it is cultivated disappears along with it. And then another corn comes in, or it is replaced by another culture, and you start doing something completely different; in other words, you get lost culturally, you give up everything, and so you're not yourself anymore… one more in the masses who doesn't have any history, who has lost his history and his identity…. It's much more profound than producing autonomously, it's about being yourself. Basically, it's about the loss of identity, for me this is the worst damage that GMOs can bring about, identity loss. When you lose your identity, you lose track, you lose your values, you lose everything else at the same time. In other words, you're not anyone anymore, you are not sovereign anymore, you have no more political autonomy, you don't have anything anymore. For me, this is all like a spider's web, very intertwined, very dependent. If the possibility *to*

[25] The son of small farmers, the author of this quote studied agronomy and was involved early on in initiatives for the preservation of farmer-selected varieties.

> *reproduce seeds* disappears, culture disappears and, as a consequence, everything else disappears at the same time. [emphasis added]

Ivo pinpoints what is fundamentally at stake—autonomy, culture and identity—and how these all revolve around the possibility to reproduce seeds. As he points out, the genetic engineering of seeds entails a subtle form of dispossession. Farmer-selected varieties—and the knowledge about their (re)production, their characteristics and their uses—are culturally embedded in a way transgenic seeds are not. Small farmers often stress how corn flour made from farmer-selected varieties is more flavourful than that made from hybrid varieties, and how traditional recipes require specific local varieties of corn. Moreover, knowledge about farmer-selected seeds is passed down from one generation to the next. As one farmer and seed saver puts it, "there's history in what you do." With genetic engineering, there is a fundamental shift, with knowledge about seeds moving out of farmers communities into distant laboratories. Whenever a farmer stops producing his own seeds, he or she gives up his knowledge about that seed (its production and reproduction) and is confined to following the instructions received from the seed company. As participants in seed fairs emphasize, what is being exchanged in seed fairs are not only the seeds themselves, but first and foremost, knowledge: "so this is what we mean by preserving [seeds]. Because it is not enough to exchange seeds, we have to exchange knowledge, that is how to care for a given seed or plant."

All of the small farmers interviewed had heard of Terminator technology and knew what it was (a technology to makes seeds sterile at harvest); they were not clear, however, as to whether it had already been authorized and introduced. Not surprisingly given their deep concern for autonomy, they are unanimous in

condemning seed sterilization technology. As Maria says: "this is craziness…. Because nature does not want to die. And this is what they want to do, make a seed that does not produce anymore, this means taking the right to life. But we're on the look-out. It won't be easy for them to introduce this. And we lament that some farmers play into their hands."[26]

As she suggests, farmers perceive themselves as resisting. Several of the small farmers I interviewed used the term to refer to themselves and to what they are doing: "as for transgenics, we're resisting, but we're not able to reverse the situation." As one small farmer and seed fair organizer puts it: "the seed fairs, in fact, are meant to show that there are farmers that are resisting, that continue to resist and that fight for this cause." Asked about his political involvement, he expresses disillusionment with mainstream politics:

> My contribution is more and more to preserve seeds. Doing it for the love of it, working at the grassroots. Because, sometimes, we know what it is to go there and make demands; we're one in a million, and even if we struggle, sometimes it's really hard because the big bosses out there, the deputies and politicians, they usually side with big business. So I think that our struggle is really working at the grassroots.

As he makes clear, this grassroots work consists in preserving seeds, "so that we don't ever let this die."

Small farmers' narratives about seeds and genetic engineering are replete with moral economic considerations. While the price of seeds is a source of concern, it is far from the only one. Non-economic concerns about autonomy, knowledge and culture loom large. Uppermost among the issues raised are the loss of farmer-selected varieties and of the knowledge that comes with them, increased dependence

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[26] On Brazilian farmers' views on Terminator, see Cordeiro et al. (2007).

on corporations, the loss of biodiversity and the cultural importance of specific cultivars.

Edelman (2005) recently argued for the continued relevance of the moral economy to 21st century transnational peasant movements. Against the rational utilitarianism of orthodox economics, the notion of moral economy has come to emphasize how "many 'economic' relations are regulated according to non-monetary norms" (Thompson 1993:340).[27] Contemporary small farmers who denounce the excess of speculative capital and profiteering by biotech companies echo E.P. Thompson's description of food rioters railing against grain hoarding and windfall profits in times of dearth. Of course, much has changed and, today, the targets of peasant protests are not only local elites and the state but transnational institutions and corporations. References to royalties, speculative capitalism or property rights reveal new sensibilities and new degrees of political sophistication, but the same underlying sense of social entitlements and social justice motivate these protests (Edelman 2005).

James C. Scott's (1976) subsequent elaboration on the concept of moral economy to refer to peasant conceptions of social justice, of rights and obligations, of reciprocity also resonates with the contemporary seed issue. Scott's conception is centred on access to land, customs of land use, and of entitlement to its produce. At stake in the seed wars are access to seeds as the most fundamental input in farming and the means of food production; the preservation of seed saving and seed exchange

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[27] Thompson popularized the term in his study of 18th century food riots in the English countryside, to refer to "confrontations in the market-place over access (or entitlement) to 'necessities'—essential food," more specifically, the "beliefs, usages and forms associated with the marketing of food in time of dearth" (1993:337-338).

customs; and entitlement to the products of the harvest, as far as the tendency is to extend intellectual property rights over plant varieties to the harvest itself (see chapter 3). Reciprocity is also an important dimension of the moral seed economy. In the sphere of informal seed production and exchange, seeds have no commercial value. However, the act of giving a seed to one's neighbour creates an expectation—and an obligation—for the latter to reciprocate. In this way, the circulation of seeds creates dense networks of obligations and reciprocity that contribute in important ways to the social tissue of farming communities.

Current struggles over seeds reinforce the argument that the moral economy is not backward-looking but continuously regenerates itself (Thompson 1993:341). Indeed, farmer-selected seed fairs represent the reinvention of seed-saving and seed exchange practices. While the practices they promote are age-old, the fair itself is a recent invention: until recently, seeds were not exchanged in fairs, but informally among neighbours and farming communities. There was, quite simply, no need for seed fairs. With the commodification of seeds, informal seed networks are rapidly disappearing and this is exacting a toll on the social tissue of farming communities. In this context, seed fairs are as much an attempt to preserve farmer-selected seeds as they are an attempt to revive the social networks characteristic of the informal seed economy.

Seed fairs arose as a way to promote the free exchange of seeds. The farmers who engage in seed fairs are aware that, by doing so, they are challenging the growing restrictions on the free circulation of seeds and the marginalization of farmer-selected varieties. Seed fairs are thus a new way of reviving a traditional practice—the circulation of seeds within farming communities. But they are also,

significantly, a challenge to the current drive to commodify seeds. In other words, the privatization of seeds prompted the emergence of seed fairs as a reassertion of farmers' rights over seeds. As Beatriz puts it succinctly: "we believe that in order to preserve [seeds], we need to cultivate, and in order to cultivate, we need to have the seeds in our own hands." Maria, expresses her concerns in relation to the private appropriation of plant material: "we are possessive about our seeds, out of fear that someone takes control of these seeds. This is why we say that seeds should be the common heritage of humanity. This is why I'll never feel good selling my seeds. I want to offer them as a gift."

Concluding Remarks

Small farmers are notoriously absent from the heated debate over agricultural biotechnology. Listening to them, it becomes clear that those opposing transgenic seeds are not Luddites, and that their resistance involves much more than mere distrust of a new or unknown technology. Small farmers' response to transgenic seeds is rooted in their mixed experiences of the Green Revolution and shows an acute awareness of the power relations intrinsic to any technological revolution. The next chapter offers critical perspectives on the genetic engineering of seeds, exploring in more depth some of the issues raised in small farmers' narratives.

CHAPTER 2

TRANSGENIC SEEDS: CRITICAL PERSPECTIVES

Seeds are a paradox at the heart of agriculture….
The life they hold is the stuff of myth and metaphor.
Daniel Charles, Lords of the Harvest

The Genetic Engineering of Seeds

It took nearly a decade after the discovery by Cohen and Boyer (1973) of recombinant DNA technology—a technique to isolate and amplify genes, or DNA segments, and insert them into another cell—for scientists to successfully apply the new technique to plants. In the early 1980s, four groups working independently—at Washington University and Monsanto Company, both in St. Louis, Missouri; the University of Wisconsin; and the University of Ghent, Belgium—announced that they had genetically engineered a plant. The first three inserted bacterial genes into tobacco and petunia plants to make them resistant to the antibiotic kanamycin, while the fourth team inserted a bean gene into a sunflower plant.

Scientists were able to induce genetic modifications in plants by using as a vector a bacteria (*Agrobacterium*) that has the natural ability to infect plant cells. The other most commonly used method for inducing gene transfer in plants was developed in 1987 with the invention of the gene gun. Biolistics (or ballistic bombardment), as it is known, consists in propelling microscopic pellets coated with DNA into the target cell using gunpowder. Genetic engineering, together with other innovations in tissue culture, irradiation and genomics, propelled what became called

"modern" biotechnology as distinct from more conventional biotechnology techniques such as fermentation and selective breeding.[28]

Genetic engineering is the most contentious of these innovations, for it alters the genetic code of an organism, thus overcoming existing biological reproductive barriers. It is important to keep in mind that genetic engineering is only one dimension of crop biotechnology; there are non-transgene approaches to incorporating molecular-biological knowledge into crop improvement (for example, marker-assisted selection[29]). However, genetic engineering—the use of recombinant DNA methods to genetically modify a living organism—is by far the most prominent. In fact, crop biotechnology has been almost exclusively about the genetic engineering of plant varieties.[30]

Crop biotechnology has been characterized from the beginning by a narrow focus on molecular genetics. In *Molecular Politics* (1995), Susan Wright documents how participation in the process of developing biotechnology was primarily restricted to molecular biologists. And yet, there is a world of difference between the confined environment of the lab and agriculture's complex and dynamic ecosystems. Among the disciplines that can make a significant contribution to our understanding of genetic engineering in agriculture are entomology, agronomy, ecology,

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[28] The UN Convention on Biological Diversity defines biotechnology as "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use" (United Nations 1992b).

[29] Marker-assisted selection combines conventional plant breeding with genetic and molecular biology; it uses DNA analysis and trait-linked molecular markers to select traits of interests.

[30] Other applications of genetic engineering that are not addressed here include transgenic experimental animals such as mice, several fish species, micro-organisms altered for genetic research, and plants altered for the production of pharmaceuticals.

physiology, biochemistry, nutrition, plant breeding, virology, pathology and evolutionary genetics, to name but a few (Clark 2000).

In recent years, post-genomics and epigenetics[31] have called into question the central dogma of molecular biology—the idea that DNA is transcribed into RNA, which is translated into protein—and drawn attention to the complex expression and regulation of genes, proteins, and their interactions with cells and organisms (Franklin and Lock 2003:13; Lock 2005). Agbiotech, however, is a prime example of "discontinuities and ruptures among knowledge domains" (Lock 2005:S48): although genetic determinism is on the wane among researchers, agbiotech continues to be characterized by a lingering reductionism that ignores the complexity of interactions among genes, the organism and the environment. I would further argue that the fact that agbiotech is developed on tenuous grounds makes it difficult to acknowledge such a paradigm shift. Agbiotech is built on the idea that you can alter the genetic makeup of a plant "one gene at a time" without altering the organism as a whole (as implicit in the idea that non-transgenic and transgenic organisms are "substantially equivalent"). Postgenomic's insight that this may not be the case throws the whole agbiotech enterprise into question.

One striking example of agbiotech's genetic reductionism is the often-made claim that "plant biotechnology is an extension of… traditional plant breeding with one very important difference—plant biotechnology allows for the transfer of a greater variety of genetic information in a more precise, controlled manner" (www.monsanto.co.uk/primer/basics.html; Accessed January 28, 2009). The claims,

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[31] *Genomics* is concerned with the sequencing of the genome, ascribing functions to genes and understanding their structure. *Postgenomics* goes a step further, studying, for example, how genes are transcribed into messenger RNA and how they are expressed as proteins.

on the one hand, that genetically engineered organisms are fundamentally new—and thus worthy of patent protection—and, on the other, that genetic engineering is simply the extension of traditional breeding techniques (and thus does not require specific testing and regulations) are contradictory. More to the point, while both conventional breeding and genetic engineering involve the transfer of genetic information, this statement conceals a fundamental difference between them, namely that genetic engineering makes it possible to transfer genes across species (and even kingdoms).

Moreover, genetic engineering is anything but more precise and controlled. With current genetic transfer techniques, the transgene is inserted randomly into the host genome. It is possible to map the insertion site, but the process is tedious and therefore rarely performed. Yet, while we understand very little of the mechanisms of gene expression and regulation, what we do know is that a gene's location influences its expression and that of other genes. Therefore, the insertion of a foreign gene influences not only the target trait but also the expression of other genes within the genome. In spite of this, the protocols used to assess transgenic varieties focus narrowly on intended outcomes (that is whether the target gene is expressed), ignoring the possibility of unintended outcomes such as changes in the expression of other genes within the host genome (Clark 2000).

The claim that genetic engineering is no different from conventional breeding also obscures the fact that it is not the actual gene that is being transferred but a *gene construct* that typically contains, in addition to the transgene, a viral vector, a promoter gene and an antibiotic gene marker. As we have seen, the virus is used as a vector to penetrate the cell. The role of the promoter gene is to trigger the activation

of the transgene in the host genome. Finally, the antibiotic gene marker is used to identify the cells that have taken up the target gene: cells are exposed to the antibiotic, and those who survive are those that have incorporated the antibiotic resistance marker along with the target gene. The use of an antibiotic gene marker is made necessary because of the inefficiency of current gene transfer techniques: only a few cells out of a thousand take up the gene construct. Using an antibiotic gene marker is the easiest way to sort out the modified cells. However, there are concerns that it may contribute to the spread of antibiotic resistance.[32]

Researchers have also raised concerns that genetic modification may induce gene silencing in plants (Latham and Steinbrecher 2004). Gene silencing is a defence mechanism by which a plant switches off genes and their promoters that are recognized as intruders or as duplicates of its own DNA. Genes that have been deactivated remain functional and can become active again generations later. As Kumpatia et al. (1998:97) note, "the widespread occurrence of transgene inactivation in plants… suggests that all genomes contain defense systems that are capable of monitoring and manipulating intrusive DNA." We are just beginning to have a glimpse of the complexity of environment-genome interactions in plants. A recent study published in Molecular Biology and Evolution, for example, suggests that the use of nitrogen-rich fertilizers is moulding the chemical composition of plants' genomes and proteome (Acquisti et al. 2009).

These scientific developments are not reflected in policy-making. In Brazil, the National Technical Commission on Biosafety (CTNBio) announced in May 2009

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[32] Antibiotic resistance could be spread, for example if a bacterium absorbs marker genes from transgenic plants. This is possible, although rare, under natural conditions.

that it was considering automatic approval of varieties obtained by conventionally breeding already-approved transgenic varieties (Zanatta 2009).[33] For example, Syngenta's insect resistant corn (event Bt11) and herbicide tolerant corn (event GA21) have both been authorized individually by the CTNBio; therefore, a variety of corn combining the two traits would automatically be authorized. The reasoning is that the transgenic variety obtained in this way will show the same characteristics as the original transgenic varieties. However, there is no guarantee that the transgenes will be located in the same position on the chromosome of the new plant, that they will not be altered in the process, and thus that they will express themselves in the same way (Valor Econômico 2009; Zanatta 2009). Faced with criticisms, the CTNBio back-pedalled (AS-PTA Bulletin 446[34]).

Genetic reductionism and the way in which transgenic crops were rushed to markets means that, after more than a decade of commercial transgenic crops, a series of issues are left unresolved. In other words, the health and environmental safety of transgenic crops was built on a series of assumptions that remain controversial because they were never adequately tested in the first place. One example is the effectiveness of the high dose refuge strategy in delaying the development of resistance in Bt crops.[35] The idea is to limit the development of

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[33] As of May 2009, four applications filed with the CTNBio concerned combined traits or events: a variety of cotton resistant to insects and to Monsanto's Roundup; (MON 531+MON1445); and three varieties of corn by Monsanto (MON810+NK603); Syngenta (Bt11+GA21); and Dow AgroSciences and DuPont (TC1507+NK603).

[34] Weekly electronic bulletin produced by the Campaign for a GM-Free Brazil, available at www.aspta.org.br/por-um-brasil-livre-de-transgenicos/boletim.

[35] Bacillus thuringiensis (Bt) is a common soil bacterium that produces proteins that are toxic to certain insects. The insertion of the Bt gene into the genome of crops results in the plant producing Bt in its own cells continually, thus conferring resistance to certain insects.

resistance to Bt insecticide by providing a non-Bt refuge so that part of the insect population does not develop resistance to Bt. However, implementing this strategy is impractical in most of the world, and its effectiveness is highly debated. Another controversial assumption is whether transgenic DNA does in fact degrade rapidly and completely in the human gut. The concern is that genetic material from the antibiotic-resistant marker gene could find its way into the human stomach and compromise the efficacy of widely-used antibiotics. There are also the risks of gene flows between transgenic plants and their wild relatives, and the risks of horizontal gene transfer (the transfer of transgenic DNA to other organisms such as bacteria, viruses, or plant or animal cells, as opposed to vertical, or sexual, transfer). Critics point out the unduly narrow scope of experiments whose design stacks the odds against obtaining positive results. As Clark (2000) puts it succinctly, the only question being asked was “how do we make it work?” instead of "what happens when it does?” and “why are we doing this in the first place?” In any event, one thing is certain: plant genetic engineering clearly defies any simplistic assumptions about genes’ expression and functions.

Genetic reductionism has direct implications for policy-making. Reductionist claims about the nature of the genetic engineering process, for example, underlie and legitimize the concept of *substantial equivalence*. The latter has been used by the United States to push for the rapid approval of GMOs. According to this principle, biotech food or crops that share health and nutritional characteristics which are similar to those of their conventional counterpart can be marketed without additional evaluation. This amounts to saying that “insertion of a transgene would influence only one trait—the target trait—leaving the transgenic crop ‘substantially equivalent’

to conventional crops" (Clark 2000). In light of the above discussion, it is clear that the concept of substantial equivalence does not hold water since it disregards the formidable complexity of genes' expression and of their interactions among themselves and with the environment. It is ironical that many countries worldwide which do not have the institutional or technical capacity to test GMOs rely on the U.S. regulatory system when, in fact, the U.S. Food and Drug Administration (FDA) has been authorizing GE varieties on the basis of companies' data, without conducting independent, rigorous testing.[36] The European Union, in contrast, has generally defended the *precautionary principle* according to which, if an activity or technology involves potential serious and irreversible threats to human health and the environment, the absence of scientific certainty should not be used to oppose the adoption of precautionary measures.[37]

This disagreement was the origin of a trade dispute between the United States and the European Union before the World Trade Organization (WTO).[38] In these trade battles, genetic reductionism is enlisted to back up arguments about the tradable nature of gene/biotechnology. As McAfee (2003:209) argues, the idea that genes are discrete, interchangeable units of information serves the argument that they should be treated as tradable commodities on the global market. The way in which

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[36] See Wright (1995) for a detailed analysis of the politics behind U.S. and British regulatory policy for genetic engineering; and Smith (2003) for a journalistic account of the controversies involving regulatory approval of GE crops in the United States.

[37] The 1992 Rio Declaration on the Environment and Development of the United Nations defines the precautionary principle as follows: "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (Principle 15) (United Nations 1992a).

[38] Canada, the United States and Argentina challenged the European moratorium on GMOs (1999-2003) before the European Community. In 2006, the WTO panel ruled in favor of the plaintiff countries.

hunger is mobilized in support of agbiotech is a telling example of the confluence of genetic and economic reductionisms and the way in which they are put to use.

Biotech Neo-Malthusianism[39]

In a replay of the Green Revolution, the Gene Revolution is said to be the only way to achieve the productivity gains needed to meet increasing food demand. Despite increases in productivity, the Green Revolution did not solve the problem of hunger, which, as Amartya Sen (1981) famously demonstrated, is not about production but about distribution and access (what he calls entitlement).[40] The Gene Revolution's claim to alleviate hunger is even more questionable.

Indeed, the parallel drawn between the Green Revolution of the 1950s and the contemporary Gene Revolution makes for a nice play on words, but must not blind us to the very real differences between the two.[41] Shaped by modernization ideology and Cold War anxieties, the Green Revolution was about increasing food production through the transfer of technology and was conducted in the international public domain.[42] The Gene Revolution, in contrast, is shaped by the imperatives of neoliberal globalization; it is driven by "considerations of private gain and profit in the form of high returns to shareholders of agro-biotech corporations of global

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39 I owe this expression to Stone (2005).

40 According to the most recent FAO Report on the State of Food Insecurity in the World, 928 millions people are chronically hungry (FAO 2008).

41 What both "revolutions" have in common is to be rooted in the same technological paradigm, that of capital-intensive agriculture, predicated on productivity increases and technological fixes.

42 USAID director William S. Gaud is credited with coining the expression Green Revolution in a speech to the Society for International Development: "these and other developments in the field of agriculture contain the makings of a new revolution. It is not a violent Red Revolution like that of the Soviets, nor is it a White Revolution like that of the Shah of Iran. I call it the Green Revolution" (Gaud 1968).

reach" (Parayil 2003:971). Moreover, its products are covered by numerous and extensive patents.[43]

As Stone shows, the discourse on agricultural biotechnology as a solution to hunger emerged at a particular juncture in the GMO debate: "since 1998", he notes, "the most intense rhetorical battle lines of the genetic-modification wars have moved south to focus on food insecurity in developing countries" (2002:611). In 1998, agricultural biotechnology's prospects looked grim; opposition was mounting, especially in Europe, and Monsanto suffered huge losses.[44] For an industry being cornered, this was an attempt to win moral grounds for GMOs by playing "the Malthus card" (Stone 2002:611). A typical example of this discourse is Monsanto's Statement "Let the Harvest Begin", that was to be published in major European newspapers in the summer 1998:

> As we stand on the edge of a new millennium, we dream of a tomorrow without hunger. To achieve that dream, we must welcome the science that promises hope. We know advances in biotechnology must be tested and safe, but they should not be unduly delayed. Biotechnology is one of tomorrow's tools in our hands today. Slowing its acceptance is a luxury our hungry world cannot afford. [Kneen 1999:18]

The statement caused an uproar. More than its messianic tone, it is the political manoeuvring that shocked public opinion. Indeed, selected Africans leaders were asked to approve a statement whose objective was to win over European consumers. In response, African delegates to the United Nations Food and Agriculture

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[43] See Parayil (2003) for a comparative discussion of the Green and Gene Revolutions.

[44] A Deutsche Bank report issued in July 1999 caused a stir by advising investors to divest stocks in agbiotech companies because GMOs had become a liability, concluding that "GMOS are dead" (Mitsch and Mitchell 1999). Retrospectively, the prediction was premature.

Organization (FAO) issued a "Counterstatement to Monsanto" in which they "strongly object that the image of the poor and hungry from our countries are being used by giant multinational corporations to push a technology that is neither safe, environment friendly, nor economically beneficial to us" (Let Nature's Harvest Continue 1998). A toned down version of the statement was finally published later in the fall in some European newspapers and on Monsanto's website.

This neo-Malthusian ethic is often used to demean critics, as when the head of an industry-backed foundation claims: "to turn a blind eye to 40,000 people starving to death every day is a moral outrage…. We have an ethical commitment not to lose time in implementing transgenic technology" (Stone 2005:203). Another particularly striking example of this rhetoric was provoked by Southern African countries' refusal to accept food aid donated by the United States through the UN World Food Program when they found out that the seeds were genetically engineered (Pasternak 2005). This decision provoked outrage in the United States; the *Washington Post* headline read: "US on GE-tainted Food Aid: Beggars Can't Be Choosers" (Weiss 2002).

Biotech neo-Malthusianism is classic Malthusianism with a twist. It subscribes to the idea that the rising population is outstripping the food supply, but adds that with biotechnology—and only with biotechnology—can food production be increased. For example, in a Monsanto publicity campaign (fall 2009), the answer to the question "how can we squeeze more food from a raindrop?" involves "putting the latest science-based tools in farmers' hands." A recent FAO report dealt a blow to these arguments by advocating a broadscale shift to organic agriculture to enhance both food security and environmental sustainability. The report states that organic

yields on average are comparable to conventional yields, and that given proper investments, organic agriculture can feed the world population (FAO 2007:2).[45] Indeed, there is no conclusive evidence that GE crops are more productive. A recent study comparing 40 transgenic soybean varieties and 20 conventional ones in Rio Grande do Sul concluded that the transgenic varieties produced on average nine percent less than the conventional ones, with equivalent production costs (AS-PTA, Bulletin 448). More importantly, the premises of biotech neo-Malthusianism themselves are flawed. Research has shown that famines are complex phenomena with structural dimensions that defy any direct causal link between population and famine (Sen 1981). Biotech neo-Malthusianism holds that strong incentives to capital are essential to the scientific and technological advances needed for agricultural growth, but leaves open the issue of how these technologies—and the proprietary rights that accompany them—will translate into affordable food for the poor, apart from invoking the long-discredited trickle-down theory.[46]

Although they have been repeatedly refuted, and convincingly so, Malthusian ideas continue to hold sway over the popular imaginary and to be invoked by some social scientists (see, for example, Pinstrup-Anderson 2000).[47] They may become increasingly difficult to defend in the face of the existing evidence. In a recent editorial entitled "Deserting the Hungry? Monsanto and Syngenta are wrong to withdraw from an international assessment on agriculture", the scientific journal

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[45] Interestingly, the report calls for "decommodifying food with environmental and socio-cultural values", but does not expand on what this means concretely (FAO 2007:9).

[46] The trickle-down theory is he idea that growth benefits all because "a rising tide lifts all boats." For a recent refutation of this theory, see Stiglitz (2003).

[47] The classic refutation is Amartya Sen's Poverty and Famine (1981); for a more recent discussion, see Ross (1998).

Nature criticized the two agbiotech companies for withdrawing support for an international initiative to fight hunger, which the two companies felt was too lukewarm about the benefits of agricultural biotechnology.[48] An industry spokesman told *Nature* that "the decision was prompted by the inability of its members to get industry perspectives reflected in the draft reports" (Editorial 2008:224). Significantly, one of the perspectives in question is the view that biotechnology is key in reducing poverty and hunger. On the issue of whether biotechnology can help meet the demand for food, the report concludes that:

> Some GM crops can bring yield gains in some places and declines in others. Because new techniques are rapidly being developed, longer-term assessments of environmental and health risks and benefits tend to lag behind discoveries. This increases speculation and uncertainty. The possibility of patenting genetic modifications can attract investment in agricultural research. But it also tends to concentrate ownership of resources, drive up costs, inhibit independent research, and undermine local farming practices such as seed-saving that are especially important in developing countries (IAASTD 2008).

This view is a far cry from the early hype surrounding agbiotech. The first decade of commercial crops has not validated the agbiotech industry's two main claims—namely increased productivity and reduced use of agrochemicals. As stated in the report quoted above, the productivity of GE crops is uneven: it is sometimes higher, sometimes equal, and sometimes even lower than for conventional crops. As for the use of agrochemicals, evidence shows that it tends to increase in areas where

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[48] The International Assessment of Agricultural Science and Technology was an ambitious, 4-year, US$10-million project aimed at assessing how science, technology and farming practice can be used to reduce hunger and improve quality of life for the rural poor. It included scientists, government officials, representatives from seven UN agencies, farmers' groups, NGOs and industry, including chemicals manufacturer BASF and (before they pulled out) agbiotech giants Monsanto and Syngenta. Its report was published in April 2008 and is available at www.agassessment.org.

GE crops are grown (Agência Estadual de Notícias 2007). It is worth recalling that during the first decade in which GE crops were commercially grown (1996-2005), herbicide tolerance has consistently been the dominant trait.[49] In 2005, herbicide tolerance in soybean, corn, canola and cotton occupied 71 percent or 63.7 million hectares of the global biotech 90 million hectares, followed by insect resistance (16.2 million hectares or 18 percent) (ISAAA 2005).[50] Herbicide tolerance consists in genetically engineering the plant so that it withstands herbicides sprayings; insect resistance consists in genetically engineering the plant so that it produces a toxin lethal to insects. More and more of the varieties introduced today are "stacked genes" for the two traits, that is plants that are both herbicide tolerant and insect resistant. For example, the transgenic corn variety *SmartStax*, the result of a partnership between Monsanto and Dow, contains eight different genetic modifications, including two that confer resistance to herbicides (glyphosate and glufosinate).

There is mounting evidence that increased exposure to a single herbicide (glyphosate/Roundup) accelerates the development of weed resistance. This leads farmers to increase the use of glyphosate in conjunction with other agrochemicals, increasing production costs and soil contamination (AS-PTA Bulletin 379). In Rio Grande do Sul, at least four species of weeds have evolved resistance to glyphosate

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[49] It has been argued that one of the prime reasons for the development of Roundup tolerant varieties was to insure a captive market for Roundup herbicide after its patent expired in 2000.

[50] A lobby of the agbiotech industry, the International Service for the Acquisition of Agri-Biotech Applications is the only available source of statistics on GE crops globally. Its data, however, must be taken carefully. ISAAA provides statistics for countries for which there are no official statistics; it does not disclose the source of its information and its statistics have been found to be inflated. See FOE (2006:7).

(Cerdeira et al. 2007). According to the Brazilian Institute of Environmental and Renewable Natural Resources (IBAMA)[51], between 2000 and 2004, a period of rapid expansion for RR soybeans, the use of glyphosate in the state of Rio Grande do Sul, the main producer in Brazil at the time, increased 162 percent (95 percent for the country as a whole) (Agência Estadual de Notícias 2007).[52] In 2008, Brazil became, for the first time, the largest producer of transgenic crops worldwide as well as the first consumer of agrochemicals, with 733,9 million tons, a 25 percent increase (AS-PTA Bulletin 443).

In fact, agbiotech companies are already building tolerances to other herbicides into their seeds.[53] In May 2009, Dow AgroSciences (a subsidiary of Dow Chemicals) announced that it was about to introduce a variety of herbicide tolerant soybean in Brazil (an application for field testing was filed with the CTNBio). The herbicide in question is 2,4D, an auxinic herbicide that was a component of agent orange and is classified as "highly toxic" (Class 1) by the Brazilian National Health Surveillance Agency (ANVISA)[54]; by comparison, glyphosate is classified as having "low toxicity" (Class 4) (Hoffritz 2009; Tenório 2009; AS-PTA Bulletin 442). This clearly shows how agbiotech is not breaking with, but reinforcing, the chemical treadmill characteristic of industrial agriculture. Agbiotech's other promises, such as

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[51] The Brazilian Institute of Environmental and Renewable Natural Resources (IBAMA) is the implementation arm of the Ministry of the Environment.

[52] According to Balcewicz (2008), in Rio Grande do Sul, between 2000 and 2005, the combined use of 14 agrochemicals used in soybean plantations decreased by 62 percent, while the use of glyphosate increased by 85 percent.

[53] A similar problem is developing with insect-resistant crops. In response, companies are now creating crops that produce multiple toxins that target the same pest, but there is laboratory evidence that insects are already able to overcome two toxins produced by genetically engineered corn. See Ledford (2009).

[54] The National Health Surveillance Agency (ANVISA) is the Brazilian equivalent of Health Canada or the U.S. Food and Drug Administration.

healthy foods with modified nutritional contents, have yet to materialize. The only benefit on which there is a consensus is that GE crops simplify management on the farm, at least in the short term. This, in itself, is an important factor in explaining their adoption by farmers.

In sum, the revolution hailed by proponents of agbiotech does not lie in its promises—which clearly warrant the kind of sceptical criticism advocated by Franklin and Lock (2003:15)—but in our unprecedented capacity to transcend natural reproductive barriers. Scientific advances in genetic engineering have greatly increased our ability to alter life forms, with profound biological, environmental and socioeconomic implications.

The Agbiotech Industry

> What kind of industrial strategist—and we must assume there was strategy at some point— would try to stealthily bring to market products that no one needs but everyone has to consume, that the most industry-friendly politician would have difficulty justifying and whose only apparent redeeming feature is to improve the market positioning of the companies that make them?
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> Editorial, *Nature Biotechnology*, September 2004

This chapter explores how contemporary biotechnologies such as crop genetic engineering must be understood in relation to the economic markets within which they emerge. As Rajan (2006) points out, biotechnology might more accurately be referred to as technoscientific capitalism. The development of agricultural biotechnology took place at the height of neoliberal capitalism, characterized by liberalization and deregulation, global trade regimes, and the financialization of the economy. Its most salient aspects—extensive patenting, the

concept of substantial equivalence or trade disputes over GE food before the WTO—are intimately linked to neoliberalism.

Agbiotech also illustrates the paradoxes of neoliberalism. One such paradox is that while the latter advocates a minimalist role for the state, states are in fact playing an active role in the implementation of neoliberal policies. As Otero notes, "in spite of the free trade rhetoric, the US government has worked hard to facilitate the development of its biotechnology industry" (2008:14). This support can be found at various levels, from the ease with which the products of public research can be appropriated by the private sector, to the willingness of the United States Patents and Trademarks Office (USPTO) to grant patents and the general laxness of GMO regulations. Zygmunt Bauman (2000:68) offers the most convincing interpretation for this apparent paradox: global capital[55], he suggests, has a vested interest in "weak states," that is states that are weak but that remain states, and whose main tasks are twofold: to secure a balanced budget by keeping in check local pressures for more state intervention, and to ensure the order and stability necessary for economic activity to take place. A second, and related, paradox is that while neoliberalism advocates deregulation and the free play of the market, the implementation of neoliberal policies in fact involves a complex and dense set of regulations. At the international level, efforts at the global regulation of living modified organisms (or LMOs, as they are known in international agreements) have led to a host of overlapping, and sometimes conflicting, agreements regulating the different dimensions of their production and circulation—primarily the UN *Cartagena*

[55] Capital is said to have become global because the core activities of production, circulation and consumption are organized/integrated on a global scale and because, for the first time, capital can operate as a unit in real time.

Protocol on Biosafety[56] and a host of World Trade Organization agreements.[57] The confusion is revealed by the numerous legal challenges to which these agreements have given rise.[58] As Randeria suggests (2007), we are in a world of re-regulation rather than deregulation.

The claim, referred to earlier, that plant biotechnology is simply an extension of traditional plant breeding, conceals the transformation of the seed industry following the advent of plant genetic engineering. The agbiotech industry did not evolve out of traditional seed breeders such as Pioneer Hi-Bred, but out of a mix of biotech start-up firms and chemical companies until recently unrelated to agriculture. Worldwide, the 1990s were marked by a deep restructuring of the seed industry and by the consolidation of the agbiotech industry. The latter emerged as large chemical and pharmaceutical companies acquired a flurry of seed companies worldwide, and merged with small start-up biotech companies.

Monsanto is a case in point. Founded in Missouri in 1901, its first product was the artificial sweetener saccharin, which it sold to Coca Cola. After World War Two, it manufactured the first agricultural chemicals (herbicides 2,4D), as well as a series of controversial products—DDT, Agent Orange, PCB and aspartame (Nutrasweet). First commercialized in 1976, the glyphosate-based herbicide

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[56] The Cartagena Protocol on Biosafety is a supplement to the Convention on Biological Diversity that deals with transboundary movements of living modified organisms.

[57] The relevant WTO agreements are (1) the *Agreement on Trade-Related aspects of Intellectual Property Rights* (TRIPS); (2) the *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS) Agreement; and (3) the *Agreement on Technical Barriers to Trade* (TBT).

[58] For example, Canada, the United States and Argentina have challenged the European moratorium on the approval of GE varieties before the WTO; and Monsanto and the Argentinean government are engaged in a lengthy conflict over royalties.

Roundup became its flagship product (it is the most widely used herbicide in the world today).[59] In 1981, Monsanto set up a molecular biology group, establishing biotechnology as one of its strategic research focus. In 1994, Monsanto's recombinant bovine growth hormone (rBGH) (also known as bovine somatotropin, or BST) became the first genetically engineered product to win regulatory approval in the United States.[60] One cannot discuss the agbiotech industry without discussing Monsanto, if only because it controls over 88 percent of the biotech market (ETC Group 2005). Monsanto is also behind major innovations such as the technology contracts (discussed in chapter 3).

Monsanto's transformation from chemical company to agbiotech leader resulted from a double process of spin-offs and mergers. In 1997, it spun off its industrial chemical and fiber divisions into Solutia Inc. In 1999, it sold its subsidiary Nutrasweet (its aspartame business since the acquisition of G.D. Searle and Company in 1985). In 2000, Monsanto merged with Pharmacia and Upjohn. The same year, Pharmacia formed a new subsidiary, also named Monsanto, for its agricultural divisions (Pharmacia retained the medical research divisions). Finally, in 2002, Pharmacia spun off its remaining interests in Monsanto (Pharmacia itself eventually becomes a subsidiary of Pfizer, in 2003).[61] At the end of this process, the

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[59] In 2008, Monsanto's net sales from Roundup and other glyphosate-based herbicides totaled over four billions dollars, and gross profits close to 2 billions dollars (Monsanto 2008b).

[60] rBGH was banned the same year in the European Union, and in 1999 in Canada, because of animal welfare concerns and potential risks to human health. See Sharratt (2001) on the mobilization that led to the rBGH ban in Canada.

[61] Pharmacia (formerly known as Monsanto) had transferred the financial liability related to contamination with PCBs to its subsidiary Solutia in 1997. When the "new Monsanto" spun off its remaining interests in Pharmacia, it agreed to indemnify Pharmacia against any liability that might be incurred from judgments against Solutia.

"new Monsanto" had divested its industrial chemical and pharmaceutical divisions and retained the agricultural ones.

The second dimension of the company's transformation into an agbiotech company entailed a frenzied series of acquisitions of seed companies and agbiotech start-up. Between 1995 and 2005, Monsanto acquired no less than 44 seed companies throughout the world (Greenpeace 2005). Its first significant acquisition was Agracetus (1996), which became a prime site for the development of RR soybeans. In 1997, it acquired Holden's Foundation Seeds and Corn States, both corn seed companies; Asgrow agronomics seed business, one of the largest U.S. soybean seed producers; Agroceres, a major Brazilian seed company; and the agbiotech start-up Calgene. In 1998, it acquired Cargill's international seed operations; Plant Breeding International of Cambridge; and DeKalb Genetics Corporation (at the time the U.S. second seed corn company)—for a total of nearly US$4 billion. With the acquisition of Seminis, the world's largest vegetable and fruit seed business, for US$1.4 billion, in 2005, it became the world's largest seed company. In 2005-2006, Monsanto took over a dozen U.S.-based corn and soybean seed companies.

In the early days of genetic engineering, Monsanto licensed its genes to seed companies in exchange for a lump sum payment, in effect ceding control over them (Charles 2001). As Wilkinson and Castelli (2000:54) point out, plant varieties are a distinctive type of innovation in that they need to be adapted to the agroecological conditions in which they are grown. Monsanto had the transgenic technology, but not the plant genetic material (germplasm); by acquiring seed companies, it gained direct access to plant genetic material. This also provided Monsanto with the means to introduce GE seeds outside the United States. For example, Cargill's international

seed operations, which Monsanto acquired in 1998, had breeding businesses in 24 countries and distributed seeds in 51 countries (Kilman 1998).

One of the most controversial mergers involved Monsanto and Delta and Pine Land (D&PL). The merger raised antitrust concerns: with 43 percent of the U.S. cotton market, D&PL was the world's largest cotton seed company. In 2005, Monsanto had already acquired the second largest cotton seed company, Stoneville Pedigreed Seed Company (13 percent of the U.S. cotton seed market). If the transaction proceeded, Monsanto would thus control 57 percent of the U.S. cotton seed market (ETC Group 2006). In 2006, the U.S. States Department of Justice gave the green light for Monsanto's US$1.5 billion takeover of D&PL, but made it conditional on a series of divestitures, including Stoneville. It concluded that "without a remedy, the acquisition of D&PL by Monsanto would pose a serious threat to competition for the sale of traited[62] cottonseeds" (USDOJ 2007). Importantly, by acquiring D&PL, Monsanto also acquired the sterile seed technology (Terminator) research program and respective U.S., E.U., and Canadian patents (ETC Group 2006).

Industry consolidation during that period was not limited to Monsanto; all major companies—BASF, Bayer, Dow, Dupont, Syngenta, etc.—were involved to some extent in this unprecedented wave of mergers and acquisitions.[63] Monsanto, however, stands out as the most aggressive (Lambrecht 2001:113). Within a decade, it positioned itself as the world's largest seed company, which is all the more impressive since it did not start off as a seed company. By 2005, Monsanto had

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[62] "Traited" seeds is a neologism that refers to seeds that are genetically engineered to incorporate a specific trait such as herbicide tolerance or insect resistance.

[63] For a list of acquisitions by all of the major seed companies, see ETC Group (2005).

completed its transformation from a chemical corporation to a "life sciences corporation" whose motto was "Food, Health, Hope." Its desire to dissociate itself from its past is evident in the following statement:

> Monsanto is a relatively new company. While we share the name and the history of a company that was founded in 1901, the Monsanto of today is focused on agriculture and supporting farmers around the world in their mission to feed, clothe and fuel our growing world. *We are an agricultural company*. [www.monsanto.com Accessed April 30, 2009, emphasis added]

As for Pioneer Hi-Bred—the first hybrid seed corn company founded by Henri Wallace in 1926 and a pillar of the seed industry—it did not survive the Gene Revolution as an independent company: it was acquired by DuPont—another chemical company converted to agbiotech—in 1999. Many seed companies worldwide met with the same fate in the late 1990s and early 2000s. Based on 2006 seed revenues, it is estimated that the top ten seed corporations now account for 57 percent of the commercial seed market worldwide (ETC Group 2007a).

Seeds as Biocapital

The emergence of the agbiotech industry illustrates the process of "accumulation by dispossession" recently suggested by Harvey (2003). Harvey points out that primitive or original accumulation, which includes a range of processes including the commodification and privatization of land and the forceful expulsion of peasant populations as well as the conversion of various forms of property rights into exclusive private property rights, is in fact an ongoing process, capital's response to the chronic problem of the over-accumulation of capital. Capitalism entered such a crisis after 1973, as capital hit the limits of the Fordist-

Keynesian model of industrial production. In this context, seeds offered a whole new frontier for capitalist expansion; apart from hybrids' timid foray, this was largely uncolonized territory. In some developing countries, farmer-saved seeds accounted for as much as 95 percent of seeds in circulation in the mid-1990s (Borowiak 2004:525). Even in countries with an industrialized agriculture and commercial seed industry, it is not uncommon for farmers to save seeds for self-pollinated crops like wheat.

Seeds have been part of the commons for most of human history, being freely (re)produced and exchanged by farmers. This is because an intrinsic characteristic of the seed—its capacity to reproduce itself—acts as a built-in barrier to capital accumulation. Hence, while the agrifood system was progressively capitalized (through the introduction of machinery, chemical fertilizers, etc. and the industrialization of food processing), until recently its productive core—farming itself, that is, planting and harvesting—was not.[64]

This started to change, however, with the introduction of hybrid varieties in the 1920s. Hybrids are obtained through a process called heterosis, which consists in crossing two different inbred lines that have desirable traits. For reasons that are not clearly understood, the first-generation offspring shows enhanced size, growth rate, fertility and yield (collectively known as "hybrid vigour"). However, hybrids "lose vigour" if they are mated together, which means that the parental lines must be maintained and crossed for each new crop. This characteristic created an incentive for farmers to buy seeds annually. In fact, the invention of hybrids marked the

[64] It has been argued that agriculture was slow to industrialize because of a mix of social and biological factors such as the specificity of the labour process, plants' seasonal and reproductive cycles, and risks from natural events.

beginning of the seed industry, along with the introduction, for the first time, of limited forms of property rights over plant varieties (Ziegenhorn 2000).[65]

However, with hybrids, seeds are only imperfectly commodified; corn, contrary to most other major crops, is uniquely suited for hybridization. Commercial seeds made partial inroads, but the vast majority of farmers continued to rely on informal systems of seed distribution, in which seed saving and seed sharing are key (Borowiak 2004). In this context, the genetic engineering of seeds opened the way to a more thorough form of commodification. Indeed, transgenic seeds no longer move freely as their exchange becomes submitted to new rules and legal regimes of property rights. With transgenic seeds, for the first time, farmers are *legally* impeded from saving and re-using seeds.

As Kloppenburg argues in his authoritative political economic history of plant breeding, *First the Seed* (2004), the significance of agricultural biotechnology—the hybrid, and now the genetically engineered seed—is that it allows capital to overcome social and biological barriers to the capitalization of agriculture by taking away farmers' ability to save seeds. Technological developments have played a key role in this process, but only to the extent to which they have been intimately linked to changes in property rights regimes. Indeed, the patenting of seeds is an important dimension of the recent emergence of a knowledge

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[65] Hybrids' superiority has come under attack. According to Berlan and Lewontin (1986), the latter was exaggerated in the interest of the incipient seed industry—for example, by not distinguishing between productivity gains from hybridization, and those from concomitant developments, such as massive public investment in breeding and the introduction of mechanization and fertilizers. They conclude that "the apparently apolitical, value-free, objective claim that hybrids (or hybridity) increased yields is a reification of a product of the human mind that was necessary for the creation of a new and immensely profitable commodity."

economy based on the commodification of life. The latter has been likened to a second enclosure movement. "Enclosure" is a process through which "things that were formerly thought of as either common property or uncommodifiable are being covered with new, or newly extended, property rights" (Boyle 2003:37). The first enclosure movement involved the privatization and fencing of formerly common land and the extinction of customary use rights (Wood 2000:33). In a similar way, the extension of intellectual property rights over seeds represents the privatization of seeds as well as the extinction of ancestral peasant practices of conserving seeds for next year's harvest, and thus amounts to the expropriation of farmers' rights over seeds. As Andreasson emphasizes, "the net effect of expanding forms of property and expanding enforcement of property rights, as opposed to what property rights can theoretically (and in some cases actually do) produce, is that people become dispossessed and without access to various things enabling their subsistence" (2006:18).

Wood underlines the peculiarity of agrarian capitalism, defined by market dependency, and not wage-labour: farmers can "be market-dependent—dependent on the market for the basic conditions of their reproduction—without being completely dispossessed" (2000:35). This remains true today since farmers, even when they nominally own the land, are increasingly merely one link in an integrated agro-industrial production process that includes the industrial production of farm inputs and transformation of farm outputs. However, free access to seeds always assured farmers of a certain level of independence. With the introduction of genetically engineered seeds, dispossession takes on a new dimension, as farmers effectively lose control over what they produce, how they produce it, and to whom they sell

their harvest. The mechanisms of dispossession at work here are both blatant—farmers are deprived of the primary input in farming—and subtle. Indeed, what is being "enclosed" are not the seeds themselves as much as the knowledge they embody. As germplasm, or genetic resources, seeds are the repository of ten thousand years of breeding by farmers, and they embody farmers' knowledge. With genetic engineering, there is a fundamental shift, with knowledge about seeds moving out of farmers' communities into distant laboratories.

In the space of a few decades, seeds have thus become global commodities subjected to the whims of market speculators. Hence, the financial crisis of 2007-2009 led to increased speculation in grain prices on Wall Street, as investors bought grain contracts seeking better returns than stocks or bonds. This resulted in record-high and volatile crop prices, leading a farmer to comment "it's the best of times for somebody speculating on grain prices, but it's not the best of times for farmers" (nor consumers) (Wilson 2008). Amidst food riots provoked by soaring grain prices and food shortages in Haiti, Indonesia, Mexico and Egypt, wheat, corn and soy futures[66] jumped to record highs.

Seeds are a good example of how the commodity status of an object may change over time (things can move in and out of the commodity state) and space (that is, one thing can be a commodity in one place but not in another). In fact, seeds show how an object can simultaneously have the status of commodity and non-commodity when, in the same farming communities, highly commodified transgenic seeds coexist with non-commodified farmer-selected seeds.

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[66] On financial markets, *futures* are contracts for trading products at some future date.

Following Appadurai (1986), seeds are commodities "by metamorphosis"—commodities not originally intended as commodities. After all, seeds were part of the commons for most of human history; only in the 1930s did they start to undergo commodification in industrialized countries, an extremely recent development if we consider that plants were first domesticated 10,000 years ago. Seeds may perhaps more accurately be considered as commodities "by diversion," that is commodities originally protected from becoming commodities. In many farming communities, the idea that seeds should always be given or exchanged, and never sold, prevails.[67]

With genetic engineering, seeds become yet another kind of commodity. As Borowiak notes, transgenic seeds are treated as special commodities in that "farmers do not acquire full property rights to the seeds after purchasing them; they are still subject to the regulation of the patent holder, even when farmers are using the seeds for personal ends" (2004:519). Indeed, with GE seeds, for the first time, farmers no longer *own* the seeds: by signing Monsanto's legally-binding Technology Stewardship Agreement (TSA), they enter into a contractual relationship with the company that gives them a "limited license to use" the seeds purchased, but "Monsanto retains ownership of the Monsanto Technologies including the genes…. and the gene technologies" (Monsanto 2005).

In fact, genetically engineered seeds are best understood as an emerging form of biocapital. "Biocapital" is marked by its global reach and by the advanced penetration of nature and biology, in other words, of life itself (Franklin and Lock 2003; Heller 2001a). One of the central insights of theories of biocapital is that

[67] See chapter one. Fowler and Mooney (1990:75) make a similar observation in the Central American context.

"biocapital is not just dependent on reproduction, it is *constituted* by it" (Franklin and Lock 2003:10). In its organic phase, capital "targets the reproductive dimensions of cultural and biological life as loci for intensified production and commodification" (Heller 2001a:406). Indeed, key to agricultural biotechnologies is the capacity to harness biological reproductive capacity for productive use. For example, the first genetically engineered product marketed in the United States—recombinant bovine growth hormone (rBGH)—increased milk yield in lactating cows, and trees are being genetically engineered for faster growth.

Heller, however, pinpoints the fundamental problem—and the inherent contradiction—faced by capital in its attempt to appropriate biological reproductive processes. While the reproductive dimension of biological processes offers limitless possibilities (allowing capital, for example, to transcend its dependence on an exhaustible resource base[68]), this same characteristic complicates its private appropriation: "at stake, is the attempt to exploit the limitless dimension of biological capacity for reproduction, even while stripping biological organisms of their autonomous generativity" (Heller 2001a:412).

This attempt is epitomized in the development of Gene Use Restriction Technologies (GURTs). Promptly renamed *Terminator* by opponents, this technology prevents the production of fertile seeds in genetically engineered plants. The plant is genetically engineered to incorporate a gene that, at germination, produces a toxin lethal for the plant embryo, thus rendering the seed sterile. GURTs were developed jointly by the U.S. Department of Agriculture (USDA) and the U.S.

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[68] One example is the decoupling of the production of food from land-based production systems, as in the case of cocoa or vanilla, which can now be produced in a laboratory using cell culture techniques (Middendorf 2000:109).

cotton seeds company Delta & Pine Land, and was patented in the United States on March 3, 1998 as "Control of plant gene expression." With its takeover of Delta & Pine Land in 2006, Monsanto acquired Canadian and European patents on GURTs. Besides Monsanto, Syngenta also holds a number of patents on GURTs.

The avowed purpose of this technology is to ensure intellectual property protection for investments in genetic engineering. As stated in the patent application: "obviously, it is necessary for at least one generation of plants to produce seeds, so that a seed company can produce seeds for sale to growers, but a seedless fruit crop grown from that seed is commercially desirable" (Oliver 1998:5). For industry, it is a solution to the high cost (including in terms of public relations) of policing farmers. In the face of criticisms, the industry claims that this technology can act as a biosafety mechanism for the prevention of genetic contamination. Critics, however, point out that this argument is flawed. GURTs prevents seed germination, but not the production and dissemination of pollen. With open pollinated varieties, nothing would prevent the transmission of transgenes through fertilization, in fact creating new biosafety risks. GURTs also raises obvious socioeconomic concerns for the 1.4 billion farmers who depend on saved seeds.

When GURTs moved into the public eye in 1998, it was widely condemned by NGOs, the FAO, the Rockefeller Foundation and others. Under a lot of pressure, Monsanto publicly pledged not to commercialize sterile seed technologies in 1999. The following year, the UN Convention on Biological Diversity (CBD) introduced an international de facto moratorium on testing and commercialization. The latter, however, is fragile. In the lead-up to the 2006 Conference of the Parties to the CBD, Monsanto revised its pledge not to commercialize GURTs. In response, an

international “Ban Terminator” campaign was formed. Largely as a result of the campaign, the attempt to end the moratorium was defeated, and the moratorium upheld (see chapter 6).

As a result of the UN moratorium, there has been no confined research field trials or commercial applications of GURTs so far. However, the industry is pursuing this technology in laboratories, and several variants have since been developed. The initial technology, known as variety-specific or v-GURTs, is designed to control plant fertility or seed development; in other words, it could be used to prevent seeds from growing after harvest. A variant, known as a trait-specific or t-GURTs, allows for the use of an external chemical inducer to turn on or off a plant's genetic trait. It could be used to allow plants to express a beneficial trait (that is, drought resistance) if, and only if, a specific chemical treatment is applied. This type of GURTs would not affect plant fertility, but without the chemical treatment the trait would not be expressed.

The development of induced seed sterility represents a qualitatively significant development. Indeed, it provides biotechnology companies with a mechanism to ensure against the unauthorized use of intellectual property by means of a biological lock; in other words, it represents a new form of “biological patent.” Contrary to legal forms of intellectual protection over plant varieties, there are no time limits nor exemptions (Shand 2003). It represents the perfectly commodified seed.

With GURTs, technology (that is, those who control it) is in fact taking over the regulating functions of legal regimes. Indeed, GURTs give the patent holder direct control over biological processes, thus subverting legal regimes of intellectual

property rights. The argument has been made that GURTs represent a means of effectively enforcing existing property rights over GE seeds (Oczek 2000). An alternative interpretation, however, (and a more convincing one, I believe) is that this technology *subverts* legal regimes of property rights by turning over seed control to the corporations that develop these seeds. Presently, biotech companies depend on the judicial system for the enforcement of their patents; if GURTs were implemented, biotech companies would be able to enforce their patents directly, thus bypassing the judicial system.

In GURTs, the production of new life forms coincides with the production of new death-forms (Franklin and Lock 2003:16). It is this programming of cell death for strictly material ends that has aroused such intense public outrage. The very possibility of sterile seeds conjures up powerful images of death and destruction, of technology gone awry. It is no wonder that the expression Terminator—coined by the politically-savvy ETC Group[69]—spread like wildfire.

As Porto-Gonçalves (2006) argues forcefully, every technological revolution is a revolution in power relations and social relations, and genetic engineering is no exception. An emerging agricultural giant, Brazil is an interesting case to reexamine the broader implications of agricultural biotechnologies. Doing so requires addressing its complex agrarian politics, booming soybean industry and changing seed industry.

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[69] The Canadian-based NGO ETC Group (formerly RAFI) is dedicated to research and public policy on plant genetic resources, intellectual property and biotechnology.

Agbiotech: The Brazilian Case

Brazil asserts itself
lifting the national economy.
Sugarcane and coffee
were great for the world;
today there are soybeans
and Tradition at the Carnival

From grain to grain
a miracle unfolds
at dawn
to feed the entire world
and angels bless
our joy in this celebration[70]

Samba school *Tradição, Enredo* 2005

In 2005, one of the Rio samba schools dedicated its carnival parade theme to the booming soybean industry. The song, light in tone and celebratory, draws a parallel between the importance of sugar cane and coffee in an earlier era and that of soybeans today. Sugar cane and coffee undoubtedly brought much wealth to Brazilian elites; but their heavy reliance on slave labour also brought its share of violence and suffering. Sugar cane, in particular, was at the origin of the creation of a slave society (Bennassar and Marin 2000:53). Three centuries of slavery[71] profoundly shaped Brazilian society and left a legacy of deeply rooted inequalities. For soybeans as for sugar cane or coffee, the *enredo* does not tell the whole story.

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[70] *"Meu Brasil se fez presente / Elevando a economia nacional / Cana-de-açúcar e café / Pro mundo foi genial / Hoje tem soja e Tradição no carnaval / De grão em grão / O milagre acontece / Ao raiar de cada dia / Pro mundo inteiro se alimentar / E os anjos abençoando / Nossa alegria nessa festa popular"*

[71] Brazil was the last country of the Americas to abolish slavery, in 1888.

Brazil's Agrarian Landscape

At the turn of the 21st century, Brazil has become an agricultural power. According to the USDA, it has seen farm exports grow an average of 20 percent a year since 2000 (Hecht and Mann 2008). It is a leading producer and exporter of many agricultural products, including orange juice (82 percent), soybeans (38 percent), soymeal (34 percent), soybean oil (28 percent); sugar (29 percent), chicken (29 percent), coffee (29 percent), tobacco (23 percent), beef (20 percent) and pork (16 percent) (Hirsch and Chu 2005). In 2004, it exported US$27.6 billion in agricultural products and imported goods worth US$3.2 billion; its agricultural trade surplus of US$24.4 billion was the biggest in the world (by comparison, the U.S. surplus was US$7.4 billion (Hirsch and Chu 2005; USDA 2009).

Meanwhile, chronic food insecurity and malnutrition remain widespread. According to the latest FAO Report on the State of Food insecurity in the World, 11.7 million Brazilians (6 percent of the total population) are chronically undernourished (FAO 2008:49). There is a simple explanation to this apparent paradox: while agricultural growth is fuelled by export-oriented agribusiness, the bulk of internal demand (70 percent) is met by the family farming sector (MDA 2008:5). In spite of its importance in terms of internal food production and workforce employment, the family farming sector has been historically neglected by public policies oriented to agribusiness (family farming is discussed in greater detail in chapter 4). Add to this picture a deeply skewed distribution of land and income, and the paradox of widespread hunger amidst agricultural surplus starts to unravel.

With a Gini index of 0.802[72], Brazil has one of the most distorted land distributions worldwide: 31.6 percent of landholdings account for only 1.8 percent of the cropland (an average of 5.7 hectares per property), while 0.8 percent occupy 31.6 percent (an average of 4110.8 hectares) (DIEESE and NEAD/MDA 2006).[73] Alongside *latifúndios* subsists an army of landless peasants. The Landless Rural Workers Movement (MST) claims half a million members, making it the largest social movement in Latin America today.[74] Brazil also has one of the largest income gaps in the world, with the per capita income of the most affluent 10 percent of the population being 32 times that of the poorest 40 percent (United Nations 2005:49). Stated differently, 2 percent of the population receives 98 percent of national income (Chaui 2000:93).

This extremely unequal agrarian structure is the legacy of a model of development predicated on slave labour, monoculture and export dependency. Land concentration is complicated by the historic collusion between large landowners, the judiciary, the police and local elected officials. The result is an explosive situation in which rural conflicts are recurrent and often violent: the Catholic Church's Pastoral Land Commission (CPT) reports that more than 1,000 peasants have been assassinated in land conflicts over the past 20 years (www.cptnac.com.br Accessed April 10, 2008). According to the CPT's annual report on violence in the

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[72] The Gini index measures the degree to which the distribution of income, or of some other resource, is unequal. The index ranges from a minimum of zero to a maximum of one; "zero" represents no inequality and "one" signifies the highest degree of inequality.

[73] This estimate only includes the distribution of land among landowners. If the Gini index also considered landless families, it would indicate an even larger concentration.

[74] Of this number, approximately 300,000 are settled on agrarian reform land (*assentados*) and 200,000 are involved in land occupations (*acampados*) (Lopes 2002:294).

countryside, there were over 1,200 conflicts in 2006, involving 140,000 persons, and 39 people were murdered in land-related disputes (CPT 2007). Brazil's territory is vast and in many parts of the country, federal enforcement officers are *persona non grata*; large landowners organize private militias and lay down the law with impunity.[75]

The large landowners/small farmers or agribusiness/family farming divide permeates Brazilian society (Sauer 2008). It is reflected, at the institutional level, in the curious fact that Brazil has not one, but two agricultural ministries: the Ministry of Agriculture (MAPA), geared to the interests of agribusiness and large landowners; and the Ministry of Agrarian Development (MDA), created in 1999 to promote public policies for landless peasants, small farmers and descendants of runaway slave communities. A praiseworthy initiative, it is also an admission of helplessness in the face of the prevailing power relations and institutional culture of the Ministry of Agriculture. Moreover, their respective means are disproportionate: the Ministry of Agriculture's budget for 2009-2010, R$93 billion [CAN$54 billion], is more than six times the MDA's (R$15 billion, or CAN$9 billion).[76] The MDA's room for maneuver is all the more limited that the overall agricultural policy is geared to agribusiness. Although President Lula had been historically close to family farming and landless social movements, his politics in his two terms in office (2003-2006; 2007 until now) has been overtly favorable to agribusiness interests, despite

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[75] As shown by the recent murder of Dorothy Stang in the Amazonian State of Pará (February 2005). The 73 year-old, U.S.-born and naturalized Brazilian nun was murdered in daylight by a gunman hired by a large landowner, in retaliation for her work on behalf of the rural poor.

[76] The MDA represents 4.2 million farms and 70 percent of the active agricultural workforce; the Ministry of Agriculture represents 550,000 farms (Sabourin 2007:716).

expectations to the contrary. In the months leading to the election, the presidential candidate gave assurances to that effect, committing to respect Brazil's international financial commitments in the "Letter to the Brazilian People" (Silva 2002). Given the importance of the agricultural trade surplus in paying off the foreign debts, this implied continued support for agribusiness.

Large landowners and agribusiness' interests are represented in Congress by the *bancada ruralista* (its official name is the Parliamentary Front in Support of Agriculture and Livestock). In Brazilian parliamentary politics, "benches" (*bancadas*) are interest groups formed around particular issues irrespective of party affiliation. The *bancada ruralista* is one of the largest and most influential; in the current legislature (2007-2011), it accounts for approximately 20 percent of deputies and 15 percent of senators (Congresso em Foco & DIAP 2007). Formed during the 1988 Constituent Assembly[77] to block any constitutional initiative at agrarian reform[78], it defends the interests of large landowners and agribusiness and is actively pushing for the swift approval of transgenic crops. Emblematic of the intertwining of political and economic power is the figure of Blairo Maggi: governor of the State of Mato Grosso, he is widely considered the largest individual soybean producer worldwide.[79]

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[77] Following the end of the dictatorship, a constituent assembly (1986-1988) was formed to devise a new constitution.

[78] The 1988 Constitution recognizes the social function of property but states that only unproductive land (and not large estates *per se*) can be expropriated and that owners are entitled to compensation.

[79] Blairo Maggi controls nearly 500,000 acres of soy, cotton and corn (Hirsch and Chu 2005).

The Brazilian Soybean Complex

For almost a decade, the history of transgenics in Brazil merges with that of soybeans. The latter is a newcomer in Brazil, as in most of the world. Soybean originated in East Asia, where it has been cultivated for its nutritional and medicinal properties for millennia. Until the 1920s, its cultivation was largely limited to China. After World War II, the United States adapted soybean to grow it as feedstuff for the fast industrializing poultry industry. As part of the Marshall Plan, it was decided that the United States would specialize in the production and exportation of oil-producing (oleaginous) plants; and, in GATT negotiations, the United States secured tariff-free access to the European market for its soybeans. As a result, the United States accounted for over three quarters of soybean production worldwide in the 1970s. With the soybean complex, it exported not only a crop, but new production and consumption patterns, namely industrial cattle farming and processed food (Schlesinger 2006).

Indeed, the rise of the soybean complex is intimately linked to the industrialization of the food system. Only a small proportion of the crop is consumed directly, but soybean has become key for the livestock and food industry (hydrolyzed soy protein is widely used in processed food). As Goldsmith and Hirsh explain, "Soybeans cannot be fed directly to livestock. They need to be processed ("crushed") in an industrial facility using heat, mechanical pressure, and chemical extraction. The output is a high protein meal for livestock and oil used in food manufacturing" (2006:98).

It is not clear when soybeans were introduced to Brazil but, by the 1920s, they were cultivated in the southern region in Brazil, which has a temperate growing

climate similar to the Southern United States. Until the 1950s, soybeans were grown on a small scale by family farmers as a source of proteins in swine feeds and as a fertilizer (soybean is particularly efficient at fixing nitrogen[80]). Their production on a commercial scale is closely linked to the Green Revolution. When the federal government began to provide incentives for wheat production in the 1950s, soybeans emerged as a good crop to cultivate in rotation with wheat. Brazilian soybean production received a further boost in 1973, when the United States introduced a temporary moratorium on soybean exports following bad harvests. From 0.5 percent of worldwide production in 1954, Brazilian soybean production reached 16 percent by 1976 (Schlesinger 2006:16).

In the 1980s, the Brazilian agricultural research corporation (EMBRAPA)[81] set out to develop a variety adapted to the tropical savannah climate of the *Cerrado* (soybean was until then a temperate crop). The *Cerrado* (the term means "closed" or "inaccessible") covers 200 million hectares, that is 20 percent of Brazilian territory. As recently as the 1960s, the region was sparsely populated by indigenous people, the descendants of escaped slaves and peasant farmers. In the 1960s, peopling this "empty" territory became a matter of national security for the military regime, which launched a colonization program under the slogan of "A land without people for a people without land" (*Uma terra sem povo para um povo sem terra*). The scheme

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[80] "Soy, like other legumes, uses symbiotic rhizobium bacteria in its roots to 'fix' nitrogen into the soil, reducing the need for fertilizer" (Hecht and Mann 2008).

[81] EMBRAPA is a public research corporation with administrative and financial autonomy, linked to the Ministry of Agriculture. It has 38 research units distributed across the territory, over 8,000 employees (2,000 of which are researchers) and a budget of over R$1 billion [CAN$555 million] (in 2007) (www.embrapa.br Accessed June 10, 2008).

foundered, but paved the way for the kind of agricultural expansion that would take place decades later.[82]

The Cerrado is one of the most biodiverse ecosystems on earth, but its soils are nutrient poor, highly acidic and rich in aluminium. It was considered worthless for agriculture until EMBRAPA researchers discovered that the soil could be made fertile by adding phosphorus and lime. They then bred soy varieties that could thrive in shorter days, and strains of nitrogen-fixing bacteria that could tolerate Cerrado soils. These developments opened the way to the rapid expansion of soybean plantations in the region. The average cost of soybean production is lower in Brazil than it is in the United States,[83] but Brazil has another advantage: it can grow two and, with irrigation, three crops a year.

No matter how you look at them, soybean expansion figures are impressive. What is sometimes called *Soylandia* is a "big swath of soy-producing lands that stretch between the Andes and the Atlantic forest and from northern Argentina to the southern flanks of the Amazon basin" (Hecht and Mann 2008). A hundred million hectares were planted to soybeans in 2005 in the region, which comprises parts of Brazil, Argentina, Paraguay and Bolivia. Of these, 23,3 million hectares were in Brazil, and that number is increasing by 5 percent each year (Schlesinger 2006:31; Hecht and Mann 2008). According to the Ministry of Agriculture, an additional 90 to 106 million hectares are available for soybean expansion (the USDA estimate—170 million—is even higher) (Schlesinger 2006:29).

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[82] Many small holders cleared the land, only to find themselves expropriated by larger landowners, setting off violent conflicts over land.

[83] US$5.09 per bushel in Brazil versus US$6.68 per bushel in the United States (Goldsmith and Hirsch 2006:98).

Today, Brazil is the second soybean producer, behind the United States and before Argentina and China. In 2005, 51 million tons of soybeans were harvested in Brazil, representing 24 percent of world production (Schlesinger 2006:31). With the fastest growth rate (twice the global rate in 2006), it is predicted that Brazil will soon occupy the first rank. Brazil is also the world's biggest soy exporter, a title it seized from the United States in 2006 (Hecht and Mann 2008).[84] Soybean is now Brazil's leading export, responsible for over 20 percent of Brazil's revenues from agribusiness exports (Schlesinger 2006:31).

The exploding demand for soybean which triggers this expansion is not internally driven: soybean domestic consumption has remained stable, around 25 percent, since the mid 1980s (Goldsmith and Hirsch 2006:100). Stated differently, over three-quarters of Brazilian soy production is exported, primarily to Europe and China (Schlesinger 2006:32). As Goldsmith and Hirsch point out, "the demand for soybeans is essentially a derived demand for meat" (2006:101). The latter is already high in industrialized countries, and soaring in China and Asia, where higher income translates into increased meat consumption. Soybeans are also increasingly used in the manufacturing of industrial products such as paints, solvents, textiles, lubricants and plastics (Hecht and Mann 2008).

Soybean expansion is not only quantitative, but marks a qualitative change in production. Up until the 1970s, soybean production was integrated in a rotation model along with wheat, corn and grazing. Wheat, an important staple, was at the centre of this model; the function of soybean was to supply nitrogen to the soils, while grazing allowed it to recover and at the same time provided manure (Porto-

[84] Brazil is an exporter of raw, not processed, soybeans (Goldsmith and Hirsh 2006).

Gonçalves 2006:223). This has been replaced today by intensive soybean monoculture, which is a source of concern in the fragile ecosystem of the Cerrado. The latter's importance in terms of biodiversity is now fully recognized, although belatedly.

Soybean expansion is also linked to the increasing concentration of both land and production. Between 1985 and 1996, there was a more significant drop in the number of soy farms (42.2 percent) than farms as a whole (16.3 percent), and this despite the increase in production. Properties with less than 100 hectares decreased by 44.8 percent, while those with more than one thousand hectares increased by 11 percent (Schlesinger 2006:34). At the processing end, Brazilian soybean production is controlled by a handful of multinational food conglomerates: ADM, Bunge, Cargill and Coinbra (all U.S.-based with the exception of Coinbra, which is part of the French group Louis Dreyfus). Consolidation in the soybean seed sector is part of a broader movement of consolidation in the Brazilian seed industry.

The Brazilian Seed Industry

Until the 1950s, seed production was conducted by the federal Ministry of Agriculture and state-level secretariats of agriculture. As Wilkinson and Castelli note, "the seed market was virtually inexistent at the time, with the exception of hybrid corn, commercialized by multinationals and by the national company Agroceres, and of vegetable seeds, which were all imported" (2000:28). In the 1950s, seed production started to shift from the public sector to the private sector. Foreign companies started to enter the Brazilian market in the mid-1960s: first

Pioneer (1964) and Cargill (1965), followed by Limagrain and Asgrow (1971), Dekalb (1978) and Ciba-Geigy (1979) (Wilkinson and Castelli 2000:28).

Following the passing of the Plant Variety Protection Act (1997), which strengthened companies' intellectual property rights over seeds and gave them the right to collect royalties, the pace of consolidation intensified (Wilkinson and Castelli 2000:53-54). By 1999, the four leading companies controlled 90 percent of the Brazilian corn seed market, compared to 77 percent only two years before. Moreover, in 1997, there were two Brazilian companies among the five leading seed companies (Agroceres and Braskalb); and Agroceres and Cargill were leading (both with a 26 percent share). By 1999, all major seed companies were transnational, with the exception of Unimilho, which only controlled five percent of the market (Wilkinson and Castelli 2000:56).

Once again, Monsanto stands out. While it was not present in the Brazilian corn seed market in 1997, it controlled 60 percent of the corn market two years later. Through its subsidiary Monsoy, Monsanto acquired the leading Brazilian seed company, Agroceres, as well as other U.S. seed companies operating in Brazil, such as Cargill and Braskalb/Dekalb (Wilkinson and Castelli 2000:55). The takeover of Agroceres took on special significance. Founded by two Brazilian geneticists in 1945, Agroceres came under the control of the Rockefeller Foundation in 1951, and was re-acquired by Brazilian assets in 1980 (Wilkinson and Castelli 2000:50). At the time it was acquired by Monsanto, it was the largest corn supplier in Brazil. In the soybean arena, Monsanto acquired the leading national company, FT Pesquisa e Sementes de Soja (1995), as well as Sementes Hatã (soybean). In 2007, Monsanto acquired Agroeste (hybrid corn). It entered the cotton seed market in 1999 by

forming a partnership with Delta and Pine Land and Maeda (MDM), which it then acquired in March 2009 (ABRASEM 2009).

In the same period, other multinational companies—DuPont, Bayer CropScience, Dow AgroSciences, and Delta and Pine Land—also entered the Brazilian market by acquiring national seed companies. Dow's seed acquisitions include Dinamilho Carol Produtos Agrícolas Ltda., Híbridos Colorado, FT Sementes de Milho and Sementes Hatã (corn) and Agromen (corn). AgrEvo (a joint venture between Hoechst and Schering)[85] acquired Granja 4 Irmãos, Sementes Ribeiral, Mitla Pesquisa Agrícola and Sementes Fartura. Dupont entered the Brazilian market by creating DuPont do Brasil and acquiring Agropecuária Dois Marcos (soybean).

Consolidation in the seed industry during that period was part of a broader restructuring of the food chain. Chaddad and Jank (2006:89) sum up these developments:

> Fostered by rising incomes, urbanization, economic liberalization, and access to competitive raw materials, multinational food processors and retailers entered or increased their investments in the Brazilian market during the 1990s. Increased foreign direct investment (FDI) by large, private agribusinesses in Brazil displaced domestic competitors, increased industry concentration, and eliminated many medium and small companies. As a result, the market share of multinational corporations in the domestic food market increased. For instance, Brazilian affiliates of multinational agrifood companies generated 137,000 jobs, almost US$5 billion in exports, and sales of US$17 billion in 2000. Given the total value of food industry shipments in Brazil of US$58 billion, the aggregate market share of foreign companies reached 30% in 2000. Among the top ten food processors in the country, eight are multinational firms with foreign head-quarters. Recent official data show that FDI inflow in the Brazilian agrifood processing industry totalled US$8.2 billion between 2001 and 2004. The top-three food retailers in the country are now controlled by two French supermarket chains (Casino and Carrefour)

[85] In 2000, AgrEvo and Rhône-Poulenc Agro merged to form Aventis CropScience. In 2002, Bayer acquired Aventis CropScience and changed its name to Bayer CropScience.

> and one US-based company (Wal-Mart), with a combined market share of 39%.

Even those who view these developments in a favourable light, like Chaddad and Jank (2006:89) recognize that they lead to the exclusion of small farmers—precisely those who produce for the internal market.

The soybean seed market in Brazil is worth R$1,5 billion [CAN$860 million], and transgenic varieties account for 60 percent of the market (Roundup Ready is the only transgenic variety of soybean authorized so far, but Dow AgroScience recently announced its intention to enter the market) (Tenório 2009). In the 2007-2008 planting season, out of 341 soybean varieties registered with the Ministry of Agriculture, 49 percent had been developed by public institutions, 28 percent by multinational companies and 23 percent by Brazilian companies. As for corn, 58 percent of the 310 varieties of corn had been developed by five multinational companies; 21 percent by national companies and 21 percent by public institutions (Cordeiro et al. 2007). In the first planting season after the authorization of the first varieties of transgenic corn, 146 out of 261 corn varieties (46 percent) registered with the Ministry of Agriculture were transgenic (Zanatta 2009).

Two more trends in the Brazilian seed market are worth emphasizing. Firstly, the introduction of smuggled RR soybean starting in 1996 coincided with a marked decline in the use of commercial soybean seeds. From 60 percent in the 1983-1998 period, the utilization rate for commercial soybeans seeds dropped to 30 percent in 2001 and 19 percent in 2002 (Cordeiro et al. 2007:9). For the country as a whole, utilization rates for commercial seeds were 55 percent for soybean and 84 percent for corn in 2006 (rates are lower for soybean because it is easier to save seeds for

soybean, a self-pollinated crop, than it is for hybrid varieties of corn). The second important trends is the increasing cost of seeds: between 1994 and 2006, the average cost of seeds increased by 246 percent (Cordeiro et al. 2007:10).

Concluding Remarks

In this chapter, I have explored the manifold dimensions—scientific and biological, economic and political—of seeds' transformation into a form of biocapital. As Charles notes, "Seeds are a paradox at the heart of agriculture. They are precious and irreplaceable, yet cheap" and "they exist in a twilight zone somewhere between private property… and a public good" (2001:111). In the prevailing neoliberal context of the 1980s and 1990s, the genetic engineering of seeds opened up new paths for their commodification.

Intellectual property rights are a fundamental dimension of this process. As Cullet argues, "in the context of the development of genetic engineering, the progressive introduction of patents over life forms has constituted a major incentive for the overall growth of agro-biotechnology" (2004:12). In the next chapter, I examine the evolution of the Brazilian intellectual property rights and seed legislation over the last decade.

CHAPTER 3

LAW AND BIO-DISPOSSESSION

Seed is stolen, multiplied and sold. These are very significant thefts.
This is not like taking a DVD of the Lion King and making a copy for your friends.
It's like walking into a car show room and stealing 5 or 6 Mercedes.
We talk about hundreds of thousands of dollars of stolen seed.
Hugh Grant, CEO, Monsanto[86]

Intellectual Property Rights in Seeds

Intellectual property rights in agriculture are a recent phenomenon. Historically, life forms have been excluded from patent laws on the basis that they are products of nature, not human inventions. Inspired by hybrid corn and the possibilities it created for the development of a seed industry, plant breeders in the United States started to lobby for intellectual property rights in plant varieties. The world's first IPR regime for new forms of plants—the 1930 *U.S. Plant Patent Act*—gave patent owners exclusive rights to asexually reproduced plant varieties for a period of 17 years (or 20 years since 1995) (United States 1930). The variety had to be new and distinct, but not necessarily useful. Protection was limited to asexually reproduced plants (principally fruit species and ornamentals) with the exception of tubers such as potatoes. With asexual reproduction, plants are produced using material from a single parent and as such there is no exchange of genetic material. The rationale for excluding sexually reproduced varieties at the time was that they were not uniform and stable enough (Borowiak 2004; Kloppenburg 2004).

In 1961, a handful of European countries created the *Union for the Protection*

[86] In an interview to the German newspaper Die Zeit. Quoted in Hoffritz (2009).

of New Varieties of Plants (UPOV) (subsequently revised in 1972, 1978 and 1991). UPOV introduced *plant breeders' rights* as an alternative to patents. Plant breeders' rights offer exclusive rights to the breeder of a plant variety that is new, distinct, uniform and stable ("new" in this context meaning that it is new on the market, not new in itself). These rights extend to a variety's production and reproduction, conditioning, sale, importation, exportation, and stocking. Plant breeders' rights were initially thought of as a less stringent form of protection than patents, more appropriate to the nature of farming and the dissemination of new plant varieties. Indeed, plant breeders' rights made provision for two important exceptions to the exclusive rights conferred to plant breeders, known as the research exception and the crop exemption. The research exception means that the patented material can be used freely for further research, while the crop exemption acknowledges the age-old practice of farmers to save seeds from their crops. In 1970, the United States followed suit by introducing plant breeders' rights legislation; the *Plant Variety Protection Act* extended intellectual property rights to sexually reproduced plants, that is, seed-propagated (United States 1970).

Starting in the 1980s, developments in genetic engineering intensified the drive toward the patenting of life forms. The first decisive move in this direction was the 1980 landmark U.S. court case *Diamond v. Chakrabarty* (447 U.S. 303 [1980]). Chakrabarty's patent application for a genetically engineered bacteria able to metabolize crude oil was initially denied by the U.S. Patent Office on the basis that living organisms were not patentable. Chakrabarty appealed, and the decision was overturned by the Supreme Court. This was a watershed decision: the first time a utility patent was allowed on living matter.

Once it was accepted that a micro-organism could be patented, it was a short step to the patenting of more complex life forms such as plants. This came five years later when another landmark legal decision—*Ex parte Hibberd*—established the right of plant breeders to obtain protection under the U.S. Patent Act (227 U.S.P.Q. 443 [1985]). These legal decisions unleashed a patenting race: the number of biotech patents issued in the United States went from 0 in the early 1980s to 6,000 per year in 2003 (Williams 2005:14).

Utility patents represent a much more stringent form of intellectual protection than plant breeders' rights. Under utility patents, it is no longer the plant variety as a whole that is protected, but specific genes and processes. The patents held by biotech companies, for example, protect "DNA sequences encoding certain enzymes with kinetic and immunological activities as well as the recombinant DNA molecules comprising them; methods to produce genetically modified plants by using the respective DNA sequence, cells and plants thus obtained; and finally, methods to selectively control weeds in a field cultivated with crops containing the respective DNA sequence" (Correa 2007). Some of these patents are unprecedented in scope: Monsanto, for example, obtained a species-wide patent on all genetically engineered soybeans.[87] The patent was eventually revoked on technical grounds by the European Patent Office, but only after a thirteen year legal challenge by the non-governmental organization ETC Group.[88] Finally, another important difference between plant breeders' rights and utility patents is that the latter does not allow exemptions for

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[87] The patent was formally opposed by Monsanto until it purchased the original patent assignee (Agracetus) in 1996.

[88] The patent was denied on the grounds that the genetic engineering process described in the patent was insufficient to allow a skilled scientist to replicate the procedure—one of the requirements for patentability. See ETC Group (2007b).

research and seed saving by farmers. Recent developments have created a number of grey areas. One of them results from the difficulty to separate the genetically engineered gene from the plant of which it is a part. In Europe, for example, individual plant varieties per se are not patentable (in contrast to the United States and Australia). However, a plant which is characterized by a particular gene (as opposed to its whole genome) is not included in the definition of a plant variety and is therefore patentable. Even in cases where the plant itself is not patentable (for example in Canada or in Brazil), a patent on a GE gene gives the patent owner *de facto* rights over the plant that incorporates the said gene. In the Monsanto v. Schmeiser case, for example, the Canadian Supreme Court ruled that the issue of how Roundup Ready canola had landed on Schmeiser's property (whether through genetic contamination or otherwise) was ultimately irrelevant; Monsanto's patent gave it rights over any plant that incorporates the patented gene (1 S.C.R. 902, 2004 SCC 34 [2004]).

The United States represents the exception rather than the rule: the majority of countries do not allow the protection of plant varieties under patent law. However, the tendency, over time, has been to expand the scope of plant variety protection to make it more akin to utility patents. Hence, the scope of the saved seed exemption to plant breeders' rights has been gradually restricted (Ewens 2000:293). UPOV, for example, initially recognized farmers' traditional practices regarding the saving, exchanging and, to a limited extent, sale of seeds. When it was subsequently amended, however, these rights became mere privileges and exceptions at the

discretion of governments.[89] Article 15.2 of UPOV 1991 ("optional exception") states that:

> each Contracting Party *may*, within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder, restrict the breeder's right in relation to any variety *in order to permit farmers to use for propagating purposes, on their own holdings, the product of the harvest* which they have obtained by planting, on their own holdings, the protected variety. [UPOV 1991, emphasis added]

The WTO Agreement on Trade-Related Aspects of Intellectual Property Rights

In the 1990s, the U.S. government and its industry worked to extend U.S. standards of intellectual property rights in plant varieties globally through the World Trade Organization (WTO). The role of transnational corporations in formulating the WTO *Agreement on Trade-Related Aspects of Intellectual Property Rights* (hereafter TRIPS Agreement) was revealed by the following comment made by an industry's representative: "industry… crafted a solution, reduced it to a concrete proposal and sold it to our own and other governments" (Oh 2000).

The TRIPS Agreement sought to "harmonize" IPR regimes worldwide by obligating member countries to extend property rights protection to plant varieties. The expression *harmonization* conceals the fact that what is at stake is not the adjustment of similar property rights regimes, but the extension of Western standards of property rights—a distinctly Western tradition—to the rest of the world. Article 27(3)b of the Agreement states that Members may exclude from patentability:

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[89] The European Union Directive 98/44/EC, for example, provides a "farmer's privilege", which allows farmers to use protected seeds freely for their own use. According to Article 11, "the sale or other form of commercialisation of plant propagating material to a farmer by the holder of the patent or with his consent for agricultural use *implies authorisation for the farmer to use the product of his harvest for propagation or multiplication by him on his own farm*" (European Union 1998, emphasis added).

> plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof. [WTO 1994]

Sui generis—literally "of its own kind"—refers to forms of IPR protection distinct from the conventional patent system (as we will see below, this was the path taken by Brazil). In sum, the TRIPS Agreement introduced the obligatory patentability of micro-organisms and of a form of intellectual property protection for plant varieties. As Purdue (2000:47) argues, the TRIPS Agreement was unprecedented in that it established a link between two issues—international trade and intellectual property—previously seen as separate issues with no logical connection. To put it simply, intellectual property rights were not, until then, considered a trade issue. Furthermore, the TRIPS Agreement represents a significant departure because, until recently, many countries expressly excluded plant varieties from patentability (Borowiak 2004:520). Some countries, like India, allowed patents for processes of plant production but not for the resulting products; while others, like Brazil, did not have intellectual property rights in plant varieties.

Before the advent of genetic engineering, the international plant breeding system was based on the premise that everyone would benefit from free access to plant genetic materials and knowledge. Plant breeders' rights were based "on the assumption that innovations by breeders could only be sustained if the primary and protected material remained freely available for further research" (Cullet 2004:15). With the introduction of utility patents over plant varieties, this approach was replaced by the classic rationale behind patents, that is, that they are a necessary

incentive for firms to undertake risky and lengthy research. However, the ensuing race toward the patenting of life forms is leading to a very real concern that the end result may be to stifle rather than promote research by denying researchers access to basic materials and processes. According to a public statement recently submitted to the U.S. Environmental Protection Agency by a group of researchers (corn insect specialists):

> Technology/stewardship agreements[90] required for the purchase of genetically modified seed explicitly prohibit research. These agreements inhibit public scientists from pursuing their mandated role on behalf of the public good unless the research is approved by industry. As a result of restricted access, *no truly independent research can be legally conducted on many critical questions* regarding the technology, its performance, its management implications, IRM [insect resistance management], and its interactions with insect biology. Consequently, data flowing to an [Environmental Protection Agency] Scientific Advisory Panel from the public sector is unduly limited. [Anonymous public comment 2009, emphasis added]

The statement is accompanied by the following comment: "the names of the scientists have been withheld from the public docket because virtually all of us require cooperation from industry at some level to conduct our research" (Anonymous public comment 2009; see also Pollack 2009). The problem is indeed compounded by the fact that financing for agricultural research has gradually shifted from the public sector to the private sector. Another study of the impact of seed industry concentration on innovation concludes that "increases in seed industry concentration have reduced biotech research intensity in the United States in the 1990s" (Schimmelpfennig et al. 2004:157).

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[90] Technology/stewardship agreements (discussed in more detail below) are private contracts signed by farmers upon purchasing genetically engineered seeds.

Besides UPOV and the TRIPS Agreement, two other international agreements govern the management of phytogenetic resources. The Convention on Biological Diversity (CBD) was signed at the UN Earth Summit in Rio de Janeiro (Brazil) in 1992. It was prompted by the growing realization that a global and coordinated response was needed to address the erosion of biological diversity. Its overarching goals are "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (United Nations 1992b). It addresses issues such as in-situ and ex-situ conservation, access to genetic resources, technology transfer and distribution of benefits. It is an ambitious initiative, whose implementation has been slowed by member states' (and non-members') conflicting interests.[91] The CBD is based on the premise that countries have sovereign rights over their genetic resources. This marks an important shift, as genetic resources were, up until then, considered to be the common heritage of humanity. The first article of the *FAO International Undertaking on Plant Genetic Resources* (1983), for example, states that "this Undertaking is based on the universally accepted principle that plant genetic resources are a heritage of mankind and consequently should be available without restriction" (FAO 1983).

The second relevant international treaty is the *International Treaty on Plant Genetic Resources for Food and Agriculture* (ITPGRFA) also known as the Seed Treaty, which comes under the authority of the FAO. The Treaty was signed in 2001 and came into force in 2004. Its objectives are similar to those of the CBD—that is,

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[91] In spite of the fact that it is not a party to the Convention, the United States often has among the largest delegations to the meetings, and makes sure that its interests are heeded.

conservation, sustainable use and benefit sharing—but, as its name indicates, it is specifically concerned with genetic resources for food and agriculture. Brazil signed and ratified both the Biodiversity Convention (and Cartagena Protocol) and the Seed Treaty.

Brazil and the Global Seed Regime: 'Harmonizing' the Brazilian Seed and IPR Legislation

Prior to the TRIPS Agreement, Brazil did not have intellectual property rights in plant varieties. A Seed Bill was introduced in 1965 to establish norms for seed production and trade, but Brazil did not offer specific protection for breeders' rights. The public sector played an important role in plant breeding, and the new cultivars it developed remained in the public domain. Private seed companies multiplied and distributed seeds, and were mostly active in breeding open pollinated crops amenable to hybridization such as corn. This started to change in the mid-1990s with Brazil's entry into the World Trade Organization. By joining the WTO, Brazil automatically signed on to the TRIPS Agreement. As we have seen, the latter obligates member countries to extend patents to micro-organisms and provide property rights protection for plant varieties.

The Intellectual Property Act (1996)

To fulfil its new obligations under the TRIPS Agreement, Brazil revised its intellectual property legislation in 1996. A bill had been tabled in 1991 by President Fernando Collor de Mello, who was the first democratically-elected president after

the end of military dictatorship and was elected on a neoliberal platform.[92] According to Alencar (1996), the bill was intended as a clear gesture to the international community, in particular the United States, that Brazil was adhering to the new rules governing IPR and trade and was thus a reliable trading partner. Civil society mobilization against the bill, in particular the fact that it allowed the patenting of life forms, delayed its adoption by five years. The new Intellectual Property Act (Brasil 1996) was finally sanctioned by the President Fernando Henrique Cardoso on May 14, 1996.[93]

For the first time, the Intellectual Property Act allowed the patenting of life forms, although these provisions are not as broad in scope as they were in the initial bill. To be patentable, an invention must meet the standard requirements of novelty, inventive activity and industrial application (Art. 8). This excludes "natural living beings, in whole or in part, and biological material, including the genome of germ plasma of any natural living being, when found in nature or isolated therefrom, and natural biological processes," which are not considered to qualify as inventions (Art.10, IX). Article 18 further specifies that living beings, in whole or in part, are not patentable, "*except transgenic micro-organisms meeting the three patentability requirements*—novelty, inventive activity and industrial application—as provided in Article 8 and which are not considered mere discoveries" (emphasis added). An explanatory paragraph defines transgenic micro-organism as "organisms, except the whole or part of plants or animals, that present, due to direct human intervention in their genetic composition, a characteristic that can not normally be attained by

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[92] President Collor de Mello was impeached later that year following corruption charges.

[93] Fernando Henrique Cardoso was president from 1995 to 2002.

species under natural conditions."[94] In sum, plant varieties and animals are not subject to patent protection, but the law does not rule out genetically engineered micro-organisms nor microbiological processes.

The Plant Variety Protection Act (1997)

To fill in the gap left in the Intellectual Property Act, a law allowing patent-like intellectual property rights on plant varieties was introduced the following year. Brazil thus opted for the less stringent *sui generis* option under the TRIPS Agreement, as did most countries that did not have plant variety protection prior to entering the WTO. It is a legal benchmark as it introduced intellectual property in plants in Brazil:

> The protection of the intellectual property rights in plant varieties is effected through the grant of a Plant Variety Protection Certificate, which shall be considered a commodity for all legal purposes and the sole form of protection in the Country for plant varieties and the rights therein that may be invoked against the free use of sexually or vegetatively propagated plants or parts thereof (Art.2).[95] [Brasil 1997]

The Brazilian Plant Variety Protection Act (LPC) is modelled on UPOV 1978. It recognizes the right of farmers to keep and plant seeds for their own use. According to Article 10, the breeder's right is not deemed infringed by a farmer who (1) stores and plants seeds for his own use, or (2) uses or sells the product of his planting as food or raw material, except for reproductive purposes. An exception is made for small rural producers, who can multiply seeds to give away or exchange,

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94 Translated into English by Araripe and Associates. (www.araripe.com.br)
95 Translated into English by GRAIN (www.grain.org)

but only in dealings exclusively with other small rural producers.[96] It also includes a research exemption, allowing the use of the plant variety as a source of variation in genetic improvement or in scientific research. In 1999, Brazil joined the International Union for the Protection of New Varieties of Plants (UPOV 1978) just before doors were closed to it. By signing on to the 1978 Convention before its closing date, Brazil avoided being forced later on to join the more restrictive 1991 Convention.

This was not the first attempt at introducing breeders' rights legislation in Brazil. An attempt had been made between 1974 and 1977 by International Plant Breeders, a group owned by the Dutch-British conglomerate Dutch/Shell, which controlled the largest share of seed sales worldwide at the time.[97] The latter worked closely with the Brazilian Seed Producers Association (ABRASEM), the Ministry of Agriculture and the Brazilian Agricultural Research Corporation (EMBRAPA) to introduce Plant Variety Protection legislation (Pelaez and Schmidt 2000). However, their hopes to pass such a piece of legislation without delay and with the least hassle possible collapsed when a preliminary version of the bill and its regulations[98] was leaked in February 1977. The document immediately caused public outrage. The State legislature of the state of São Paulo unanimously took position against the bill. It passed a motion condemning the bill as an attempt to "denationalize" the Brazilian seed production sector to the benefit of foreign seed companies, and as a threat to

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[96] The LPC (Art.10.1), makes an exception for sugarcane, for which protection extends to the final product (sugarcane is propagated through stems, not seeds); in other words, there is no "farmers' right": no matter what, a farmer must obtain the patent holder's permission (and eventually pay royalties) to reproduce it.

[97] This section draws on Paschoal's account of the events that led to the demise of the bill (Paschoal 1986).

[98] The Brazilian legislation requires a regulatory decree signed by the President in order for a law to become effective. Although a Decree cannot change the principles of the law adopted by the National Congress, it can create bureaucratic stumbling blocks that may impact its effectiveness.

Brazilian farmers, who would pay higher prices for seeds if that were to happen. It concluded: "protecting seeds, through patenting, amounts to protecting the commercial interests of large economic groups in already-developed countries, to the detriment of the real interests of our farmers and of national private enterprises" (Paschoal 1986:xv).

The Campaign obtained considerable support in the following months, including that of the influential Brazilian Society for the Progress of Science (SBPC), several agronomists professional associations, and a number of deputies and senators. The bill made the headlines of major newspapers with titles such as "Agronomists Against Seed Project" (*O Estado de São Paulo*); "The Seed is Ours" (*Veja*); and "Seeds: Multinational Control?" (*Diário do Comércio e Indústria*). Mobilization was fuelled by fears of multinational corporations' monopoly over seeds and of the rise in prices if seeds were to come under the control of the private sector, and had strong nationalist overtones. One of the factors that contributed to the bill's disrepute was the role played in the drawing up of the bill by International Plant Breeders (a foreign lobby) and Agroceres (a private seed company). Under pressure, the Ministry of Agriculture announced the bill's indefinite deferment in August 1977 (International Plant Breeders closed its Brazilian office shortly after). At the time, Brazil was in the throes of a dictatorship (1964-1985). Without downplaying the key role played by mobilization in defeating the bill, Pelaez and Schmidt (2000) suggest that the military government's national-developmental ideology and the fact that it saw food security as a strategic issue also played a role in the bill's demise.

Twenty years went by before plant variety protection was back on the table.

Much had changed in the two decades between the first unsuccessful attempt in 1977 and the passing of the Brazilian Plant Variety Protection Act (LPC) in 1997. The military dictatorship and its national-developmental ideology had been replaced by a democratically-elected, market-oriented, government (the LPC was passed under President Cardoso). Public breeding programs were weakened and transnational seed companies had entered the Brazilian market (and Brazilian politics) and were pressuring for strong plant patent as transgenic varieties were about to be introduced. Finally, the international context had changed; Brazil had given in to international pressures and signed into the TRIPS Agreement and UPOV. According to a seasoned observer, "the LPC was passed under international pressure and, internally, under pressure from agribusiness—that is large seed producers and multinational corporations that were entering Brazil at that time in the area of biotechnology and GE crops—they were the ones who needed the LPC."[99]

Among the groups who pushed for the LPC were the Brazilian Seed Producers Association (ABRASEM), the Brazilian Plant Breeders Association (BRASPOV) and the National Agricultural Confederation (CNA), with the tacit support of EMBRAPA. Opposition to the LPC was led this time by a caucus of the Workers Party, jointly with civil society organizations such as the Brazilian Institute for Consumer Protection (IDEC)[100], Consultancy and Services for Projects in

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[99] Interview with José Cordeiro de Araújo, Brasília (DF), 05/12/08. Specialist on the issue of agriculture and rural policy for the Chamber of Deputies, J.C. de Araújo has participated in the formulation of nearly every projects involving genetic engineering and seed legislation since the first biosafety bill in the mid-1990s.

[100] Founded in the aftermath of the military regime (1987), IDEC is Brazil's oldest and largest consumer protection organization.

Alternative Agriculture (AS-PTA) and Greenpeace.[101] As we can see, the locus of opposition to the bill had shifted from within the professional body of agronomists and elected officials (deputies, senators and politicians) to civil society. Civil society organizations were able to limit the scope of certain articles of the bill, but not to prevent its adoption (see diagram of the main actors in appendix B).

The introduction of plant variety protection did not put an end to the struggle. Indeed, as soon as the LPC was passed, the very groups who had pushed for its adoption pressed to amend it. Three bills aimed at modifying the LPC were discussed at the end of 2009. Two were sponsored by members of congress, while the third, broader in scope, came from the executive branch (in this case, the Ministry of Agriculture). These bills vary in the particulars, but share the same underlying goal: make the use of saved seeds more difficult, and tighten control and sanction mechanisms under the stated purpose of fighting smuggling, piracy and frauds in seed production and distribution. The objective is to amend the LPC so that patent protection is extended to products, and seed saving prohibited, with the exception of small farmers. The bill is not taking on small farmers' right to save seeds, for the time being, because large farmers represent a bigger economic loss for seed companies than small farmers. Moreover, doing so would be politically and economically costly—politically because small farmers are well-organized and vocal, and economically because they are spread out geographically on countless small properties, which complicates enforcement.

In the first bill (n° 2.325), the proposed amendments concern four articles of the law. By replacing, in a few key places, the expression *propagating material* by

[101] The Brazilian chapter of Greenpeace International was created in 1993.

"propagating material or the products of a crop grown from a protected cultivar", the bill extends protection to the production resulting from the use of the protected cultivar (Art. 9 and 37). This means that a farmer needs the breeder's authorization to sell his crop (Art. 10 and 37). This is a major change, since it means that a farmer effectively loses control over his harvest. Moreover, protection is extended not only to the cultivar's reproductive structures but to the plant as a whole and its parts (Art. 8), and to all activities involving the cultivar—production, reproduction, importation, exportation and storing (Art. 9) (ANA 2008). In short, the bill limits the right to save seed to small farmers and extends protection to farmers' production (Brasil/Câmara dos Deputados 2007b).[102] The second bill (nº 3.100) is slightly different: it also extends protection to products, and maintains the saved seeds exception for small farmers, but prohibits saved seeds under any circumstances for all other farmers (Brasil/Câmara dos Deputados 2008).

In June 2008, I attended a public hearing organized by the Agricultural Commission of the Chamber of Deputies to discuss the first of these two bill (nº 2.325).[103] All of the main parties involved were present that day: the two agricultural ministries (MAPA and MDA); industry, through the Brazilian seed producers and plant breeders associations (ABRASEM and BRASPOV) and the flower seed industry (ABPCFlor); agricultural unions (CNA and CONTAG); and small farmers, through AS-PTA and the National Articulation of Agroecology (ANA). While the text of the government bill is not yet public, its substance can be

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[102] The explicit aim is to bring Brazil's plant protection legislation into line with UPOV 1991. Brazil being a member of UPOV 1978, it would in that case exceed its international commitments.

[103] Public hearing on proposed revisions to the Law on Plant Variety Protection, Agricultural Commission, Chamber of Deputies, Brasília (DF), 06/17/08.

inferred from the Ministry of Agriculture's presentation at the public hearing. The Ministry of Agriculture opened by reminding that Plant Variety Protection had been introduced in the 1990s in Brazil in a context of government withdrawal, private sector incentives and new international commitments. It then listed what it considered a number of bottlenecks in the current plant variety protection legislation, including the limited number of species covered; the fact that breeders' rights were limited to propagative material (as opposed to products); the existence of "own use" provisions; the fact that vegetative propagation was not covered with the exception of sugarcane; and that the term of protection (15-18 years) was insufficient. BRASPOV/ABRASEM, CNA and ABPCFlor also came out in favour of strengthening plant breeders' rights, with a few differences: BRASPOV/ABRASEM did not support extending protection to production, and CNA and ABPCFlor argued for eliminating "own use" provisions altogether. On the other side, the CONTAG representative took position in favor of maintaining the existing legislation, arguing that seed was a strategic sector from which the government should not withdraw. The representative of the Ministry of Agrarian Development (MDA) reminded the meeting that the solution to the problem that the bill set out to solve—the decline in the use of certified seeds—was not tighter legislation but more effective control and enforcement of the existing legislation. Finally, AS-PTA pointed out that the cost of seeds had increased by 246 percent between 1994 and 2006, and that further restricting farmers' rights would represent a breach of Brazil's commitment under the FAO Treaty on Plant Genetic Resources for Food and Agriculture.

As of July 2008, the two bills were under review by the Agriculture Commission of the Chamber of Deputies. The rapporteur was awaiting the third bill,

elaborated by the executive and expected any time now, to issue an appreciation of all three bills. After the Agricultural Commission, the bills will go to other Commissions of the Chamber of Deputies and then to the Senate.

The Revised Seed Act (2003)

Among the reasons that prompted the revision of the Seed Act was the need to adjust it to the various changes to plant legislation introduced in previous years, particularly the LPC. The first Seed Act was passed in 1965 and revised in 1977 (Brasil 1965; Brasil 1977). It set up a system for the private certification of seeds and strengthened control over seed production and commercialization. As was the case for the LPC, proponents of changes to the Seed Act invoked the need to fight smuggling, piracy and fraud in seed production. Prior to the introduction of RR soybeans, Brazil had a fairly well-structured commercial seed sector. However, widespread seed smuggling of RR soybeans combined with the rapid expansion of soy plantations (mostly in the centre-west region) led to a marked decrease in the use of commercial seeds starting in the 1990s. In this context, the commercial seed sector pushed to revise the Seed Act in an attempt to make the use of non-certified seeds more difficult. Critics pointed out, however, that the solution to the problem lies in the effective implementation of existing norms and regulations by the relevant governmental body (the Ministry of Agriculture), rather than in amending the existing legislation to further restrict farmers' rights (ANA 2008).

One of the main changes introduced by the revised Seed Act was to allow accredited private companies to certify seeds, previously a prerogative of the Ministry of Agriculture (Londres 2006). Seed categories were also modified, so that

certified seeds (C1 and C2) could only give way to two generations (S1 and S2), after which certified seed producers would have to return to the owner of genetic material to obtain basic seeds (Brasil 2004b). The result has been to strengthen the latter's position and increase dependence on them.

On the other hand, the 2003 Seed Act includes a series of specific provisions for family farmers, land reform settlers or indigenous people. One highlight of the bill is the recognition of local, traditional or 'crioula' varieties (*cultivar local, tradicional ou crioula*) as varieties:

> developed, adapted or produced by family farmers, land reform settlers or indigenous people, with well-determined phenotypic traits that are recognized as such by the respective communities and which, in the understanding of the [Ministry of Agriculture], and considering sociocultural and environmental descriptors, are not substantially similar to commercial cultivars (Brasil 2003a).

At the same time as it recognizes their existence, however, it puts restrictions on their circulation. The regulatory decree establishes strict conditions under which seeds for one's own use (*sementes para uso próprio*) can be used, but specifies that this does not apply to "family farmers, agrarian reform settlers and indigenous people who multiply seeds or seedlings for distribution, exchange or commercialization among themselves (Art. 115)" (Brasil 2004b). Notwithstanding these constraints, these provisions were hailed as a victory by small farmers' organizations.[104] Their inclusion were a direct result of the latter's participation in the process of elaborating the law.

In sum, the changes brought to the Brazilian legislation in the last ten years or

[104] The latter could no longer count on the unfailing support of the Workers Party's agricultural caucus, which was somewhat constrained now that the Workers Party formed the government.

so—from the revision of the Intellectual Property Act in 1996 to the introduction of the Plant Variety Protection Act and revision of the Seed Act—reveal a double shift toward the privatization of plant breeding and the strengthening of intellectual property rights in plants. This shift reflects a global trend, but is more drastic in countries like Brazil, which did not offer protection for breeders' rights in the first place. In this process, farmers' rights are being increasingly marginalized. During the same period, another innovation—this time in the realm of private law—further restricted farmers' rights.

Technology Stewardship Agreements

First introduced in the United States in 1996, Monsanto's legally-binding Technology Stewardship Agreement (TSA) radically altered the circulation of seeds and, indeed, the very nature of farming. This agreement is signed by farmers upon the purchase of patented seeds. It represents a significant departure, because it means that farmers no longer *own* the seeds; they have a *limited license to use* the seeds purchased, and they have to commit to using the seeds for a single commercial crop, and not to save or give seeds away. This development is in keeping with Rifkin's argument that capitalism is increasingly based on trading *access* to goods and services, as opposed to commodities (Rifkin 2000).

In *Lords of the Harvest*, Charles (2001) tells the story of how Monsanto's TSA came about. In the early days of genetic engineering, Monsanto licensed its genes to seed companies in exchange for a lump sum payment, in effect ceding control over them. For example, in 1992, Monsanto gave Pioneer the right to use the Roundup resistance genes in its soybean varieties forever in exchange for a one-time

payment of half a million dollars (Charles 2001:120). Monsanto then came up with a more profitable scheme: having farmers pay a technology fee to Monsanto, "in effect buying the new genes in a separate transaction from the seed purchase" (Charles 2001:152). In this way, Monsanto is licensing its genes directly to each farmer. This allows the firm not only to retain control over pricing, but to enforce a ban on seed saving. In order for this scheme to work, seed companies that had already acquired rights to Monsanto's genes had to agree to give them up, which they did, largely because it took them out of the line of fire (royalties could provoke resentment among farmers) while still guaranteeing them a share of the technology fee.

I focus on Monsanto because it was the first to introduce such agreements, but other companies followed suit. While the specifics of each agreement vary, the broad lines are the same (these agreements are also called licensing, grower or technology use agreements). By signing the TSA, farmers enter into a contractual relationship with the company that gives them a "limited license to use" the seeds purchased in exchange for the payment of royalties, but "Monsanto retains ownership of the Monsanto Technologies including the genes… and the gene technologies" (Monsanto 2005). Farmers accept the terms of the TSA by signing it or simply by opening a bag of Monsanto's seed. The agreement stipulates that farmers commit to using the seeds for a single commercial crop, and not to save or give seeds away. Farmers also commit to using only Monsanto approved chemicals. Farmers who sign the agreement waive all of their rights under the Federal Privacy Act, and must allow Monsanto full access to their records and invoices for all seed and chemical purchases, and allow Monsanto to copy any relevant receipts and documents, as well as allow the in-field inspection of their crops. There is no time

limit to the contract: Monsanto can review a farmer's documents, fields and crops even after the farmer has stopped growing Monsanto's seeds. If Monsanto believes that a farmer is violating the contract, it will seek to collect damages and attorneys' fees and costs from farmers, and all legal disputes will be settled in St. Louis, Missouri (Monsanto's headquarters), regardless of where the farmer lives (Moeller and Sligh 2004). Finally, the agreement prohibits growing the crops for research purposes. Scientists who want to conduct research must therefore seek permission from seed companies. The latter often deny permission outright, or insist on reviewing any findings before they are published (Pollack 2009).

With the combination of new intellectual property rights legislation and TSAs, Monsanto secured effective patent rights over genetically engineered seeds. Enforcing them, however, would prove far more difficult.

The Criminalization of Seed Saving

Monsanto has gone to great lengths to enforce TSAs and prevent farmers from saving seeds of genetically engineered varieties. Its practices have been well-documented in North America.[105] They include hiring investigative agents (often recruited among former policemen)—known among farmers as the seed or gene police—to take samples on farmers' properties; setting up a toll-free number where farmers can anonymously report neighbours for growing seeds without authorization; and suing farmers for the "unauthorized use of its patented technology."

These practices can be highly intrusive. Farmers have reported cases where Monsanto flies a plane over a farmer's field (without the latter's knowledge, let

[105] See Center for Food Safety (2005), Barlett and Steele (2008), Snedegar (2009).

alone his authorisation) and sprays Roundup herbicide. It then comes back a few days later: if the area spread is intact, the farmer is growing a RR variety (tolerant to Roundup) and will likely be sued. If the area is destroyed, then he is not growing a RR variety; he will not be sued, but neither will he be compensated for the loss of his crop. One of the most disquieting aspect of the Schmeiser v. Monsanto decision was the implication that Monsanto's intellectual property rights extend to contaminated crops. In fact, farmers who sign the TSA contract accept all liability and responsibility for keeping genetically engineered crops out of markets, elevators or other farmers' fields that do not want or allow them (Moeller and Sligh 2004). These practices are starting to be questioned in the United States. In September 2008, the State of California passed a law to protect farmers whose crops have been contaminated by GE seeds or pollen from being prosecuted for patent infringement. Among other things, it prohibits biotech firms from taking samples of farmers' crops without their explicit consent (U.S. California State Assembly 2008).

According to a report from the Centre for Food Safety, as of October 2007, Monsanto had filed more than a hundred lawsuits against farmers for "alleged violations of its Technology Agreement and/or its patents on genetically engineered seeds" (also known as patent infringement) (Center for Food Safety 2007). Of these, fifty-seven resulted in damages awarded to Monsanto, for a total of over 21,6 million dollars. Another twenty-four resulted in out-of-court settlements (whose texts are confidential); the majority of farmers, even if they believe the lawsuit unfounded, choose to settle out-of-court to avoid a lengthy lawsuit against a multinational with

teams of experienced lawyers—and potential bankruptcy.[106] One cannot help but note the irony of a company suing its own customers. Scott Baucum, Monsanto's chief intellectual property protector, is reported as saying that "we [Monsanto] have to balance our obligations and our responsibilities to our customers, to our employees and to our shareholders", an interesting statement on the nature of shareholder capitalism (Associated Press 2005). On its website, Monsanto answers the question "Why Does Monsanto Sue Farmers Who Save Seeds?" as follows:

> Monsanto does become aware, through our own actions or through third-parties, of individuals who are suspected of violating our patents and agreements. Where we do find violations, we are able to settle most of these cases without ever going to trial. In many cases, these farmers remain our customers. Sometimes however, we are forced to resort to lawsuits. This is a relatively rare circumstance, with about 120 lawsuits having been filed within the last decade. Less than a dozen cases required a full trial. In every one of these instances, the jury or court decided in our favor. [www.monsanto.com Accessed May 20, 2009]

The surveillance techniques deployed by Monsanto in its attempt to micromanage farmers' activities are having pernicious effects. The resulting climate of suspicion and denunciation is trying for farming communities; many farmers report how these practices are destroying the very social fabric of their communities by sowing fear and mistrust among neighbours.[107]

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[106] The remaining lawsuits were either dismissed (13) or in progress (18) at the time the report was published.

[107] There are many testimonies to this effect, but little has been published. For a rare discussion of the impact of biotechnology on the social fabric of farming communities, see Mehta (2005).

Monsanto's Dual Remuneration System

Monsanto's North American scheme did not fare well in Brazil. Contrary to other countries, like Canada and the United States, where royalties on GE seeds were introduced without much ado, in Brazil, royalties proved to be highly controversial, not only among opponents of transgenic seeds, but also among farmers who grow transgenic varieties.

As long as transgenic crops were grown illegally, Monsanto could not collect royalties. However, starting with the 2003/2004 harvest, it has been charging a technological fee as an "indemnity for the unauthorized use of a patented technology" despite the judicial moratorium. In a notice to soy growers published in major newspapers in September 2003 (Appendix N), Monsanto stated:

> Considering that the sowing of soybeans will start within a few weeks, Monsanto notifies that the planting of Roundup Ready Soybeans® (transgenic soy) **continues to be suspended in accordance with the September 8, 2003 decision of the TRF** [Regional Federal Court].
>
> Regardless of the approval process, farmers who plant Roundup Ready Soybeans® **will have to pay for use of technology when they commercialize their production.**

Monsanto was legally entitled to collect royalties for the first time in the 2005/2006 harvest, that is after the passing of the revised biosafety bill. It moved swiftly to introduce royalties in the first weeks of July 2005, at a time of year when farmers buy seeds for planting. By then, the practice of saving seeds was widespread among farmers growing RR soybeans, and the attempt to introduce royalties met with fierce resistance. The coalition that pushed for the approval of RR soybean split over the issue of royalties, and some of Monsanto's commercial partners denounced

its claims as abusive. This coalition was formed, in addition to Monsanto, by the Brazilian Seed Producers Association (ABRASEM), major plant breeders, and large farmers' organizations such as the National Agricultural Confederation (CNA) and the Agricultural Federation of Rio Grande do Sul (FARSUL).[108] ABRASEM, for example, initially warned: "all seed producers who received or will receive a copy of the Monsanto contract should consult their lawyers before signing it… because… many elements are legally incomprehensible" (Reis 2005). Following further negotiations, ABRASEM gave in, apparently in exchange for a slightly greater share of the royalties, but farmers remained mobilized (Reis 2005). Caught between Monsanto's pressure to have its patent rights enforced and farmers' staunch opposition to forfeiting the right to save seeds, the federal government issued a series of decrees temporarily authorizing farmers to save and replant RR soy seeds.

As Monsanto soon came to acknowledge, the North American scheme was simply not practicable in Brazil, where plant protection is a recent fact, seed saving practices are deeply rooted, and farmers' organizations vocal. In a context where seed saving is more widespread, Monsanto simply did not have the means to investigate or prosecute each and every farmer. Moreover, such practices would certainly have backfired and unleashed a backlash against the company. In any event, Monsanto did not have enough seeds to supply the Brazilian market at the time RR soybeans were authorized (Stroud 2005).[109]

In this context, Monsanto came up with a different strategy, a "dual

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[108] FARSUL – the Agricultural Federation of Rio Grande do Sul – represents the interests of large farmers and landowners.

[109] According to a farmers union representative I interviewed, this will go on as long as Monsanto is not able to meet the demand for RR soybean seeds; when it does, it will enforce the payment of royalties through the rural credit system.

remuneration scheme" that was unique worldwide at the time it was implemented. It combined *royalties* on the sale of seeds with a *technological fee* on the sale of grains. The dual remuneration scheme is a shrewd system: the farmer who does not pay royalties at the time he purchases the seeds is forced to pay them when the time comes to sell his grains. It is dependent on seed companies' collaboration; while farmers are required to sign a contract with Monsanto (as their North American counterparts do), the seed producers are ultimately responsible for collecting royalties from farmers. The contract stipulates that the seed producer "agrees to act on behalf of Monsanto as its representative vis-à-vis soy producers" to "implement the licensing of RR technology found in RR seeds used by soy producers in their fields; this includes a commitment, on the part of the seed producer, to collect royalties from soy producers and pay them to Monsanto" (Monsanto n.d.).[110] This involves implementing a computerized system to keep track of farmers' seed purchases and the commercialization of grain. In fact, much of the 25-page contract consists in a detailed description of the implementation conditions.

The contract covers "intellectual property rights related to the gene sequence that confers soybean resistance to glyphosate-based herbicides" (otherwise known as RR technology). It stipulates that Monsanto's rights extend not only to "the production and commercialization of RR seeds" but to "the planting and commercialization of RR soybeans." This is an important statement, since it means that Monsanto's rights extend not only to the seeds purchased, but to farmers' production. The contract goes on to state that "given that it is common among soybean producers to save seeds for sowing or planting," Monsanto intends to collect

[110] All quotes in this section are taken from the contract; translations are my own.

royalties at the time of the acquisition of seeds as well as for the authorization to use reserved seeds. *Reserved seeds* is the expression used by Monsanto to refer to soy seeds saved by soy growers for their own use, that is for planting. Royalties are defined as "Monsanto's remuneration value for RR seeds acquired by soy producers and/or for the use of reserved seeds by soy producers" and their value for the 2005-2006 harvest is set at R$0.88 per kilo of seeds [CAN$0.40] (Art. 4.2).[111] However, to allow the seed producer to "offer incentives for soy producers to purchase RR seeds… Monsanto authorizes the producer to grant a discount on the value of Royalties, limited to R$0.38 [CAN$0.17] per kilo of RR seeds" (4.2.1). In other words, the seed producer is free to forego his share of the profit as long as it guarantees Monsanto's (R$0.50, or CAN$0.23). At the time (2005), a kilo of soybeans seeds was between R$1.70 and R$2.00 [CAN$0.77 and CAN$0.91], so the technological fee represented a 44 to 52 percent increase (Reis 2005).

Here is how the system works in practice: when a farmer goes to the grain processor to sell his grains, he is asked to show a receipt for the purchase of the seeds (that is, evidence that he has paid royalties). A technician trained by Monsanto tests the grain to see if it contains the RR gene. If the test is positive and the farmer cannot show a receipt for the purchase of RR soybeans, he has to pay an extra fee calculated as a percentage of his production. Currently set at two percent of the value of RR soy at the point of sale, it is higher than royalties (1.05 percent), thus acting as a deterrent (Monsanto also refers to this technological fee as an "indemnity for the unauthorized use of a patented technology"). Moreover, the farmer who has paid

[111] Drought and the falling price of soy on the market forced Monsanto to revise its claims downwards.

royalties is entitled to a certain production (for example, 69 kilos of grain per kilo of seeds purchased), and a technological fee is charged on any grain in excess of this "production waiver" (*crédito de isenção*). This production waiver is based on average productivity for conventional soy in each state (which contradicts the argument that GE varieties are more productive) (Safras 2005).

Finally, the value of the technology fee paid by seed producers for the right to produce RR soybeans was set at R$0.20 by kilo of planted seeds, which represents 36.76 percent of the seed production costs. In contrast, the technology fee paid to EMBRAPA for the right to produce conventional cultivars represents on average 3.34 percent of the seed production costs (Reis 2005). It must be stressed that this royalty collection system is unique worldwide. As a rule, royalties are collected on seeds only, and there is some legal debate on whether intellectual property rights extend to farmers' production.

The overhaul of the Brazilian intellectual rights legislation in the last decade has left some issues unresolved. Hence, the Brazilian Plant Variety Protection Act (LPC) and the Intellectual Property Act conflict with regard to seed saving or reproduction. While Article 10 of the LPC guarantees farmers' right to save seeds for their own use, this is prohibited for genetically engineered varieties under the Intellectual Property Act and Technology Stewardship Agreement (TSA). The LPC is "the sole form of protection in [Brazil] for plant varieties" (Art. 2) and plant varieties are excluded from patenting under the Intellectual Property Act. However, a patent on a GE gene or process gives the patent owner *de facto* rights over the plant that incorporates the said gene or process, leading to a form of virtual patenting.

The prohibition of seed saving has been questioned in the courts on several

occasions since 2005. In their decisions, the judges have tended to recognize the legitimacy of the royalty collection system, suspending the right to save seeds when it comes to transgenic varieties (Reis 2005; n.d.). In one case, the Judge ruled that:

> Bill n^{o} 9.456/97, Article 10, which regulates intellectual property in plant varieties specifically, does not apply; indeed, even if this bill voided the rights guaranteed by the Intellectual Property Act, which is quite arguable, it could only apply if the producer had paid royalties when he first acquired the seeds; this is obviously not the case, since it is public knowledge that all transgenic soybean seeds entered the country illegally, and were not commercialized by the defendant who, for this reason, did not charge royalties. [Reis 2005]

In this case, the Judge ruled that farmers' right to save seeds did not apply because royalties had not been paid, but left open the question of whether farmers' rights would take precedence in cases where seeds are acquired legally.

Royalties and technological fees continue to be challenged in the courts. In March 2009, three rural unions from the State of Rio Grande do Sul (Passo Fundo, Santiago, Sertão) brought a class action against Monsanto. The rural unions were demanding soy growers' right to save the product of soy cultivars for replanting on their properties; to sell the production as food or raw material; and to give or exchange seeds without having to pay royalties, indemnities or fees. A preliminary ruling determined that the sum at stake be deposited in court pending a decision. However, in May, a state court upheld royalties on RR soybeans (AS-PTA Bulletin 438 and 440; Canal Rural 2009a, 2009b, 2009d; Athayde 2009).

In August 2008, Monsanto announced that it would increase the value of royalties by 17 percent, from R$0.30 [CAN$0.20] to R$0.35 [CAN$0.23] per kilo of certified seeds (Safras 2008). According to the Seed Producers Association of Rio Grande do Sul (APASSUL), this represents more than R$28 million [CAN$18

million] in income from royalties for Monsanto for the soybean area planted with certified seeds (approximately 40 percent of the total soybean area). For the RR soybeans area planted with seeds produced by farmers, Monsanto will receive an additional R$86 million [CAN$57 million] in technological fees.[112] In addition to this, there is the revenue from the sales of Roundup herbicide, a Monsanto brand whose price has gone up in recent year. Roundup's U.S. patent expired in 2000, and there now exist many generic products. It nevertheless remains an important source of revenue for Monsanto, since farmers growing Monsanto's transgenic varieties are contracted to use Roundup and not a cheaper generic brand. Moreover, Monsanto remains one of the main producers of glyphosate, the active ingredient in both Roundup and generic products. If one sums up royalties, technological fees and the sales of Roundup, this represents well over R$100 million [CAN$66 million] in revenue for Monsanto for the 2008-2009 harvest in Rio Grande do Sul (Canal Rural 2009c).

Concluding Remarks

In the neoliberal era, biotech firms were able to capitalize on technological developments by shaping legal regimes to suit their commercial interests. Brazil is a case in point: in the space of two decades, the legislation governing intellectual property rights in plants has rapidly evolved from a flexible legislation to one that confers plant breeders extensive patent rights. In this process, an age-old practice at the heart of agriculture—seed saving—is increasingly being marginalized (and, in some instances, criminalized). In the next chapter, I examine how these

[112] These figures are based on an average production of 2,400 kilograms/hectare and on a sale price of R$45 [CAN$30] per 60-kilogram bag.

developments have prompted the emergence of a movement in defence of farmer-selected seeds.

CHAPTER 4

THE MOVEMENT IN DEFENSE OF FARMER-SELECTED SEEDS

Biotechnology holds both promise and perils. It is crucially important that we preserve, and if possible expand, our capacity to generate alternatives as we explore the applications of this new technology…. We must not allow our options to be foreclosed by ceding to capital the exclusive power to determine how biotechnology is developed and deployed.

Jack R. Kloppenburg (2004)

Control over our own seeds is the first step toward food sovereignty.

Silvia Rodríguez (Genetic Resources Action International)

Family Farming in Southern Brazil

In a country where there are huge landed estates alongside large numbers of landless peasants, the Southern region of Brazil stands out for its strong family farming sector composed of privately-owned smallholdings. In 2006, a federal act established a national policy for family agriculture (Brasil 2006a). It defines a "family farm" as being run by the farmer's family, using mainly family labour as opposed to hired labour. In order to avoid the inclusion of unproductive large estates (*latifúndios*) in this category, it also establishes a limit to the size of the property. In the Southern region, the maximum area is 280.5 hectares and family farms average 21 hectares (INCRA/FAO 2000:73,18). With few exceptions, the family farmer is also a small farmer.[113] Family farming represents 90.5 percent of the farms in the region and over 900,000 farmers, and occupies 43.8 percent of the area (INCRA/FAO 2000:16). It is responsible for 57 percent of the regional gross

[113] In Brazil, small farmer (*pequeno agricultor*) and family farmer (*agricultor familiar*) are used interchangeably, and correspond to the English term *smallholder*.

production value and employs 84 percent of the agricultural workforce (INCRA/FAO 2000). The average monthly revenue in rural areas is R$352 [CAN$176] (compared to R$230 [CAN$115] nationally) (DIEESE and NEAD/MDA 2006).[114] The most important cash crops are soybeans, corn, rice, manioc (or cassava), wheat, sugar cane, grapes, potatoes, oranges, apples, tobacco, beans, onions and bananas (www.saa.rs.gov.br Accessed May 9, 2008).

The continued importance of family farming in Southern Brazil can be explained in large part by the region's colonization process. The region did not experience a plantation economy and large-scale slave labour as in the Northeast and Southeast.[115] Moreover, at the turn of the 20th century, the government encouraged the influx of European immigrants—mostly German, Italian and Polish. These immigrants came through government-sponsored colonization projects and received small plots of land on which they established themselves as smallholders. With time, the descendants of these immigrants moved out of Rio Grande do Sul into the Western region of the neighbouring state of Santa Catarina in search of lands.

Historically, family farming has been confined to marginalized environments, characterized by rugged terrain and relatively infertile soils. Small farmers also have limited access to credit and technical assistance; while they are responsible for 40 percent of the total net production value, they take out only 25 percent of agricultural loans, and fewer than 30 percent of them receive technical assistance (Dal Soglio et

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[114] The "average monthly revenue" refers to the average gross monthly income of the family living on the farm from various sources (farm activities, equipment rental, social benefits, etc.). For the sake of comparison, the minimum wage in 2009, calculated on a monthly basis, amounts to R$465 [CAN$282].

[115] Though slavery did exist in Southern Brazil, it was not used on a large scale there as it was in the coffee and sugar plantations of the Northeast and Southeast.

al. 2007). Even so, small farmers in the Southern region are better off on all these counts (size of properties, access to credit and technical assistance, productivity, farm income, etc.) than in the other regions of the country.

Because family farming is oriented toward subsistence and because of its low level of capitalization, it is often seen, erroneously, as backward and unproductive. Recent studies have shown that the family farming sector provides up to 70 percent of internal food consumption nationally (MDA 2008:5). In the South, family agriculture produces a large percentage of basic foodstuffs such as beans (67 percent), cassava (89 percent), poultry (70 percent), pork (60 percent) and milk (56 percent) (MDA 2008:5). In Rio Grande do Sul, a recent study showed that family agriculture accounted for 27 percent of the State's GDP, compared to 23 percent for agribusiness (*agricultura patronal*) (FIPE/USP 2005:3). According to INCRA/FAO (2000:20), it is also more efficient and socially productive: family farmers in Southern Brazil produce on average R$241/hectare per year [CAN$193], as compared to R$99/hectare [CAN$79] for agribusiness,[116] and, with 30 percent of the agricultural area, they employ 77 percent of the agricultural workforce nationally. In the South, this figure is even higher (86 percent); stated differently, family farmers occupy one person per 7 hectares, while agribusiness occupies one person per 48 hectares (INCRA/FAO 2000:23,26).[117]

In spite of its importance in terms of internal food production and workforce employment, the family farming sector has been systematically neglected by public policies oriented to agribusiness. A timid step in remedying this historical bias has

[116] For Brazil as a whole, these figures are R$104/hectare [CAN$83] versus R$44/hectare [CAN$35].

[117] Mostly relatives, as opposed to hired labour.

been the creation of the Ministry of Agrarian Development (MDA), in 1999, to promote public policies for landless peasants, small farmers and descendants of runaway slave communities—a task that would have proven difficult, if not impossible, within the Ministry of Agriculture, historically geared to the interests of agribusiness and large landowners. The new ministry was created following the murder of 19 landless peasants by the Military Police in Eldorado dos Carajás, in the State of Pará (Amazonia), on April 17, 1996.[118] In the aftermath, the Minister of Agriculture resigned and a new Ministry of Agrarian Development (MDA) was created. When the Workers Party was first elected in 2002, there was expectation among civil society that the two ministries might be merged, but this did not materialize (von der Weid 2006:98). In the first decade of its existence, the MDA has taken a number of praiseworthy initiatives, without nevertheless altering the prevailing correlation of forces within government and society. The two ministries continue to exist side by side, with all the contradictions and inconsistencies that this involves.

The family farming sector is represented nationally by the National Confederation of Agricultural Workers (CONTAG), the Family Farming Workers Federation (FETRAF) and the Via Campesina. In Brazil, the global peasant coalition Via Campesina is represented by the Landless Rural Workers Movement (MST), the Peasant Women's Movement (MMC), the Small Farmers Movement (MPA), the Movement of Dam-Affected People (MAB)[119], the Brazilian Federation of Agronomy Students (FEAB) and the Catholic Church Rural Youth Pastoral (PJR).

[118] At Via Campesina's initiative, April 17 has since become International Peasant's Struggle Day.

[119] Movement formed in 1991 by small farmers to oppose land expropriations for the construction of hydroelectric dams.

While CONTAG and FETRAF represent the institutionalized union movement[120], Via Campesina represents rural social movements (see diagram in appendix B). As a result of the action of rural unions and social movements, negative images of family farming seem to be receding, giving way to positive views of family farming as generating jobs and ensuring healthy rural economies, as ecologically sound, producing quality food, and preserving biological and cultural diversity as well as rural landscapes.

The Green Revolution and its Critics

In the 1970s, Brazil's military regime embarked on an agricultural industrialization project with the backing of U.S. philanthro-capitalist institutions such as the Rockefeller foundation. A tri-dimensional system based on agricultural research, extension and credit was set up. The Brazilian agricultural research corporation (EMBRAPA) was created in 1973 to conduct agricultural research and develop cultivars adapted to the different Brazilian biomes.[121] A decentralized network of agricultural extension called EMATER (Technical Assistance and Rural Extension Enterprise) was to bring the new technological packages—high-yield varieties, pesticides and chemical fertilizers—to farmers. Finally, access to subsidized rural credit programs was made conditional on the adoption of high yield varieties (Garcia 1998:220). Government subsidies and incentives also brought about

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[120] CONTAG was founded in 1963 and represents all rural workers (family farmers, waged rural workers and land reform settlers. FETRAF, founded in 2005, is affiliated to the Central Workers Union (CUT) and represents family farmers.

[121] The five Brazilian biomes are: Atlantic Rainforest (*Mata Atlântica*), Amazon, Pantanal, Cerrado, Caatinga and Pampa.

the formation of an agroindustrial complex for the production of agricultural equipments and inputs (Dal Soglio et al. 2007; Teixeira 2005).

The Green Revolution has been described as a movement of "conservative modernization" by its critics. Founded on high-yield varieties, chemical fertilizers, pesticides and irrigation, it benefited farmers who were well-off, but proved wholly inadequate to resource-poor farmers. The Green Revolution did lead to sharp increases in the productivity of crops such as rice, corn and wheat, but did so mostly for prosperous farmers working in high potential agricultural areas (e.g. better quality soils and irrigated lands) and having access to inputs such as fertilizers and agrochemicals. Moreover, high-yield varieties were responsive to inorganic fertilisers and chemical pesticides, whose increased use engendered a slew of environmental problems, felt most severely by resource-poor farmers, including soil impoverishment, contamination of water resources by chemical fertilizers and pesticides, pesticide poisoning and pest infestation caused by growing pest immunity to pesticides. These resource-poor farmers could not afford the high cost of inputs, and this led to indebtedness, land concentration and rural exodus. Millions of people swelled Brazil's urban shantytowns in the 1970s, the decade in which the Green Revolution came into full force, contributing decisively to Brazil's explosive urban problems. Finally, despite increases in productivity, the emphasis on agricultural exports and the rural-urban migration of people who were previously self-sufficient (and producing food surpluses) meant that the Green Revolution failed to ensure the food security of the populations of developing countries.[122]

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[122] Exports of food to developing countries increased fivefold between 1970 and 1990 (Gliessman 2000:10f).

Another unfortunate consequence of the Green Revolution was that, by concentrating on a few varieties, it displaced a large number of traditional varieties, resulting in the erosion of crop biodiversity (Fowler and Mooney 1990). This process can be rapid—a variety can disappear within a generation—and it is irreversible. When a variety disappears, it disappears for good, and with it the knowledge about its cultivation, reproduction and uses. In Brazil, the impact was particularly severe in the case of corn, with the introduction of a limited number of hybrid varieties displacing a wide range of farmer-selected varieties (as we will see below, Brazil is a center of diversity for corn).

The Green Revolution's penetration in Brazil has been uneven. As a rule, the more marginalized the farming communities, the later was the introduction of Green Revolution practices and the lesser their impact. In the mountainous region of Santa Catarina, for example, some farmers were starting to experiment with hybrid corn in the mid-1980s (hybrid corn was introduced in Brazil in the 1970s). At the time, the Green Revolution had made only timid incursions in the region, and had not yet had a significant impact. It is in the farming communities "bypassed" by the Green Revolution that the greatest diversity of farmer-selected varieties is found today.

Contesting the Green Revolution: the Emergence of Alternative Agriculture

At first, small farmers' organizations embraced the Green Revolution and pressed for its democratization: in addition to land reform and welfare rights, they demanded access to agricultural credit and to the collective purchase of chemical fertilizers (Tardin et al. 2004:45). By the 1980s, however, it became clear that industrial agriculture was not holding its promises of improved income and living

standards. Quite the opposite, in fact: the 1980s were marked by soaring levels of impoverishment and indebtedness, the depletion of natural resources and rural-urban migration. While the roots of the social and economic crisis in the countryside predate the Green Revolution, the latter clearly exacerbated it.

On the national scene, the crisis was also taking its toll on the military regime, which fell into disrepute amidst galloping inflation and exploding foreign debt. This allowed the re-emergence of rural movements quelled by the 1964 coup. The first land occupations that led to the founding of the Landless Rural Workers Movement (MST), in 1984, were carried out in the State of Rio Grande do Sul in 1979-1980. The Women Farmers Movement, today the Peasant Women's Movement (MMC), emerged in the neighbouring State of Santa Catarina at about the same period (1981).[123]

These movements developed in close relationship with the progressive sectors of the Catholic Church (and, to a lesser extent, the Lutheran Church). After initially supporting the 1964 coup in the name of anticommunism and the fight against corruption, the Catholic Church became increasingly critical of the human rights abuses committed by the military regime (Aquino 2002:709). The progressive forces within the Brazilian Church gained strength after the 1968 Latin American Bishops Conference (CELAM) endorsed the "preferential option for the poor."[124] Also known as liberation theology, the latter called for the Church to become actively involved in promoting social justice and the democratization of religious authority and institutions. An interesting mix of Christian faith, Marxist economic

[123] For a historical overview of peasant struggles in Brazil, see Martins (2002).

[124] It is important to note, however, that even at its height, liberation theology remained a minority trend within the Catholic Church (Benassar and Marin 2000:456).

analysis and Paulo Freire's *Pedagogy of the Oppressed*[125], it was aimed at fostering a critical consciousness that would lead to individual emancipation and social change. Liberation theology found its most fertile breeding ground in Brazil, where, unlike in other Latin American countries, it had the support of the episcopal hierarchy through the National Bishops Conference of Brazil (CNBB) (Benassar and Marin 2000:452). The Pastoral Land Commission (CPT), in particular, played a key role in the emergence of rural workers union, community associations and other informal organizations (Tardin et al. 2004:45). This made the Catholic Church an ally of choice for social movements. Under the military dictatorship (1964-1985), the Church became a refuge for civil society groups—students, political opponents, unionists—who were repressed or simply banned. Numerous social activists were initiated to political activism in Church-related activities[126]; with re-democratization[127], many of them left to join unions, political parties, and social movements or to found NGOs.

A number of small non-governmental organizations (NGOs) founded during the redemocratization process were aimed at providing technical support to small farmers as regards alternative agricultural practices. Many of the NGOs which would later play a key role in the transgenics debate, such as Consultancy and Services for Projects in Alternative Agriculture (AS-PTA), originated during that period. These

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[125] This work was written by its author in exile in Chile in 1968 and was first published in Brazil in 1970, but Paulo Freire's ideas were widespread in Brazil in the 1960s.

[126] This is the case, in particular, of the Landless Rural Workers Movement (MST), of which several prominent leaders were formed in Catholic seminaries. See Löwy (2001)

[127] In Brazil, the redemocratization process was characterized by a lengthy transition that started with the granting of political amnesty and political party reform (1979), and culminated with the promulgating of a new Constitution (1988) and the first presidential elections the following year.

agro-environmental NGOs were typically founded by "dissenting" agronomists and agricultural technicians, who combined technical knowledge of alternative agricultural practices with a sociopolitical critique of the dominant agricultural paradigm. They linked technical assistance with political activism in support of farmers' autonomy, the development of new forms of solidarity and the promotion of family agriculture (Almeida 1999). One of these NGOs was to play a key role in the issue of seed crop biodiversity and later transgenics. The Alternative Technologies Project (PTA), originated in 1983 as a project of the Federation of Social and Educational Assistance Organizations (FASE), one of Brazil's oldest NGOs. The project was originally aimed at forming a technical assistance team that would work jointly with rural communities to find solutions to the problems experienced by recently-created land reform settlements. With time, PTA developed a critique of the dominant agricultural model and became a fierce advocate of alternatives to industrial agriculture. It advocated "the need to break with the technological-scientific paradigm that organizes the official systems of production and dissemination of knowledge in the field of agriculture" (Petersen 2006). It states in one of its early document that alternative agriculture ought to become "an instrument in small farmers' struggle to remain on their land… an aid for agrarian reform… a tool to support rural grassroots movement, another weapon for the defence of their economic and political interests" (quoted in Almeida 1999:86).

The PTA's approach was grounded in practice. It advocated a participatory methodology that placed the farmer at the center of the process. In contrast to the top-down, "diffusionist" approach characteristic of rural extension or conventional rural development, the PTA argued that the farmer ought to be the agent of

development; in this view, NGOs were merely a catalyst. In practical terms, this meant working together with farmers to identify alternative technologies and then disseminate these among farmers' communities. Later, the need for a more systematic approach led to the implementation of local agroecology programs. In the words of one of the organization's founders, they moved from a "technology development and dissemination" approach to a "dissemination of technology development" approach, one in which "it is not technology that is being disseminated, but the experimentation process, seen as a dynamic social mobilization of old and new knowledge, of farmers' empirical experience and scientists' knowledge" (von der Weid 2006:96). This methodology was also innovative in that it brought together social and environmental concerns in an approach in which the conservation of biodiversity was seen as indissociable from local development. Finally, central to this approach was farmer's autonomy and the search for new forms of solidarity (Almeida 1999).

The project gradually evolved into a network of rural labour unions, small farmers' associations, NGOs promoting alternative agricultural practices and church organizations supporting family agriculture. It emerged first in the Southern and Southeastern regions, where the process of agricultural modernization was more advanced, and later expanded to the Northeast. In 1990, the PTA project broke away from FASE and became an autonomous non-governmental organization called Consultancy and Services for Projects in Alternative Agriculture (AS-PTA). By then, the AS-PTA network comprised 17 groups or organizations and was present in ten different states (Almeida 1999:87). Agroecological approaches tackled many problems, from soil management and fertilization to pest controls and seed

production. One of its main concern was the recovery of traditional varieties of many species like beans, corn, potatoes, rice, wheat and manioc (von der Weid 2006:97).

Pioneering Initiatives in Participatory Plant Breeding

From the beginning, seeds were a central concern for the alternative agriculture movement. The latter was concerned about the disappearance of farmer-selected varieties and farmers' growing dependency on seed companies, especially for corn. Moreover, some technicians working with small farmers noticed that hybrid corn did not perform that well. This was in part because hybrid varieties were ill-adapted to small farmers' growing conditions. What is more, in order to save on cost, some farmers bought seeds every two or three years instead of every year (hybrids' productivity decline after the first generation, which is why, in order to maintain the same levels of productivity, farmers have to go back to seed companies to buy new seeds every year). Technicians also observed that some farmers were obtaining good yields with local varieties. This led them to develop a strategy aimed at finding solutions to the problems of seed dependency based on two basic principles: farmers' participation and the valuing of local varieties (Cordeiro and Mello 1994).[128]

Corn was chosen because it is a staple crop cultivated on the vast majority of family farms, and characterized by great biological diversity and sociocultural value. Corn was first cultivated in Mesoamerica around 6,000 years ago, and from there spread to the rest of the Americas. In Brazil, there is evidence of the presence of corn in the Pre-Colombian period among the Guarani, Tupi, Kaingang and Xavante

[128] While my focus here is on Southern Brazil, there exists similar experiences in other regions, notably in the Northeast. See Almeida and Cordeiro (2002); Almeida and Freire (2003); Pinheiro and Peixoto (2004).

Indigenous people (Cordeiro and Mello 1994). But the great diversity of corn varieties found in Brazil today—and which makes it a centre of diversity for that species[129]—was developed in the course of the last century. From the 1930s onward, public agricultural research institutions[130] initiated corn breeding programs with local varieties that had been, for the most part, collected from small farmers. Improved materials were then reintroduced to farmer communities, who crossed them with local varieties and adapted them to their different agro-ecosystems, giving birth, within decades, to a large diversity of local corn varieties (Machado 2000).

Starting in the 1960s, however, there was a shift in the public corn breeding sector toward hybrids and seed marketing (Machado 2000). These hybrid varieties, and the intensive cultivation system of which they were part and parcel, were ill-adapted to family farming, with its unfavourable terrains and low level of capitalization. Moreover, the introduction of hybrid corn varieties was leading to the disappearance of farmer-selected varieties.[131] In the western region of Santa Catarina, for example, the vast majority of small farmers did not abandon local varieties. In the case of corn, however, the impact of hybrid varieties was drastic, and few families preserved local varieties (Canci and Canci 2007:220). In the face of this, some researchers and extensionists started working with family farmers to seek

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[129] A "centre of origin" is the geographical area where a plant species was first developed (whether in the wild or through domestication), while a "centre of diversity" is an area where, for various social and environmental factors, a plant species attains a high level of genetic variation. The two may overlap but are not always the same. See Fowler and Mooney (1990:27-37).

[130] For instance, EMBRAPA, Escola Superior de Agricultura Luiz de Queiroz de Piracicaba; Universidade de Viçosa; Instituto Agronômico de Campinas.

[131] There are several causes for the loss of traditional varieties: in the South, it was mostly a result of farmers abandoning them for Green Revolution varieties; in the Northeast, in contrast, loss of varieties is mostly due to the recurrent droughts (von der Weid 2006:97).

ways to reverse this process and win back farmers' autonomy with regard to seed production (Pelaez and Schmidt 2000).

Assentamento Mutirão Sol da Manhã (Seropédica, RJ)

Starting in 1984, a pioneering experiment was conducted in a recently-created land reform settlement called *Sol da Manhã* (morning sun), in the State of Rio de Janeiro. It started as a collaborative project between the land reform settlement and a small groups of researchers from EMBRAPA and a federal university (*Universidade Federal Rural do Rio de Janeiro*, UFRRJ). The settlement was experiencing serious difficulties—including food insecurity—because it was established on severely degraded land. It lacked the resources to cope with this problem, and called on researchers to help them develop viable agricultural systems in these adverse conditions[132] (Machado and Machado 2007). An initial diagnosis carried out with the community identified that the main problems were low fertility soils and genetic erosion (local varieties of corn had disappeared from the region over twenty years ago). It was thus decided to start a participatory breeding program. This took place over fifteen years, and involved the evaluation, selection and improvement of corn varieties, conducted both in farmers' fields and at the EMBRAPA research station.[133]

The result of these efforts was a variety officially released in 1998 under the name *Sol da Manhã*, as a tribute to the community that had actively participated in its development. In the course of the breeding program, its productivity was

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[132] These adverse conditions included "low soil organic matter, low nitrogen and pH, high aluminium and periods of heat and drought stress alternating with waterlogging" (Machado 2000:200).

[133] For a more detailed description of the participatory breeding process, see Machado (2000) and Machado and Machado (2007).

increased fourfold. It is today one of the most widespread open pollinated corn varieties in Brazil (Machado and Machado 2007). The variety was registered in the public domain, "because it was recognized that farmers' participation in the development of the material had been essential and did not allow for exclusive plant breeder rights or patenting by any individual organization" (Machado 2000:201-202).

From the Corn Network to the Seed Network

Based on *Sol da Manhã*'s success, a national corn network (*Rede Milho*) was launched in 1990. It brought together local associations and farmers' organisations—supported by NGOs of the PTA (Alternative Technologies Project) network—and EMBRAPA researchers. Its aim was to conduct participatory breeding of corn varieties jointly with farming communities, in order to identify, preserve and improve local varieties of corn adapted to small farmers' cultivation systems, and ensure the production and distribution of seeds. As one of the coordinators explains, the objectives were several:

> we thought that it was a pedagogical and methodological way for farmers to get to know this [genetic] variability, for them to identify their material and see the degree of adaptation. It was a strategy to verify the degree of genetic erosion in these materials, and also to explore farmers' knowledge with regard to these cultivars. Finally, it was a way of recovering their cultural values in terms of mystical issues, celebrations, socializing, consecration and also the culinary, nutritional issue.[134]

In 1990, the network organized the first national evaluation trial of farmer-selected corn varieties (*Primeiro ensaio nacional de milho crioulo*). Farmer-selected

[134] Interview with Altair Toledo Machado, Brasília (DF), 05/30/08.

varieties were collected and redistributed among farmers from different regions, in order to be tested under different climate and soils conditions. The project, which combined controlled national trials and local on-farm trials, showed that local varieties sometimes equalled or even outdid commercial hybrids. According to its coordinators, the national corn trials demonstrated, firstly, that local corn varieties were a viable option, thus bringing into question the assumption of hybrid varieties' absolute superiority; secondly, that crop improvement can be decentralized; thirdly, that farmers can produce high quality seeds (Cordeiro and Mello 1994). Starting in 1995, the Corn Network expanded its work—both from the point of view of geography and variety—and was renamed the Seed Network (*Rede Sementes*).

Producing Farmer-Selected Seeds: BioNatur

In 1997, a cooperative of land reform settlers linked to the Landless Rural Workers Movement (MST) created a national network of agroecological seeds called BioNatur.[135] The latter was aimed at breaking seed industry oligopoly in the vegetable seed market by producing non-hybrid varieties (i.e. that farmers could multiply themselves) and sell them at or below market prices. They are produced by land reform settlers and small farmers and are distributed through the MST and agroecological networks. The seeds are said to be "agroecological" because they are not treated with agrochemicals and because they are adapted to agroecological production systems.

[135] The *Cooperativa Regional dos Agricultores Assentados* (COOPERAL) is located in MST settlements in the Hulha Negra and Candiota municipalities, southwest region of the State of Rio Grande do Sul.

BioNatur has since become the MST's main initiative in the area of agricultural biodiversity: "the strategy, besides promoting [farmers'] autonomy in seed production and marketing, was aimed at establishing seeds as a heritage of humanity, and redeeming farmers' culture and knowledge" (www.bionatur.com.br Accessed May 12, 2008). The cooperative, which started with 12 families, has nearly 230 families today and has expanded into other states (Santa Catarina, Paraná and Minas Gerais). It currently produces and markets approximately 20 tons of seeds annually, from 45 different varieties. (BioNatur n.d.; Corrêa and Monteiro 2004).

The Agroecology Movement and the Seed Issue

In Brazil, initiatives for the preservation of farmer-selected seeds are intricately linked to the development of the agroecological movement. As one author puts it, the agro-environmental NGOs "brought up the incipient debate over agroecology along with the seed issue" (Canci and Canci 2007:220). Until the 1990s, alternatives to the dominant agricultural model, which had their roots in the organic and biodynamic[136] agriculture movement, were loosely referred to as "alternative agriculture" (von der Weid 2006). In the course of the 1990s, they coalesced under the banner of agroecology. McAfee defines agroecology as "an approach to farming that responds to the agronomic inefficiencies and social failures of conventional agriculture. Agroecological principles and practices combine time-proven farming

[136] Biodynamic agriculture began in the 1920s under the influence of Rudolf Steiner, considered the founder of modern organic agriculture. It is inspired by Steiner's spiritual philosophy (anthroposophy) and relies on the use of fermented herbal and mineral preparations as compost and of an astronomical calendar for sowing.

methods, new ecological science, and local farmer knowledge to enhance the yields, sustainability, and social benefits of farming" (2004:7).[137]

The first National Agroecology Meeting (ENA), held in Rio de Janeiro in the summer 2002, was a landmark for the Brazilian agroecological movement.[138] The context was ripe: by then, all three national family farmers organizations—the Via Campesina coalition, CONTAG and FETRAF—had adhered to agroecology (von der Weid 2006:95). Moreover, the pre-electoral context (with legislative and executive elections at the state and federal level to be held in November 2002) lent itself to public debate over agricultural policy, fuelled by the ongoing controversy over illegal transgenic crops. Finally, for the first time, a presidential candidate committed to agrarian reform and family farming was leading the polls (there was no sign yet that, once elected, President Lula would yield to the agribusiness lobby).

Over a thousand people participated in the meeting, among them farmers, unionists, researchers, extension workers and professors; civil society groups and social movements representing farmers, breeders, fisherfolk, extractivists[139], descendants of runaway slave, and indigenous people; and governmental and non-governmental organizations. The meeting resulted in the creation of a National Articulation of Agroecology (ANA), which describes itself as an horizontal and decentralized network for civil society movements, networks and organizations involved in concrete experiences promoting agroecology, family farming and sustainable rural development (www.agroecologia.org.br Accessed June 6, 2009). Its

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[137] For an overview of agroecology by one of its most well-known theorists, see Altieri (1995).

[138] On the Brazilian agroecological movement, see Petersen and Almeida (2008).

[139] In Brazil, extractivism (*extrativismo*) refers to removing nontimber forest products, such as latex, resins, nuts and medicines, without felling the trees. The most well-known extractivists are the Amazon rubber tappers (*seringueiros*).

objective was twofold: to consolidate the agroecological movement, and to give it a unified voice at the national level; in other words, to bridge the gap between local experiences and public policies. Its founding document states that "one of ANA's objectives is to fight the environmentally predatory and socially excluding development model that has prevailed in Brazil for the past 50 years, based on the so-called Green Revolution, and whose current political expression is 'agribusiness'" (ENA 2002).[140]

Since the creation of ANA, initiatives for the preservation of biodiversity and farmer-selected seeds have come under the umbrella of its working group on biodiversity, whose task is to "identify, promote and better articulate the various national initiatives in the field and ensure farmers' right to the free use of agricultural biodiversity" (ANA 2007). The network's position on biodiversity and genetic resources is stated in its founding document:

> On the issue of biodiversity's use and management, current public policies and legislation have proven to be barriers to family farming sustainability. By inducing productive specialization and the gradual disappearance of local races and varieties, the technical packages being disseminated are undermining productive systems' ecological balance, generating a vicious circle in which environmental degradation leads to the intensification of agrochemical use and vice versa. [ENA 2002]

This document reasserts that seeds are the common heritage of humanity and demands changes to the current patent, genetic resources and seed legislation, tailor-

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[140] Among the movement's demands are the recognition of the social debt toward the countryside and measures to redress it; the democratization of access to land, water and genetic resources; gender equity; family farming; sustainable local development; the production of agroecological knowledge and its social appropriation; and people's active participation in the formulation and management of public policies (ENA 2002).

made for the interests of multinational agribusiness and financial capital and deemed incompatible with agroecology and small farmers' interests. In particular, it demands the revision of the Patent Act so as to prohibit the patenting of life forms (ENA 2002).

On the issue of genetic engineering in agriculture, ANA criticizes the government's laxness: "the State's attempt to release the planting and consumption of transgenics in Brazil, in an undemocratic fashion undergirded by technocratic arrogance, reveals an absolute lack of commitment toward public health, the integrity of biodiversity and the economic sustainability of family farming" (ENA 2002). It goes on to argue that, given the existence of alternatives, the risks inherent to genetic engineering in agriculture are simply not worth taking: "the numerous successful experiences with agroecological production in Brazil show its potential for attaining, in an autonomous way, a model of sustainable rural development without the need to incur any of the enormous risks posed by transgenics" (ENA 2002). Consequently, ANA defended, at the time, the adoption of an indefinite moratorium on the production and commercialization of transgenic crops until it was demonstrated, with public oversight, that they posed no risks, not only to public health and the environment, but also to family farmers' economic and technological autonomy (ENA 2002).

With ANA, the agroecology movement has gained visibility at the national level. But the movement continues to face significant barriers, such as the entrenched institutional culture of public agencies like EMBRAPA and the Technical Assistance and Rural Extension Enterprise (EMATER), themselves the products of agricultural

modernization ideology.[141] While agroecology has made some breakthrough in recent years with the appointment of some of its proponents in key positions (for example as Minister of Agrarian Development and Minister of the Environment, and as heads of agronomic research entities), it has not received the support hoped for from the Lula government (von der Weid 2006).

Going Global: Via Campesina's International Seed Campaign

In the early 2000s, these initiatives took on an international dimension with the launching of a worldwide seed campaign by the global peasant movement Via Campesina. Founded in 1993, the Via Campesina—literally translated as "the peasants' path"—is an international movement of peasants, small- and medium-sized producers, landless, rural women, indigenous people, rural youth and agricultural workers from Asia, Africa, Europe and the Americas (www.viacampesina.org Accessed April 6, 2008).[142] The Landless Rural Workers Movement (MST) being one of its founding members, and by far the largest, Via Campesina has a strong presence in Brazil, where it has been actively organizing and mobilizing against genetic engineering in agriculture.

The Via Campesina defends peasant, family farm-based production. It was the first to come up with the concept of food sovereignty, defined as "the right of communities and countries to produce for their own needs, determine their own farming methods and food policies, and decide what to import and export" (McAfee 2006:132). It is not just a trendy concept; it entails a more radical critique of current

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[141] While there are currents which are sympathetic to agroecology within EMBRAPA, these are marginal.

[142] For a recent, in-depth discussion of the Via Campesina, see Desmarais (2007).

food production systems. As opposed to the more narrowly-defined concept of food security, food sovereignty emphasizes that what is at stake is not technology or productivity, but the politics and power relations behind food production and trade. In fact, food sovereignty means having control over what to produce and how to produce it.

The international seed campaign was formally launched at the Third World Social Forum in Porto Alegre (RS) in January 2003, during a conference on food sovereignty in a stadium packed with 15,000 people. The decision to call for an international seed campaign had been taken a year before, at the UN/FAO World Food Summit in Rome (June 2002). The campaign's slogan—"Seeds: People's Heritage Serving Humanity" (*Sementes: Patrimônio do Povo a Serviço da Humanidade*) (Appendix O)—was intended as a clear statement that seeds "have no owner" (*não têm dono*) (Stedile 2003; Via Campesina Brasil 2003a; 2003b; 2004).

The campaign is aimed, first and foremost, at guaranteeing the right of family farmers to produce their own seeds, individually or collectively. In order to achieve this objective, the campaign seeks to democratize seed production and to raise awareness among family farmers throughout the world of the importance of producing their own seeds. The campaign also makes demands on international institutions. These include pressuring the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the FAO to have farmer-selected varieties declared the cultural heritage of humanity; and exempting agricultural products, in particular foodstuffs and seeds, from World Trade Organization (WTO) legislation and trade agreements (as well as resisting the introduction of intellectual property rights and patents on seeds in national legislation).

The Campaign is closely linked to the transgenics issue: "profoundly linked to the struggle against transgenics, the Campaign will also have to spark debates and offer concrete alternatives to this technology, which perpetuates and deepens the socially excluding and environmentally predatory agricultural model which dates back to early Brazilian history" (Corrêa and Monteiro 2004:41). It reasserts the precautionary principle with regard to genetic engineering, that is preventing the spread of transgenic seeds for commercial crops as long as there is no scientific consensus as to the risks they pose to the health of farmers and consumers, and to the environment.

With the international seed campaign, the Brazilian agroecological movement linked up with the global justice movement (otherwise known as the antiglobalization movement). As the Pastoral Land Commission (CPT) wrote on the occasion: "by defending the right of family farmers, peasants and indigenous people to produce, keep and exchange farmer-selected seeds, and by criticizing life patenting in all its forms, the campaign 'Seeds: Heritage of Humanity' sets up a pluralistic political and ideological safeguard against the neoliberal offensive that seeks to monopolize and transform all life forms into a commercial opportunity" (Carvalho 2003:11).

Advances and Impasses

Initiatives for the preservation of farmer-selected seeds, such as participatory breeding and seed fairs, have mushroomed in recent years. Given the decentralized nature of these activities, there is no data at the national level on how many organizations are involved in this type of initiative, the number of farmers and

communities reached, or the varieties produced.[143] What does exist is data on specific microregions. For example, in the South-Central region of the State of Paraná (Southern Brazil), one of the first to implement this kind of work, a group of 120 farmers-experimenters (*agricultores-experimentadores*) coordinates a program that reaches 4,000 families in 22 different municipalities. They have recovered 138 varieties of corn, 141 of beans, 26 of rice, 25 of cassava and 12 of potatoes (*batatinha*), in addition to a range of winter cereals, vegetables, seasonings, fruits, medicinal and ornamental plants, and heritage breed (*raças crioulas*) pork and poultry (Tardin et al. 2004). While they are more developed in some states and regions, this kind of initiatives are found all over Brazil today. As a result of the work of ANA and of Via Campesina Brasil, agricultural biodiversity and farmer-selected seeds have become omnipresent in social movements' discussions, training courses, assemblies and public events.

These initiatives, however, are facing various obstacles—political, legal, and biological. One recent example clearly illustrates the kind of dilemmas to which the movement is confronted. With the coming into force of the Revised Seed Act (2003), farmers sowing farmer-selected seeds are now entitled to agricultural credit (PRONAF). Farmers who have access to agricultural credit are required to get crop insurance in order to ensure that they will be able to pay back their loan in the event of crop failure, such as the one caused by drought in the Southern region at the time of the 2004-2005 harvest.[144] However, farmers who received agricultural credit and

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[143] A national registry of entities working to recuperate, manage and conserve local, traditional and farmer-selected varieties—a joint MDA/ANA initiative—is currently being compiled, and should help to map these initiatives nationally.

[144] The MDA/SAF estimates that among the 40,000 cases of crop insurance denied for use of "inappropriate technology", between 6,000 and 8,000 were farmer-

planted farmer-selected seeds and who lost their crops that year were denied crop insurance. They were told that, in order to access crop insurance, seeds had to be registered with the Ministry of Agriculture's climate risk zoning (*Zoneamento Agrícola de Risco Climático*) which, in turn, requires registration with the National Registry of Cultivars (RNC). However, according to the Seed Act (Art. 11, Para 6) farmer-selected seeds are exempted from RNC registration.

Special measures were taken so that farmers sowing farmer-selected seeds could temporarily access crop insurance. Meanwhile, a joint committee composed of representatives of the ANA's Working Group on Biodiversity, the Ministry of Agrarian Development (MDA) and the Ministry of Agriculture was set up to find a long-term solution. At first, there was an attempt to find ways to include farmer-selected seeds in the RNC. However, this proved a failure for both political and technical reasons. Indeed, beyond the intricacies of harmonizing new legislation, the incident reveals a deeper problem: farmer-selected seeds simply do not fit RNC criteria. The latter presupposes a high level of genetic uniformity and stability not found—nor considered desirable—in farmer-selected varieties. Moreover, given the quantity and diversity of farmer-selected varieties found in Brazil and the little information that exists about them, collecting such information would prove a daunting task. To give but one example, different varieties may have the same name in different regions and, inversely, the same variety may have different names in different regions (Londres 2006:17-22). Finally, a fundamental characteristic of farmer-selected varieties is their great adaptability to specific socio-environmental conditions and practices. Registering these characteristics at a certain point in time

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selected seeds, close to 18,000 were "pirated" transgenic seeds, and between 10,000 and 14,000 were saved conventional seeds (Londres 2006:16).

means “freezing” their evolution.

What these contradictions reflect is that “modern” or “improved” and farmer-selected varieties are inscribed in different paradigms (industrial agriculture vs. agroecology) and obey distinct logics. To give another example, one of the RNC requirements is that, in order to be registered, a variety must have a “maintainer,” that is an entity that commits to maintaining the variety. This in turn raises a series of problem, from the fact that it is problematic to attribute an owner to a farmer-selected variety cultivated in numerous communities, to the fact that these communities would not meet the Ministry of Agriculture’s maintainer requirements. Finally, there was resistance to the inclusion of farmer-selected seeds in the RNC among farmers’ organizations, who saw the RNC as an instrument for the private appropriation of genetic resources (Londres 2007:160).

For all of these reasons, the attempt to include farmer-selected varieties in the RNC was dropped. An alternative solution was found that consists in creating a national registry of entities working to recover, manage and preserve local, traditional and farmer-selected varieties. In order to compile the registry, entities will provide the Ministry of Agrarian Development (MDA) with the names of the municipalities and communities where they are conducting activities with farmer-selected varieties and a list of the species. The idea is that, in the event of crop failure, farmers from communities appearing in this national registry would be eligible for crop insurance (MDA 2006).

The solution reached was a concrete illustration that, with ANA, the agroecological movement gained the capacity to negotiate with the government in public policy matters. It was hailed by the movement “as a political victory against

discrimination toward farmer-selected seeds, and as an important precedent for the democratization of agricultural credit and the expansion of agroecology" (Machado et al. 2008). As ANA itself recognizes, the proposal has its drawbacks: some farmers will be left out, for example those who use farmer-selected seeds but are outside NGOs' field of action. However, it represents a great advance over the initial proposal, if for no other reason than the fact that it avoids the hurdle of submitting farmer-selected seeds to the breeders rights system. It is also testimony to the fine balance that the agroecological movement has to strike in defending farmers' rights while doing so on its own terms.

Concluding Remarks

In this chapter, I have traced the development of the movement for the defence of farmer-selected seeds in Brazil, from the pioneering experiences of the mid-1980s, to the creation of the corn and seed networks in the 1990s, the consolidation of the national agroecological movement and the launching of an international seed campaign in the early 2000s.

The socioeconomic and environmental impacts of the Green Revolution and the consequent resurgence of a social movement seeking alternatives to industrial agriculture are essential to understanding the response to the introduction of transgenic crops in Brazil. By the 1990s, rural organizations and social movements had developed an elaborate critique of the Green Revolution paradigm and a wealth of experiences in agroecology. When the issue of genetic engineering in agriculture arose in the late 1990s, it was understood by rural organizations and social movements as an extension and deepening of the Green Revolution paradigm.

Moreover, the introduction of transgenic varieties conferred a new sense of urgency to agroecological initiatives. Indeed, these initiatives depend on the preservation of farmer-selected seeds, which could be jeopardized by the risks of genetic contamination by transgenic varieties. This explains why, three decades after the smooth diffusion of the Green Revolution's technological packages, transgenics were met with more resistance among some farming sectors. In the next chapter, I trace the protracted and ongoing political and legal dispute over transgenics in Brazil from the introduction of a national biosafety framework in 1995, until 2008.

CHAPTER 5

THE CONTROVERSY OVER TRANSGENICS IN BRAZIL, 1995-2008

Why would we be so foolish as to not produce genetically modified crops?
We have to grow what the market wants to buy. This is not a country of fools.
Pratini de Moraes, Minister of Agriculture, July 2000

Authorizing [GMOs] would be stupid.
Presidential candidate *Luiz Inácio Lula da Silva*, July 2001

The Judicial Moratorium of 1998

On September 24, 1998, Brazil's biosafety agency—the National Technical Commission on Biosafety (hereafter, CTNBio or, simply, the Commission)—approved Monsanto's Roundup Ready (RR) soybeans for production on a commercial scale. Thirteen out of the fifteen members present that day voted in favour; the consumer representative voted against and the Ministry of External Relations representative abstained from voting. However, this was a mixed victory for Monsanto and the biotech lobby: despite the Commission's favourable technical report, a court injunction prevented the Ministry of Agriculture from granting Monsanto the licence required for commercial production of RR soybeans.

Indeed, days earlier, the Brazilian Institute for Consumer Protection (IDEC) and Greenpeace had obtained a court injunction prohibiting authorization of the commercial production of RR soybeans. As they argued in a civil lawsuit, RR soy had been authorized without carrying out the environmental impact assessment (EIA) provided for in the Constitution of 1988. In December 1998, the preliminary ruling was confirmed by a Federal Court. In his decision, Judge Antônio Souza

Prudente reaffirmed the precautionary principle enshrined in the Constitution, prohibiting the planting and commercialization of RR soy until the completion of EIAs, and the elaboration of food safety and labelling norms.

This decision translated into a de facto moratorium in force for the next five years. Not only did the legal challenge reverse the initial approval granted to Monsanto, but it also initiated a prolonged and epic legal battle opposing IDEC and Greenpeace to industry and the federal government, that gave national prominence to the issue. In the meantime, the election of the Workers Party in Rio Grande do Sul (RS) in the October 1998 State election turned that State into the epicentre of the controversy over transgenic crops.

How It All Began. Seed Smuggling and Rio Grande do Sul's Failed Attempt at Becoming a GE-Free Zone (1998-1999)

In the late 1990s, it was common knowledge that transgenic soybeans were smuggled into Southern Brazil from neighbouring Argentina, hence their nickname—"Maradona seeds"—after the famous Argentinean soccer player. As Jepson et al. note, this was "as much a reference to the Argentine origin of the GM seeds as to their adulterated or altered state, and their 'addiction' to herbicides; Maradona was expelled from the 1994 World Cup for a positive drug test" (2008:219).

In November 1998, the newly-elected State governor of RS, Olívio Dutra (Workers Party, 1999-2002), emboldened by the federal injunction prohibiting GE varieties, took the unprecedented step of announcing his project of making the State a Transgenic-Free Zone—the first such initiative worldwide. Amidst growing

evidence of illegal planting of GE soy, this was a bold move. It carried strong popular support—in 1999, 58 percent of the population in Southern Brazil supported the judicial moratorium,[145] but it antagonized the many farmers who were already growing transgenic seeds illegally. This policy was a marked departure from the previous State government of Antônio Britto (PMDB, 1995-1998), which had turned a blind eye to transgenic seed smuggling. It was also at odds with the federal government's active promotion of GE crops under President Fernando Henrique Cardoso (1995-2002).

This policy was both politically and economically motivated: it aimed at meeting the demands of the State's vocal environmental movement as well as guaranteeing access to non-transgenic markets for the State's agricultural production (Barboza 2004:439). The Dutra government considered that the new biotechnology had been developed primarily for large scale intensive farming, and therefore was not in the interest of the state's important small family farming sector (Hisano and Altoé 2008:250). It was also part of the Workers Party's support for small farmers. As the State Secretary of Agriculture said at the time, "we can't support a technology that excludes precisely the small family farmers. This is one important reason why we are against the production and sale of GMOs" (Silveira 2004:77). He expressed the view that, as with the Green Revolution's technological packages, these technologies encourage large-scale, capital intensive agriculture and exacerbates small farmers' social exclusion.

To implement this policy, Governor Dutra signed a decree (March 1999) that required the conduct of EIAs prior to field testing and made it compulsory to inform

[145] This figure went up to 77 percent by 2002; 67 percent for the country as a whole (Bauer 2006:233).

public authorities of the planting of experimental and commercial GE crops. As a result, dozens of field tests authorized by the CTNBio in the absence of EIAs were closed down, and an injunction prevented the harvesting of Monsanto's experimental crop (Menasche 2003:55).

In an effort to prevent the spread of illegal transgenic seeds, the Dutra government launched a public campaign under the theme "Transgenics: Don't Sow this Idea" (*Transgênicos: Não Plante Essa Idéia*)—an information campaign coupled with a phone line for denunciations—and announced the acquisition of rapid testing kits for detecting GE seeds and crops. As the planting season drew near, the government moved beyond experimental areas into farmers' fields. In October, State Secretariat of Agriculture inspectors collected 800 soy seed samples for testing, and announced that farmers whose seeds were found to be transgenic would be prohibited from selling their harvests. The same month, the Federal Police incinerated GE soy seized a year earlier in the municipality of Júlio de Castilhos (RS). The State Secretariat of Agriculture proceeded with inspections: in the first week of November, another 200 rural properties were inspected and 700 transgenic tests performed, leading to the confiscation of more than 3,000 bags of transgenic soybeans. The State Secretariat of Agriculture also sent a list of potential offenders to the Public Ministry (Menasche 2003:58-59).[146]

Farmers in GE soy-growing regions in the north central region of the state were outraged by what they saw as undue government interference. They retaliated

[146] Headed by the Federal Attorney General (*Procurador Geral da República*), the Public Ministry (*Ministério Público*) is the body of public prosecutors. It is authorized by the Brazilian Constitution to bring actions against private individuals, commercial enterprises and the federal, state and municipal governments, in the defense of minorities, the environment, consumers and the civil society in general.

by mobilizing to physically prevent inspectors from performing their tasks. In November and December, hundreds of farmers held demonstrations, blockaded roads and, on one occasion, held inspectors hostage (Menasche 2003:58-59). Faced with an explosive situation, the government temporarily suspended inspections and sought a negotiated solution—but to no avail. Its proposal to swap transgenic seeds for conventional ones at public expense was rejected outright by the Agricultural Federation of Rio Grande do Sul (FARSUL).

In December, the opposition-dominated State Legislative Assembly approved a bill giving the federal government exclusive responsibility over inspections. The State government contested the bill, but nevertheless had to suspend its activities temporarily. When the Federal Supreme Court— Brazil's highest court —restored the State's authority over inspections a year later, the Dutra government had become politically weakened and was no longer in a position to resume the inspections (Menasche 2003:62).

It is hard to convey the magnitude of the debate in Rio Grande do Sul at the time. Transgenics were a daily news issue: as Bauer's media coverage analysis shows, *Zero Hora*, RS's main newspaper, carried no less than 296 articles on the topic between 1998 and 2002 (2006:229). At the height of the controversy, in 1999, *Zero Hora* reported that the term "transgenic" (*transgênico*) appeared 1,291 times in its pages, that is an average of 3.5 times per day (Menasche 2000). In August 1999, a fairly large demonstration—approximately 2,000 people—was held in the capital, Porto Alegre, in support of a transgenic-free state. Far from being limited to certain sectors, the debate permeated society. Hence, various municipalities positioned

themselves for or against transgenic crops in what came to be known as the "battle of the counties" (*a batalha das prefeituras*) (Bauer 2006:234).

Paradoxically, at the time Rio Grande do Sul proclaimed itself a transgenic-free State, it was in fact the only Brazilian State where there was significant transgenic production. According to estimates, between 10 percent and 15 percent of the 1998-1999 soy harvest was genetically engineered (Bauer 2006:238; Silveira 2004:76).[147] Since this was illegal, there are no official statistics; estimates are based, among other things, on the decrease in the production and sales of conventional soybeans for planting. Hence, in 1998, state-registered seed growers in RS produced 300,000 tons of soybeans to plant. By 2001, production had dropped to 100,000 (Ewing 2001). Statistics rapidly became an integral part of the controversy: at the height of the dispute, in September 1999, the main seed producer (ABRASEM) declared 30 percent of the State's soy to be transgenic (Bauer 2006:235). This figure, however, is disputed, given ABRASEM's vested interest in overestimating the importance of the RR soy in order to press for its legalization.

While my objective is to understand the reasons behind farmers' rejection of GE crops, and not the reasons behind their adoption (which would warrant another research project altogether), let me say a word about why some farmers embraced GE varieties. Transgenic soybeans were adopted by farmers as an attempt to reduce pesticide use, and therefore costs, and increase productivity and profits (although with mixed results). These farmers usually pointed to the high production cost of traditional soybeans and their curiosity in experimenting with a new technology (EMBRAPA 2003; Hisano et Altoé 2008:250). Monsanto's effective sales pitch and

[147] That is, between 300,000 and 450,000 hectares of a total crop area totaling three million hectares (Silveira 2004:76).

the fact that RR soybeans were introduced in the absence of royalties (as we have seen in chapter 3, royalties were only introduced in 2003) also contributed to make them attractive to farmers, in spite of the fact that they were illegal. While GE crops did not meet the increased productivity promised (for one thing, GE varieties were not as well adapted to local growing conditions as conventional ones), simplified weed management seems to be the single most important factor explaining their adoption. Roundup Ready varieties are genetically engineered to tolerate Roundup herbicide, thus allowing the farmer to spray a single broad-spectrum herbicide (Roundup) that kills everything but leaves the soybean crop unharmed (that is, as long as weeds do not develop resistance to Roundup). RR soybeans have become less attractive in recent years as a result of the introduction of royalties, increases in the price of Roundup and the development of weed resistance.

In any case, the propagation of GE soy and the State's inability to carry out inspections soon rendered the project of a transgenic-free zone obsolete. After the Workers Party lost the 2003 State elections[148], opposition to transgenic seeds lost most of its political momentum in Rio Grande do Sul. At the national level, however, Luiz Inácio Lula da Silva, who ran on the promise that he would not authorize GE soy, won the presidential election, generating tremendous hope among advocates of a precautionary approach. Before turning to the role played by the Lula government

[148] In the 2002 election, the Workers Party chose another candidate (Tarso Genro), and lost the election to the Brazilian Democratic Movement Party (PMDB) of Germano Rigotto (centre-right). This defeat was not directly related to the transgenic free zone project. Olívio Dutra did not have the support of the dominant telecommunication network (RBS/Globo) nor did he enjoy a majority in Congress; he suffered several political setbacks and one corruption scandal during his mandate.

with regard to the transgenics issue, let me first discuss the Brazilian biosafety legislation.

Transgenic Politics: The Brazilian Biosafety Legislation

Unlike Canada and the United States, Brazil opted early on, as did the European Union, to regulate both the processes and products of agricultural biotechnology. Article 225 of the Federal Constitution of 1988 is recognized as a statement of the precautionary principle. It states that "everyone is entitled to an ecologically sound environment, for the common use of the people and essential to a healthy life; the Government and the community thus having the responsibility to defend and preserve it for present and future generations" (Brasil 1988). To ensure that this right is enforced, the Government must preserve the variety and integrity of the country's gene pool and monitor the entities engaged in the research and manipulation of genetic material; demand, by law, a prior EIA for construction projects or activities that may cause significant environmental degradation, which study must be made public; and, control the production, marketing and use of techniques, methods, and substances that pose a risk to life, quality of life and the environment (Brasil 1988).

The precautionary principle is also inscribed in the first article of the Brazilian Biosafety Act, which states that it is "being guided by the need to encourage scientific progress in the area of biosafety and biotechnology, and to protect life and human, animal and plant health, *in keeping with the precautionary principle* for the protection of the environment" (Brasil 1995a, emphasis added).

First introduced in 1995, the Biosafety Act was substantially modified in 2005. While biosafety is not defined in the bill, it is generally understood as:

> All the procedures aimed at the prevention, mitigation, minimization or elimination of the risks inherent to activities involving genetically modified organisms (GMOs) and their derivatives, which can compromise the health of humans, plants, animals and the environment. The key function of GMOs biosafety procedures is to analyze the adverse effects of genetic engineering as called for in the biosafety legislation. [Rodrigues 2004]

While the precautionary principle is formally recognized, its application has been more problematic. In Brazil, the creation of an agency responsible for the oversight of transgenic techniques and products—the CTNBio—has resulted in greater laxness rather than greater vigilance. Indeed, the Commission has not upheld the precautionary principle. In the dispute opposing it to other government ministries and agencies—first and foremost the Ministry of the Environment—the Commission has pushed for the speedy approval of transgenic varieties while the Ministry of the Environment defends a more cautious approach.

The 1995 Biosafety Act instituted the National Technical Commission on Biosafety (CTNBio) as the agency responsible for regulating all recombinant DNA technology-related products and activities. A multidisciplinary body within the Ministry of Science and Technology (MCT), it is responsible for:

> providing technical support and advice to the Federal government on the formulation, updating and implementation of the National Biosafety Policy for GMOs, as well as establishing technical safety standards and issuing technical reports pertaining to the protection of human health, living organisms and the environment, for activities that involve the development, experimentation, cultivation, manipulation, transportation, commercialization, consumption, storage, release and disposal of GMOs and their derivatives. [www.ctnbio.gov.br Accessed April 30, 2008]

The CTNBio was originally made up of thirty-six members from the scientific community, governmental and non-governmental sectors, that is one titleholder and one alternate for each of the following eighteen positions: (1) eight scientific and technical experts in the biotechnology sector, two in each of four areas—human, animal, plant and environmental; (2) a representative of each of the following ministries—Science and Technology, Health, Environment, Education and External Relations; (3) two representatives of the Ministry of Agriculture, from the plant and animal sectors; (4) three representatives of legally-recognized organizations in the areas of consumer protection, corporate biotech, and occupational health and safety.

The elaboration of the Biosafety Act was the object of intense political negotiations. As a member of the Commission who participated in the early discussions of the Biosafety Bill in 1993-1994 explained to me, the bill underwent profound changes as it worked its way through Congress.[149] In the original formulation of the bill, the CTNBio was, de facto, a technical commission, that is a scientific body responsible for issuing technical reports, while the final decision rested with the already-existing regulatory agencies of the Ministries of Agriculture, Health and the Environment. However, between the bill's approval in Congress and its approval by the president[150], an election took place. Newly-elected president Fernando Henrique Cardoso used his veto power to eliminate the articles of the bill establishing the CTNBio and defining its competences, including the one stating that regulatory agencies were responsible for granting approvals (Brasil 1995c). It took

[149] The National Congress consists of the Chamber of Deputies and the Senate, both of which are elected.

[150] In the Brazilian legislative process, a bill must receive presidential assent after having been approved by both chambers of Congress.

almost a year before President Cardoso signed the regulatory decree enacting the law (Brasil 1995b). The Commission started to meet in 1996.

As a result of the veto, the power to authorize transgenic organisms shifted to the Commission, while the Ministries of Health, Agriculture and the Environment were left with limited responsibility, within their areas of competence, for the implementation of CTNBio decisions. The Ministry of the Environment, in particular, was stripped of its constitutional attributions in the matter of EIA. As we will see below, the regulatory agencies' powers would be further restricted under the revised Biosafety Act. It is precisely the question of who has authority to decide on the need for EIA that has been the crux of the decade-long controversy over transgenics. This whole question has involved the CTNBio, various ministries and government agencies, the executive branch of government and non-governmental organizations and social movements.

In May 1999, the Workers Party filed a Direct Action of Unconstitutionality (ADIN) with the Federal Supreme Court challenging the decree implementing the Biosafety Act (Brasil/STF 1999). A Direct Action of Unconstitutionality (ADIN) is a legal instrument based on Brazil's constitution that allows a challenge in the highest court of any law that is considered to be unconstitutional. The Workers Party argued that the creation of the Commission by decree violated the president's constitutional power; and that the conditionality of EIAs at the CTNBio's discretion violated Article 225 of the Constitution (see above).

The veto also had an unintended consequence: it put the CTNBio in a regulatory vacuum. Between 1996 and 2001, the CTNBio functioned without having legal existence. As of 2002, it had authorized over one thousand controlled release of

GE organisms (both laboratory and field experiments), and one commercial variety, RR soybean (Brasil/Câmara dos Deputados 2000). To remedy the situation and normalize the Commission's activities and decisions, President Cardoso signed a provisional measure effectively creating the Commission in May 2001 (Brasil 2001).

Those early years were marked by incessant controversy. In September 1999, in the midst of the soy controversy in Rio Grande do Sul, the Commission's president, claiming that the population needed to be better informed about issues of biotechnology, announced that public hearings would be held during the upcoming First Brazilian Biosafety Congress, organized by the CTNBio later that month. The Congress, it turned out, was sponsored by Novartis, AgrEvo, Dupont and Monsanto—four of the largest agbiotech companies. Denounced to the Public Ministry by IDEC and Greenpeace, the event foundered in controversy. This marked the beginning of the—still ongoing—battle over CTNBio which, according to its critics, is acting more as a promoter of biotechnology than as a technical risk-assessment body. Infighting and court cases against some of its decisions soon brought the Commission to a stalemate. The revised Biosafety Act, passed in March 2005, redesigned the biosafety framework and redistributed powers among the different government bodies and agencies.

The Revised Biosafety Act

On March 2, 2005, the National Congress approved a revised Biosafety Act, which replaced the previous legal framework in use since 1995, in an attempt to break the deadlock in which the Commission found itself (Brasil 2005). Discussions over the new bill brought to light opposing views. On one side were those who

argued for maintaining the ministries' powers, in the name of the precautionary principle and of the environmental and health risks posed by the release of transgenic organisms into the environment. On the other were those who argued that, for the sake of the progress of science and technology, Brazil's international competitiveness and the modernization of the countryside, the Commission had to be given greater leeway and power in order to speed up commercial approvals of transgenic varieties (Araújo and Dolabella 2007:207).

Under pressure from environmental groups, the government proposed legislation in line with court rulings and civil society demands, and maintained the Ministry of the Environment in charge of transgenic organisms' EIAs (Hochstetler 2007:19). Minister of the Environment Marina Silva came to an agreement with President Lula that he would veto any change to the bill in Congress aimed at stripping authority from the Ministry of the Environment. However, the Lula administration then worked to undermine its own bill in Congress (Hochstetler 2007:19). As was the case with the first Biosafety Bill, the revised bill underwent major changes as it worked its way through Congress, including the addition of provisions for stem cell research (Dolabella et al. 2005). The bill came back from the Senate giving broader powers to CTNBio, including the authority to waive the need for EIAs. Giving in to the influential Ministry of Agriculture and breaking his promise to the Ministry of the Environment, President Lula abstained from using his veto power and gave presidential assent, turning the bill into law. In the struggle opposing, on the one hand, the Ministry of the Environment and the Ministry of Agrarian Development and, on the other hand, the Ministry of Agriculture, the

Ministry of Science and Technology, and the Ministry of Development, Industry and Trade, the second group had the upper hand.

Under the new legislation, the Commission became the sole authority with the power to approve the testing and commercialization of transgenic organisms. Ministries were stripped of what little powers they had had under the 1995 framework to give their opinion as to the suitability of conducting an experiment or the conditions under which it was to be conducted (Araújo and Dolabella 2007:207). Their role henceforth was limited to implementing the Commission's decisions, without being able to examine the grounds of the said decisions. Hence, the Act stipulates that:

> 1º CTNBio's technical decisions on the biosafety of GMOs and their derivatives are *binding* for all other administrative bodies and agencies.
>
> 2º In the instances of commercial use… the registration and oversight bodies and agencies, in the exercise of their mandate, when so requested by CTNBio, *will comply* with the technical decision issued by CTNBio with regard to the biosafety aspects of GMOs and their derivatives. (Art. 14) [emphasis added]

Another major change brought to the bill by Congress was the inclusion of provisions allowing stem cell research, not originally part of the bill. As critics pointed out, stem cell research is an ethical, not a biosafety, issue. One of the consequences of lumping the two issues (both of them controversial, although for different reasons) within the same bill was that interest groups with a stake in stem cell research (and no particular interest in, or knowledge of, agbiotech) put all their weight behind the bill's approval. In fact, stem cell research is so controversial in

Brazil that it overshadowed the genetic engineering provisions, though the latter were at the origin of the bill.[151]

To counterbalance CTNBio's extended powers, the revised Act created a new body—the National Biosafety Council (CNBS)—which would stand above the Commission and act as a final arbiter in case of disagreement between the latter and the Ministries (Art. 8 and 9). Composed of eleven ministers[152] and under the presidency of the Chief of Staff[153], it convenes on an *ad hoc* basis. The highest authority on biosafety, the CNBS is responsible for (1) establishing principles and guidelines for federal bodies and agencies dealing with transgenic organisms (2) analyzing, at CTNBio's request, commercial approvals of transgenic organisms from a national interest and socioeconomic perspective and (3) settling, in last resort, disagreements between the Commission and the ministries in cases of commercial approvals (Brasil 2005 Art. 8, Para 1).

The CNBS's effectiveness remains to be shown. On the practical level, convening eleven federal ministers is no easy task. Moreover, the CNBS is a political body rather than a scientific one, and the fact that many of the ministers who make

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[151] Stem cell research was approved after a ten-year battle in Congress. The law allows research using stem cells from human embryos produced by *in vitro* fertilisation, provided the embryos have been frozen for more than three years or if they would be unlikely to survive if they were transferred to a woman's uterus. In either case, the donors' permission is required before embryos can be used for research. Stem cell research continues to be highly controversial and is actively opposed by religious groups. At the time of writing, the stem cell provisions of the Biosafety Bill were being challenged before the Federal Supreme Court.

[152] The eleven ministers composing the National Biosafety Council are: Chief of Staff of the President of the Republic; Minister of Science and Technology; Agrarian Development; Agriculture; Justice; Health; Environment; Development, Industry and Trade; External Relations; Defence; and the Special Secretary of Aquaculture and Fisheries.

[153] The Chief of Staff (*Chefe da Casa Civil*) is the highest-ranking member of the Executive, and a senior assistant to the President. It is generally regarded as the second most powerful person in government.

up the CNBS are only indirectly affected by issues of biosafety and biotechnology means that the CNBS is vulnerable to political pressures. Hence, when the CNBS met in February 2008 to settle disagreements over the approval of the first varieties of GE corn, Chief of Staff and CNBS chairman Dilma Rousseff made it clear that the government was in favour of the release of transgenic corn and demanded that the ministries follow suit (Stedile 2008).[154]

Finally, the revised Act brought important changes to the Commission's composition and bylaws. The Commission went from 18 to 27 members, distributed as follows: 9 ministry representatives; 12 technical and scientific experts; and 6 experts in the areas of consumer protection; health; environment; biotechnology; family farming and occupational health and safety. These experts are appointed by the relevant ministries from a triple list elaborated by scientific or civil society organizations.

The revised Biosafety Act's attempt to put an end to infighting among government ministries and agencies, and make the approval process smoother, was a failure. In June 2005, the Public Ministry took legal action to contest the constitutionality of the new Biosafety Law on behalf of IDEC and the Green Party (Brasil/STF 2005).[155] It challenged the release of RR soy while an injunction was in force. It also argued that CTNBio's authority to waive EIAs violated the

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[154] The revolving door between governmental regulatory agencies and the biotech industry, well documented in the United States, is also present in Brazil. In February 2006, the Chief of Staff officer responsible for issues related to the Biosafety Protocol was an ex-lawyer for Monsanto and a member of the Biotechnology Information Council (CIB), a lobby group of the biotech industry (AS-PTA Bulletin 290).

[155] Greenpeace, IDEC, and the National Association of small farmers (ANPA) filed *amicus curiae* (friends of the court) briefs in the case, as did the National Biosafety Association (ANBio).

precautionary principle enshrined in the Constitution, and that the powers given to CTNBio infringed on the constitutional powers of the Ministries of Health and the Environment, in particular their responsibility to determine when EIAs are required. The case is not likely to be resolved for some time, perhaps years.

The National Technical Commission on Biosafety (CTNBio)

Since its inception, in June 1996, the National Technical Commission on Biosafety (CTNBio) has been mired in controversy. Beside the central dispute over the Commission's authority to decide on the need for EIAs, its independence and technical/scientific nature are also being questioned. Several of its members are from the field of biotechnology, and have systematically declined to sign the "conflict of interest" declarations provided for in the Commission bylaws (CTNBio 2006, Section IV Art.11.1).[156] Let me quote at length Judge João Batista Moreira in the civil lawsuit:

> The National Technical Biosafety Commission lacks sufficient democratic legitimacy and does not have the independence needed to make final and binding decisions in the matter, since it is *composed of members appointed by the Minister of Science and Technology*, without legislative oversight.
>
> It is evident that this decision-making body is highly vulnerable to political and economic pressures. Its members are humanely subject, more than regulatory agencies, to cooptation by interest groups, especially in an economic sector that involves large transnational investments and profits. One need not go far to find this vulnerability. Simply observe that in the previous government, the interest of the

[156] According to a member of the Commission, "in fact, many people in the CTNBio are in a situation of blatant conflict of interests. For example, there is always someone who says 'I abstain on this issue because I am in partnership with this company.' Many people. Many. So this is an important element of the prevailing climate, situation. This relationship between scientists, the scientific community, and companies." Interview with Rubens Onofre Nodari, *op. cit.*

> Union[157], through the Executive Branch—which designates the members of the entity—in authorizing the planting of genetically modified soybeans was obvious. [Brasil/TRF 2004]

In 2001-2002, the controversy around the competences of CTNBio intensified, leading the Chamber of Deputies to commission an inquiry into the proceedings followed by the executive branch of government in authorizing the approval of transgenic plants in the country. The resulting report identified an impressive list of irregularities, for example in authorizations for the creation of demonstration plots; in the conditions under which RR soy was authorized for commercial production in 1998; in the approval of transgenic corn imports in 2000; and in the (non-)application of fines for breaches of the Biosafety Act, as provided for in the legislation (Brasil/Câmara dos Deputados 2000; See also Marino and Minayo-Gomez 2004). The report also identified irregularities in the regulatory policy of the Ministry of Agriculture, the National Health Surveillance Agency (ANVISA) and the Ministry of the Environment. Hence, on the very same day RR soy received CTNBio approval, the agency of the Ministry of Health responsible for food inspection released an ordinance recommending a hundredfold increase in the Maximum Residue Limit of glyphosate in soybeans, from 0,2 ppm to 20 ppm (parts per million) (ANVISA 1998a). Glyphosate is the active ingredient in Monsanto's Roundup herbicide, which RR soybeans have been genetically engineered to tolerate. The Maximum Residue Limit was finally set at 2,0 ppm, that is a tenfold increase

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[157] In Brazil, "the Union" (*A União*) is an autonomous entity, distinct from the federal district, member states and municipalities, whose administrative and legislative jurisdictions are defined by the Constitution. It is the legal embodiment of the executive government and can be a plaintiff or defendant in civil actions to which the government is a party.

(ANVISA 1998b; Brasil/Câmara dos Deputados 2000:29). The report also identified a broader problem: the lack of a national biosafety policy. Indeed, seven years after it came into existence, CTNBio had not yet defined biosafety norms, including post-commercialization norms and norms for the coexistence of transgenic crops with conventional and organic ones.

The numerous irregularities surrounding the regulatory process for transgenic varieties have led to the "judicialization" of the conflict. Indeed, all of the commercial approvals granted so far by the Commission have been challenged in the Courts. In the following two sections, I examine in greater detail the approval process of the first two transgenic crops authorized— soybeans and cotton (the third crop, corn, is discussed in chapter six).[158]

Roundup Ready Soybeans

In April 1997, Monsanto's RR soybeans became the first transgenic variety to obtain CTNBio approval for field testing. In the previous years, Monsanto had entered into a technical cooperation agreement with the Brazilian Agricultural Research Corporation (EMBRAPA) for the development of transgenic soybeans adapted to Brazilian soils (Lisboa 2007).[159] A year later, in June 1998, Monsanto moved on to the next step and applied to CTNBio to have RR soy approved for production on a commercial scale. This was the first such request; until then all applications had been for experimental purposes. At this point, the approval process

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[158] I concentrate here on legal actions involving commercial approvals, but other aspects of transgenic organisms, such as labeling, have also been the object of legal proceedings.

[159] According to these agreements, EMBRAPA contributed soybeans varieties adapted to Brazilian growing conditions, while the transgenic component remained Monsanto's property and trade secret.

for RR soy started to derail. On the CTNBio was a consumer representative, who had an inside view of the process. Andrea Salazar, a lawyer who was working for IDEC at the time, recounts:

> The Commission had a seat for a consumer representative, and IDEC was invited to attend. The executive coordinator of IDEC participated for a year and a half, and was quite concerned by what she saw, with the way meetings were conducted and the push to approve commercial releases quickly. So IDEC withdrew, in 1997, and continued to follow the issue and act in an incisive manner, but outside the CTNBio.[160]

Indeed, when the Commission was about to authorize RR soybeans, IDEC resigned its seat and moved to the courts. On September 16, 1998, it obtained an injunction in a federal lower court prohibiting the Union from authorizing the commercial production of RR soybeans. In the court decision, the judge invoked the precautionary principle to prohibit the Union from authorizing the planting and commercialization of RR soybeans until the completion of EIAs, and the elaboration of food safety and labelling norms.

Flouting the judicial decision, the CTNBio issued on September 24, 1998, a technical report favourable to the commercial use of RR soybeans (CTNBio 1998b). The report concluded that the cultivation of RR soybeans did not pose any environmental risk, nor its consumption any food safety risk. This report would normally have resulted in the commercial release of RR soy. However, the court injunction obtained days earlier meant that the commercial approval granted by CTNBio was for all purposes null.

As IDEC and Greenpeace argued, CTNBio had exempted Monsanto from carrying out EIA in defiance of the Constitution and environmental legislation. In

[160] Interview with Andrea Salazar, São Paulo (SP), 10/09/07.

Monsanto's application file for RR soybeans, the only experiments conducted in Brazil were related to the variety's agronomic efficiency, and not to its environmental biosafety. To justify that the variety did not pose any environmental risks, the Commission merely cited approvals granted in other countries (Faria 2003:17). Some members of the commission themselves believed that the data was insufficient:

> The dossier presented by the applicant contains only and solely information about the soybeans in question when cultivated in the United States. The experiences in Brazil concern tests to determine the efficiency of the varieties and are related to the registration of the herbicide Roundup in this country, thus being basically concerned with agronomic issues, not environmental biosafety. Therefore, they do not address aspects that are relevant to the biosafety of transgenic strains. We believe that this level of information is insufficient to make a decision on the so-called deregulation of this product in Brazil. [Brasil/TRF 1999]

In August 1999, a lower court ruled on the court action launched by the Public Ministry on behalf of IDEC, Greenpeace and the Brazilian Institute of Environmental and Renewable Natural Resources (IBAMA). Federal Judge Antônio Souza Prudente ruled that, in accordance with Art. 225 of the Federal Constitution, the presentation of EIA by Monsanto and its subsidiary Monsoy was an essential precondition for the planting of RR soybeans on a commercial scale. It also prohibited the companies from commercializing GE soybeans until biosafety and labelling norms for GE organisms were defined and adopted by the competent public authorities. Finally, it suspended the commercial planting of RR soybeans until light was shed on possible irregularities committed by CTNBio during the approval process. Monsanto was thus effectively prevented from legally selling GE seeds for

the 1999-2000 harvest. Monsanto and the Solicitor-General of the Union announced that they intended to appeal the June ruling.[161]

A year later, the Regional Federal Court met to hear Monsanto and the Union's appeal against the judicial decision that prohibited the planting and commercialization of RR soybeans in the absence of EIA. The Reporting Judge commented that in her twelve years of legal practice, she had never seen as much pressure coming from various government sources as well as from the company itself, and postponed a decision (Menasche 2000). In the meantime, IBAMA announced that it was withdrawing from the court action. On August 8, 2000, the court dismissed the appeal and ruled to uphold the 1999 decision and maintain the ban on the production and commercialization of transgenic organisms.

Parallel to this court action, IDEC filed a civil lawsuit against the Union. The objective was the same—establish the compulsory nature of EIA—but while the former was an immediate and limited action aimed at impeding the impending release of RR soybeans, the latter was broader in scope and applied to all GE organisms. In June 2000, Judge Antônio Souza Prudente allowed the civil lawsuit and ruled in favour of IDEC (Brasil/TRF 2000).

In his decision, Judge Prudente ruled that the presidential decree exempting CTNBio from requiring EIAs was unconstitutional. According to the decree, the Commission could "demand as additional documentation, *if found necessary,* an Environmental Impact Assessment and respective Environmental Impact Report for projects and applications that involve the release of GMOs into the environment"

[161] The solicitor-General of the Union (*Advocacia Geral da União*) is the legal representation of the Union. It represents the Union before the national courts and provides legal advising to the executive branch.

(Brasil 1995b, Art.2, Item XIV; emphasis added). Judge Prudente ruled that CTNBio could not waive the requirement to carry out EIAs in cases involving the release of GE varieties.

The decision also compelled CTNBio to establish biosafety rules before issuing technical reports. Judge Prudente instructed the Commission to draw up food safety norms and rules for the commercialization and consumption of GE crops, in accordance with the Brazilian Constitution, Consumer Code and environmental legislation, within a period of ninety days. The Commission was prevented from issuing technical reports as long as it did not fulfil these conditions, and failure to comply with the decision would incur a daily fine. Judge Prudente also reaffirmed the prohibition of RR soybeans in accordance with the August 1999 decision.

Ignoring the preliminary decision suspending the commercial approval of RR soybeans, Monsanto went ahead and presented to the National Plant Varieties Protection Service (SNPC) a demand for the protection and registration of five transgenic soybeans varieties developed by its affiliate Monsoy. Ten days later, the Ministry of Agriculture announced that the licences had been granted.

Also defying the judicial moratorium, the CTNBio, backed by the Ministry of Science and Technology, issued in June 2000 a technical report favourable to the importation of thirteen varieties of transgenic corn for use in animal feed (CTNBio 2000). The federal government then used the report to cancel the judicial suspension of the unloading of 38 thousands tons of transgenic corn originating from Argentina, embargoed since June in the harbour of Recife (Pernambuco State).

On July 6, 2000, the federal government of President Fernando Henrique Cardoso came out in favour of GE organisms in an official public statement signed

by the Chief of Staff and the Ministers of Agriculture, Science and Technology, Justice, the Environment and Health. On the same day, IBAMA announced that it was withdrawing from the civil lawsuit. Significantly, this marked the first time the federal government took a stand, officially and publicly, in favour of GE organisms. It was coming out in support of CTNBio at a time when the latter's credibility was tested by a series of legal setbacks. According to the statement, CTNBio was "exercising its functions with an unassailable sense of responsibility" and its decisions were taking into consideration "the possibility of risks to human health, animals and the environment, based on rigorous technical evaluations." Its activities, it was said, were the expression of government policy insofar as the safety of transgenic products was concerned. The concerns behind this position were clearly stated: "The government understands that Brazil cannot remain at the margin of this technology [genetic engineering] or of any other that can bring benefits to the country and to its citizens" (MCT 2000). There were other such declarations. For example, in June 2000, Minister of Agriculture Pratini de Moraes had declared that the Brazilian government intended to give "absolute flexibility" to the production of GE varieties, stating that the market would determine if the country ought to produce and commercialize transgenic varieties (Menasche 2000).

Despite the Fernando Henrique Cardoso government's pro-transgenics stance, the 1998 judicial moratorium on GE production was still in force when President Lula da Silva took office in January 2003.[162] Given the latter's statements in support of a precautionary approach, advocates of the precautionary principle

[162] President Fernando Henrique Cardoso's Minister of the Environment, Sarney Filho, remained steadfast in defending IBAMA's competency for conducting environmental assessment and licensing (Lisboa 2007).

were hopeful that the newly-elected government would enforce the judicial decisions.

De Facto Amnesty: The (not-so-)Provisional Measures

On March 26, 2003 – in one of his first major decisions in office—President Lula signed a provisional measure authorizing the commercialization of the 2002-2003 illegal RR soybean harvest, in effect lifting the judicial moratorium in place since 1998 (Brasil 2003b). [163]

To justify its decision, the government argued that it had inherited an uncontrollable situation from the previous government and that, in order not to penalize farmers who had already planted transgenic crops, the only option was to temporarily allow the commercialization of transgenic soybeans. Financial considerations also weighed: the monetary losses avoided by this last-minute release of the clandestine harvest were estimated at US$1billion (Faria 2003:25).

The provisional measure stipulated that soybeans could be commercialized exclusively as grains or in a form in which their reproductive properties were destroyed; their use or commercialization as seed was strictly prohibited. Farmers had until January 31, 2004 to commercialize their harvests; after that date, any surplus had to be incinerated and storing facilities cleaned to receive the 2004 harvest. The provisional measure also made provision for the labelling of transgenic soybeans and their by-products. Offenders who did not respect those conditions exposed themselves to fines and to loss of access to State-bank financing. These

[163] A provisional measure (*Medida Provisória*) is a presidential decree with force of law that depends on congressional approval to remain in effect after the first three months.

provisions, however, went unheeded, as witnessed by the fact that the first provisional measure was shortly followed by another one.

Indeed, a second provisional measure (September 2003) and a third one (October 2004) came on the heels of the first, for the 2004 and 2005 harvests, respectively. The second provisional measure introduced a few innovations in relation to the first, such as the "Commitment, Responsibility and Behaviour Adjustment Term" *(Termo de Compromisso, Responsabilidade e Ajustamento de Conduta*), through which the farmer committed to respecting the conditions under which GE soybeans could be commercialized. It also introduced responsibility for contamination, stipulating that "the producers of soybeans containing genetically modified organisms that cause any harm to the environment or to others, including contamination through hybridization, will be held collectively responsible for the compensation or full reparation of the damage, independently of the existence of guilt." A sole paragraph, the only one vetoed by President Lula, added that "the responsibility called for above, applies equally to the patent holder for the technology applied to soybeans indicated in Art. 1" (Brasil 2003c). By vetoing this provision, President Lula shifted the burden entirely onto farmers, relieving the company of any responsibility for the product it had developed. The note explaining the motives behind the veto pointed to the legal difficulty of holding Monsanto responsible for seeds that had not been acquired legally (Brasil 2003d). With a few exceptions, the third provisional measure was a repeat of the second, allowing the planting and commercialization of GE soybeans reproduced by farmers for their own use, but prohibiting their commercialization as seed (Brasil 2004a).

This state of affairs was politically costly—each new growing season involving uncertainty, political strife and lengthy negotiations—and could not continue indefinitely. When the revised Biosafety Act was passed in March 2005, it made the *de facto* approval of GE soybeans definitive by authorizing "the production and commercialization of seeds from genetically modified, glyphosate-resistant, soybean cultivars registered in the Ministry of Agriculture's National Registry of Cultivars (RNC)" (Brasil 2005, Art. 34-36). The Biosafety Act thus ensured that, for the first time, GE soybeans would be legally available on the market.

The Lula Government's Volte-Face on Transgenics

The breaking of President Lula's campaign promise to enforce the precautionary principle was totally unexpected, and it came as a serious blow to advocates of a precautionary approach. Even with the benefit of hindsight, they struggle to explain this turnaround. The Workers Party's historical positions, President Lula's declarations during the electoral campaign[164], the support he enjoyed among Brazilian environmental and social movements, and the nomination of Marina Silva—a renowned environmentalist and outspoken advocate of the precautionary principle[165]—as Minister of the Environment led all to believe that the newly-elected government would support the precautionary principle. Moreover, as we have seen earlier, the Workers Party itself had challenged the constitutionality of the 1995 Biosafety Act.

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[164] When Greenpeace questioned the political attaché about the Workers Party's policy on transgenics, his answer was "no, we won't authorize." Interview with Gabriela Vuolo, Brasília (DF), 08/15/07.

[165] As federal senator, Marina Silva tabled a bill suggesting a five year moratorium so as allow more time for research (Brasil/Senado Federal 1999).

Lisboa puts forward an interesting argument to account for President Lula's about-face. In her opinion, "the main reasons why the Lula government legalized the commercial planting of soybeans sowed illegally in the country, waiving the necessary scientific studies on biosafety, and later modified the biosafety legislation to facilitate the future release of other varieties, *were strictly reasons of political opportunism*" (Lisboa 2007, emphasis added). Indeed, although he was elected with 61 percent of the popular vote in 2002, President Lula's was a minority government. In order to create an electoral majority in Congress, he had to forge alliances with other parties (mostly of the centre) to form a governing coalition. This political vulnerability meant that he had to make important concessions to allied parties, and compromise with a Congress where the biotechnological lobby could count on the support of the influential *bancada ruralista*.[166] But, Lisboa adds—and this is important—these concessions did not go against the predominantly developmental ideology of the Lula government. Indeed, far from breaking with its predecessors, the Lula administration has fully embraced the export-oriented agribusiness model (Soares et al. 2004).[167] As Sabourin (2007) concludes in his examination of farming policy during President Lula's first mandate, despite increases in resources devoted

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[166] The biotechnological lobby manoeuvred skilfully to win congressmen's support. During the 2002 electoral campaign, Monsanto invited deputies on trips abroad (all expenses paid) to learn more about transgenic products. Hence, federal deputy Paulo Pimenta (Workers Party/RS), appointed by the president as rapporteur for the second provisional measure, had recently converted to the authorization of transgenic soybeans following a guided tour of Monsanto's headquarters in Saint-Louis, Missouri, along with seven other Brazilian deputies (AS-PTA Bulletin 164).

[167] President Lula once declared, in a speech before businessmen, landowners and State governors, that Indigenous people, *quilombolas* (descendants of runaway slaves), environmentalists and the Public Ministry were hindrances to the country's economic development, calling the Brazilian environmental legislation "knick-knacks" (Folha de São Paulo 2006).

to the family farming sector and the creation of programs such as the National Program for the Strengthening of Family Agriculture (PRONAF), "the Lula governmnent continued giving priority to agribusiness in the distribution of resources" (2007:715).

The release of illegal transgenic soybeans was the first of a series of setbacks for Minister of the Environment Marina Silva. Renowned environmentalist and outspoken advocate of the precautionary principle, she rapidly came into conflict with other ministries—first and foremost the Ministry of Agriculture and the Office of the Chief of Staff—on issues opposing environmental preservation to economic interests. After being repeatedly disavowed by the executive, she handed in her resignation in May 2008, lamenting President Lula's lack of support for environmental policy.

In July 2007, in the midst of the transgenic corn controversy, the front page of the Brazilian weekly magazine *Carta Capital* showed President Lula whistling and looking the other way (Appendix P). In retrospect, is interesting to note that, as presidential candidate, he had stated: "I am radically opposed to it [the authorization of transgenics] and I think it's a step backwards for the government to do this. In reality, this is happening because, once again, the political elite of this country has fallen for the charm of a multinational" (Folha de São Paulo 2003).

Update on the Civil Lawsuit

The civil lawsuit is not over yet. On June 28, 2004, a three-judge panel of the Regional Federal Court decided on the merits of the previous lower court ruling. In a majority decision, it ruled in favour of the authority of the CTNBio to waive EIAs

for biotech products, thus overturning the lower court decision. Judge Selene Maria de Almeida argued that the current prohibition was detrimental to Brazil's competitiveness on international commodity markets (EcoAgência de Notícias 2003). The dissenting Judge, João Batista Moreira, argued, in counterpoint, that any commercial approval of transgenic organism should be conditional on carrying out EIA so as to comply with the democratic principle of human health and environmental protection. Judge Selene Maria de Almeida also voted in favour of lifting the ban on RR soybeans, arguing that scientific research by international agencies (FAO, World Health Organization, Royal Society, Codex Alimentarius) attested to the safety of RR soy for human and animal consumption and for the environment. The other two judges did not follow suit, however, and the ban on RR soybeans was upheld. This was the first decision favourable to Monsanto and the Union so far, but since the decision was not unanimous, IDEC was allowed to appeal. The appeal is before the Superior Court of Justice at the time of writing.

Bt Cotton

The passing of the revised Biosafety Act not only sealed the approval of RR soybeans, but also that of the first variety of transgenic cotton. Indeed, on March 17, 2005, on the eve of passing the revised Biosafety Act, CTNBio approved[168] Monsanto's Bollgard variety, genetically engineered with DNA from the soil microbe *Bacillus thuringiensis* (hence the abbreviation Bt) to produce toxins

[168] Of the ten members present for the vote, only the representative of the Ministry of the Environment voted against.

poisonous to the bollworm (CTNBio 2005).[169] The timing was not coincidental: the revised Act stipulated that CTNBio decisions that were anterior to it would not be opened up to re-examination (Brasil 2005, Art. 30, 32 and 34). In other words, any approval already granted by the Commission would become permanent with the coming into force of the new Act.

The Ministry of the Environment immediately contested the decision. In an official note published the day after the CTNBio decision, it argued that the approval was "an attack on the precautionary principle, Brazilian environmental legislation and the Cartagena Protocol on Biosafety, and a danger for the country's environmental protection and the quality of life of current and future generations" (MMA 2005). The ministry criticized the Commission's hurry in approving cotton just when a new biosafety framework was about to be introduced. It also denounced the fact that Bollgard cotton had been authorized based on Monsanto's own studies, of which only five had been conducted in Brazil, and only three published in peer-reviewed scientific journals. It pointed out that Brazil was a centre of origin for cotton, and that no measures[170] had been taken to prevent the contamination of wild species (one of which is unique to Brazil) by transgenic varieties. It added that little was known as to the impact of the transgenic toxin on insect populations (including the pests' natural enemies). The Ministry of the Environment concluded by declaring that it intended to contest the decision (GTA 2005).

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[169] Two months earlier (January 2005), Monsanto had been sentenced to a US$1.5 million fine by the U.S. Securities and Exchange Commission for (unsuccessfully) bribing Indonesian senior government officials into authorizing the same variety (Bollgard) without EIA.

[170] Measures to prevent contamination include zoning for planting, segregating production to avoid mixtures and to guarantee traceability of the different varieties, and organizing transportation to avoid loss of seeds.

The Public Ministry also threatened to enter into a civil lawsuit against CTNBio for authorizing the commercialization of conventional cottonseeds containing up to 1 percent transgenic elements (2004-2005 harvest). It denounced the lack of technical and scientific criteria for establishing the presence of GE seeds in conventional cottonseeds; the non-existence of analyses on the food safety, health and environmental risks of GE cottonseeds; and the lack of EIAs and environmental zoning for GE production. It also pointed out that the decision had been taken by only seven votes in favour, while the Commission bylaws stipulated that a decision had to be made by two-thirds of its 18 members (MPF/DF 2005).

Even though Bollgard had received CTNBio approval, the seeds were not yet available in Brazil (seeds had to be imported from the United States and multiplied). As it was soon revealed, however, cotton seeds smuggled from Australia and the United States were multiplied illegally, including several transgenic varieties that had not yet been approved. In June 2006, after confirming the presence of illegal varieties of transgenic cotton in five different States, the Ministry of Agriculture ordered that they be destroyed.

In a now familiar scenario, a provisional measure approved by Congress authorized the commercialization of transgenic cotton planted illegally and harvested that year (Brasil 2006b). It specified that cottonseeds had to be destroyed or used for biodiesel production. The special measure would benefit the owners of 150,000 hectares planted with illegal varieties, which production had been seized by the Ministry of Agriculture. However, when President Lula sanctioned the provisional measure, he vetoed the provision allowing the sale of illegal transgenic cotton.

Bt cotton—the second transgenic crop to obtain commercial approval—followed a course similar to that of RR soybeans. While the controversy surrounding transgenic cotton was less heated—in part because it was approved at a time when civil society mobilization was at a low ebb following the commercial release of transgenic soybeans—several parallels can be drawn. Firstly, it was approved by CTNBio under questionable conditions. Secondly, the Commission's decision was contested—this time by the Ministry of the Environment and the Public Ministry—over similar grounds (the absence of EIA). Finally, the existence of illegal harvests was used to justify a provisional measure authorizing its commercialization (which was eventually defeated, but largely for extraneous reasons).[171]

Terminator

Brazil is the only country, besides India, to have introduced a national ban on sterile seed technologies. The Brazilian Biosafety Act prohibits the use, commercialization, registration, patenting, and licensing of Genetic Use Restriction Technologies (GURTs), defined as "any human intervention to generate or multiply genetically modified plants to produce sterile reproductive structures, as well as any kind of genetic manipulation to activate or deactivate plant genes related to fertility by external chemical inducers" (Brasil 2005, Art. 6 VII.).

The ban, however, is fragile. A bill aimed at modifying this provision of the Biosafety Act is making its way through Congress (Brasil/Câmara dos Deputados

[171] See Appendix Q for an up-to-date list of transgenic varieties authorized for commercial production in Brazil.

2007a).[172] If it were passed, it would lift all prohibitions on GURTs except for the commercialization of sterile seeds. GE organisms containing these technologies could therefore be patented or used in research, for example. However, the most controversial provision of the bill is that it allows for the commercialization of sterile seeds in the case of *bioreactor plants*, defined as transgenic organisms that produce proteins or substances for therapeutic or industrial purposes. The bill suffered a setback in the Chamber of Deputies' Environmental Commission but was approved by the Agriculture Commission; It will be considered by one more commission (Constitution, Justice and Citizenship) before a vote is held in the Chamber of Deputies (Agência Câmara 2007; Suzuki 2006).

Concluding Remarks

Taken together, the quotes in excerpt well summarize the ambivalence and ironies of transgenic politics in Brazil over the last decade. Minister of Agriculture Pratini de Moraes' stance ultimately prevailed and, ironically, this was under the presidency of Luiz Inácio Lula da Silva. Indeed, after a five-year judicial moratorium, the first transgenic variety introduced in Brazil was authorized shortly after the Workers Party came to power in January 2003, despite its electoral promise to enforce the judicial ban. As witness the interdepartmental commissions, the series of presidential decrees and the creation of the National Biosafety Council (CNBS), the controversy over transgenics in Brazil reached considerable proportions and was dealt with at the highest levels of government. Federal government backing for the

[172] This bill is in fact the revival of a 2005 bill that was shelved with the end of the legislature (Brasil/Câmara dos Deputados 2005).

swift approval of GE varieties was key in allowing the authorization of the first varieties despite the judicial moratorium.

Pressures to speed up the introduction of transgenic varieties have led to irregularities in the approval process for transgenic varieties. Civil society has seized upon this failure to respect the existing environmental and biosafety legislation to contest decisions involving transgenic varieties before the courts. The crux of the matter has been a power struggle over who would have the competency to decide on the need for EIA. This was at the heart of the civil lawsuit, of two Direct Actions of Unconstitutionality and of both the original and revised Biosafety Act. The transgenics issue pitted the Ministries of the Environment, Health and Agrarian Development against the Ministries of Science and Technology, and Agriculture. Internal divisions have led to strange situations, where, for example, IBAMA filed a civil lawsuit against the Union alongside IDEC and Greenpeace. IBAMA was eventually forced to withdraw from the court action but, for a whole year and a half, a governmental agency was involved in a lawsuit against its own government. Internal divisions continue to this day, as witness criticisms raised by IBAMA and the National Health Surveillance Agency (ANVISA) regarding the CTNBio approval of transgenic corn varieties.

In both cases of commercial approval—RR soybeans and Bt cotton—authorization was granted after the fact, that is after having been illegally cultivated. Brazil is a case in point for the argument that "the idea, quite simply, is to pollute faster than countries can legislate—then change the laws to fit the contamination" (Klein 2001). As a biotech industry consultant said: "the hope of the industry is that over time the market is so flooded [with GMOs] that there's nothing

you can do about it. You just sort of surrender" (quoted in Laidlaw 2001). In Brazil, this was a deliberate strategy, with both Monsanto and the government turning a blind eye to illegal seed production and seed smuggling. Hence, in June 1998—that is, three months *before* it released RR soy—CTNBio authorized Monsanto to sow 110 hectares of RR soy destined to seed production.[173] The Ministry of Agriculture's inspection services are notoriously inadequate (Faria 2003:25; Marino and Minayo-Gomez 2004). More importantly, the fact that the very agency responsible for monitoring illegal GE crops—the Ministry of Agriculture—was openly in favour of their legalization ensured that seed smuggling would go on unfettered.

Judge João Batista Moreira concluded his minority decision in the civil lawsuit with a witty comment: "I wouldn't say that this is a vote totally in support of *green* (symbol of the environment) or *yellow* (of gold, wealth, or economic activity), but it is a vote that supports green and yellow (*verde-amarelo*), popular participation, citizenship"—a play on words based on Brazil's national flag, known as *verde-amarelo* (Brasil/TRF 2004). This statement hints at the clash between advocates of the precautionary approach and those in favour of the speedy introduction of transgenic crops, at the economic interests at stake and at the important role played by civil society. In the last chapter, I examine in greater detail the role played by Brazilian civil society in the debate over genetic engineering in agriculture.

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[173] This is well-documented in Brasil/Câmara dos Deputados (2000), Section IX Item 4.

CHAPTER 6

CONTESTING GENETIC ENGINEERING IN THE FIELDS AND IN THE COURTS: THE NATIONAL CAMPAIGN FOR A GM-FREE BRAZIL

To counter the bulldozing of corporations
and the servile position of the Brazilian government,
we demand a wide social debate so that public opinion,
duly informed, may express itself.

Founding Declaration of the National Campaign for a GM-Free Brazil (1999)

First Steps (1999-2003)

In November 1999, a dozen non-governmental organizations launched the "National Campaign for a GM-Free Brazil" (*Campanha Nacional por um Brasil Livre de Transgênicos*, hereafter, the Campaign).[174] Among the founding entities were agro-environmental NGOs. Consultancy and Services for Projects in Alternative Agriculture (AS-PTA), in particular, was to play a crucial role, contributing space and staff to the Campaign's national coordination. Among the Campaign's early members there was also the consumer defence organization IDEC and the environmental NGO Greenpeace, various socioeconomic research institutes and NGOs, two NGOs working in the field of food security, and an agricultural research workers union.[175]

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[174] See Campaign logo in Appendix R.

[175] The founding organizations are Consultancy and Services for Projects in Alternative Agriculture (AS-PTA); the Ecology Centre; the Brazilian Institute for Consumer Protection (IDEC); Greenpeace; ActionAid; the Federation of Social and Educational Assistance Organizations (FASE); the Brazilian Institute for Socio-Economic Analysis (IBASE); the Institute for Socio-Economic Research (INESC); Research and Consultancy Centre (ESPLAR); the Brazilian Forum for Food and Nutrition Security (FBSAN); the Association for Projects to Fight

The Campaign was formed at a crucial time juncture. In Rio Grande do Sul, the controversy was at its height: the Dutra government seemed intent on enforcing its project for a GM-free state but was facing mounting opposition from industry and farmers growing RR soy. At the federal level, the government was pushing for the introduction of transgenic crops despite the judicial moratorium. In this context, the civil society organizations which were involved in the debate felt the need to better articulate their efforts. Their immediate objective was to prevent the spread of illegal RR soybeans; their ultimate objective was to transform the *de facto* judicial moratorium into a national moratorium on transgenic crops.

The first electronic bulletin of the Campaign came out on November 23, 1999. Its purpose was to "disseminate ideas and information on the risks and impacts of GMOs on the environment, consumer health and agriculture" (AS-PTA 1999). The electronic bulletin has been *e*-published weekly ever since (that is, for nearly a decade) and has become an important element of the Campaign. As of May 2009, the Campaign had published 440 issues and there were close to 7,000 subscribers. The bulletin reproduces articles on transgenic-related issues (such as biosafety, biodiversity and agroecology) published in Brazil's major newspapers, as well as summaries in Portuguese of articles published in foreign newspapers and scientific publications. It provides a forum to publicize the Campaign's actions, orientations and position statements, and to comment on the latest political and judicial developments. Each bulletin also includes concrete examples of agroecological experiences and alternatives. Finally, it publicizes related events (training courses,

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Hunger (AGORA) and the National Union of Agricultural Research and Development Workers (SINPAF).

conferences, book launches and documentary screenings) and other relevant sources of information, such as publications and websites.

The Campaign's first official public statement—the manifesto for a GM-Free Brazil—came out in January 2000. It was signed by the Campaign's founding organizations, and endorsed by 23 organizations of the AS-PTA agroecology network representing 11 different states. The first section—"Why Say No to Transgenics"—opens with an analysis of the situation with regards to the issue in Brazil and abroad, emphasizing the lack of scientific consensus on their biosafety. Next, comes a brief explanation of genetic engineering and a critique of the genetic reductionism underlying it. The third section—"Who Produces Transgenics and Why?"—denounces the profit-incentive driving agbiotech research and the trend toward increasing corporate concentration in the sector. The fourth section lists a series of potential risks and problems posed by transgenics, such as genetic contamination and the erosion of agricultural biodiversity; the lack of information and accountability (in the absence of labeling regulations); and, finally, the lack of independent, scientific studies and the absence of scientific consensus on their safety.

The last section—the manifesto itself—denounces the biotech sector's undue influence on the approval process and the Brazilian government's submissive attitude: "To counter the bulldozing of corporations and the servile position of the Brazilian government, we demand a wide social debate so that public opinion, duly informed, may express itself" (AS-PTA 2000). It calls for an indefinite moratorium on the planting and commercialization of transgenic crops and for a broad public debate. It also calls on the public to write to the ministers of Science and Technology, Health, Environment, Agriculture and Justice and to the President of the

Republic to demand the enforcement of the precautionary principle, the rigorous testing of genetically engineered organisms and the compulsory labeling of their by-products. Finally, it calls on consumers and their local retailers to insist on knowing if foodstuffs contain transgenic products, and to boycott soybeans, corn and potato-based foodstuffs imported from the United States, Canada and Argentina (AS-PTA 2000).

First Actions

In its early years, the Campaign carried out a number of direct actions against the importation of genetically engineered grains. The first action took place in December 1997, when Greenpeace blocked the unloading of a ship containing imported U.S. RR soybeans in the southern State of Santa Catarina. Activists first attempted to prevent the ship from docking, and when this failed, they went on board, hung up a banner saying "Frankensoy: Don't Swallow It!" (*Frankensoja: Não Engula Essa!*) and chained themselves to unloading equipment. This was one of the first shipments of transgenic soybeans to Brazil. It had been authorized by the CTNBio for industrial processing only, but Greenpeace argued that the environmental and health effects of genetically engineered plants were still unknown, and that the government should at least require labelling of soy products to identify those made from genetically engineered beans (Reuters 1997).

Greenpeace struck again in February 2000, this time preventing the unloading of 30,000 tons of corn imported from the United Stated by the company Perdigão that it suspected could be genetically engineered. The denunciation led to a court action, and the company agreed to re-export. In June, another ship was prevented

from unloading genetically engineered corn from Argentina in the southern port of Rio Grande (Rio Grande do Sul) following a denunciation by Greenpeace. The federal justice department suspended unloading and ordered that detection tests be performed. The latter revealed the presence of transgenic grains and the Ministry of Agriculture announced that the shipment would be re-exported. However, in the meantime, the CTNBio issued a technical report in favour of the import of 13 varieties of transgenic corn for use in animal feed (in defiance of the judicial moratorium), and the latter was then used by the government to release the embargoed shipment (CTNBio 2000). In these two cases, transgenic corn imports had not been authorized and were happening on the sly (www.greenpeace.org/brasil Accessed August 4, 2008; Menasche 2000).

The action that had the strongest repercussions in the media, however, was the first Brazilian uprooting of transgenic crops, carried out in Rio Grande do Sul during the First World Social Forum. On January 26, 2001, eight hundred small farmers and landless rural workers related to Via Campesina uprooted 2.5 hectares of experimental transgenic soy and corn belonging to Monsanto in the municipality of Não-Me-Toque.[176] Inspired by the French voluntary reapers (*faucheurs volontaires*), the action was the first of its kind in Brazil, and had national and international repercussions, in large part due to the controversial participation of the high-profile French peasant leader José Bové.[177]

Early on, the Campaign set itself up as a watchdog, closely monitoring the CTNBio's actions, and denouncing any irregularity in the approval process. Hence,

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[176] Amusingly, the name of the municipality—Não-Me-Toque—means "don't touch me."

[177] Menasche discusses this episode in more details in her PhD thesis. See Menasche (2003), pp.200-213.

in June 2000, IDEC and Greenpeace alerted public opinion to the presence of transgenic soy in the food chain. Out of 42 food products found in Brazilian supermarkets and tested in laboratories in Switzerland and Austria, 11 revealed the presence of transgenic organisms. Following this action, the two organizations launched the campaign "No GMOs on my Plate!" (*Transgênicos: No Meu Prato Não!*). Like its counterparts in other countries, Greenpeace-Brazil produces a consumer guide to GMO-free food that lists the brands and products found in Brazilian supermarkets that contain transgenics.[178]

From the very beginning, campaign activists were also involved in challenging transgenics in the courts. The initial lawsuit launched by IDEC against the release of RR soybeans without environmental impact assessments (EIAs) was key in first raising awareness about the problematical aspects of the approval process. What was in fact the first legal action involving transgenics in Brazil was led by Greenpeace and involved the labelling of cooking oils derived from transgenic soybeans. Because it did not involve a commercial release, it did not have the same repercussions as the RR soybean lawsuit was to have only months later. It was followed by numerous other lawsuits, involving different aspects of the issue, from commercial authorizations to labeling.

Taken together, these actions played a key role in igniting the controversy and launching a public debate on genetic engineering in agriculture. As a result, what companies hoped would remain a purely administrative process burst into the open. A "non-issue" at the time of the first Greenpeace action in December 1997, transgenics had become an explosive issue by the end of 1998.

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[178] Available online at www.greenpeace.org/brasil. Accessed August 4, 2008.

Consolidation and Expansion (March 2003)

March 2003 was a turning point in the campaign. Pressure to release illegal transgenic soybeans in Rio Grande do Sul was mounting. To find a solution to this vexed issue, newly-elected President Lula had set up an interministerial commission on transgenics the previous month, formed of the ministries of the Environment, of Health, of Agrarian Development, of Agriculture, of Science and Technology, of Justice, of Development, Industry and Foreign Trade, and of the National Council for Food and Nutritional Security (CONSEA).

In this charged context, a seminar entitled "Transgenic Threat: Civil Society Proposals" was held in Brasília, on March 18-20, 2003. It was organized by the Campaign, the National Articulation of Agroecology (ANA), several agricultural workers unions[179], the Landless Rural Workers Movement (MST) and the Workers Party's agrarian caucus. It brought together 150 participants representing 85 different organizations—among them social movements, workers unions, cooperatives, research institutes, professional associations, NGOs and private foundations. Its objective was to bring together organizations involved in the debate in order to draw up proposals and submit them to the special commission (AS-PTA Bulletin 151).

Participants came up with detailed recommendations organized around five axes. With regards to Brazil's biotechnology and biosafety legislation, the seminar recommended that Brazil: ratify the Cartagena protocol on Biosafety[180]; restore the Ministry of the Environment's competency in the area of EIAs; introduce a

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[179] The participating agricultural workers unions are The National Confederation of Agro-industrial and Rural Workers (CONTAC); the National Confederation of Agricultural Workers (CONTAG); the Central Workers Union (CUT); and the Family Farming Workers Federation (FETRAF-SUL/CUT).

[180] Brazil ratified the Cartagena Protocol on Biosafety in November 2003.

moratorium as long as the precautionary principle was not met; ban seed sterilization technologies; and establish joint study groups on specific aspects of the issue with members of congress and civil society representatives. With regard to the CTNBio, it recommended the development and implementation of an effective national biosafety policy, something that had not yet been done; and, given the CTNBio's poor record, that all of its decisions to date be reassessed in light of the new policy. It proposed modifying the Commission's composition with a view to achieving a better balance among the various sectors (the Ministry of Science and Technology being over-represented within the Commission) and greater transparency in the Commission's functioning. Finally, it recommended to give a greater role to other government agencies with specialized expertise, such as the Brazilian Institute of Environmental and Renewable Natural Resources (IBAMA) and the National Health Surveillance Agency (ANVISA).

The Seminar made detailed recommendations with regards to the pressing issue of the illegal transgenic soybean harvest. It recommended that an inquiry be conducted to determine the public and private responsibilities in the smuggling of RR soybeans. It also proposed that the illegal soybean harvest be exported in order to avoid contamination. Finally, it recommended that the agenda for public research be expanded to include not only biotechnology, but biodiversity, biosafety, bioethics and the socioeconomic, social and cultural repercussions of transgenic crops. Farmers' rights and national sovereignty over genetic resources were also reaffirmed: "it is essential to safeguard the national genetic heritage through protective legislation, and to prohibit the patenting of germplasm, because the latter's

improvement is the product of millennial selection by peasants and, for this reason, seeds are the heritage of humanity" (AS-PTA 2003c).[181]

These proposals were presented during the closing ceremony in the presence of Environment Minister Marina Silva, and representatives of the Ministry of Science and Technology, the Ministry of Agriculture, the Brazilian Agricultural Research Corporation (EMBRAPA) and some members of Congress. Civil society organizations made public an open letter to President Lula presenting their main recommendations, as well as a motion of non-confidence against the minister of Agriculture for openly endorsing transgenic plantations despite the judicial moratorium (AS-PTA 2003b).

On March 26, less than a week after the seminar, President Lula signed the first provisional measure authorizing the commercialization of the 2003 transgenic soybean harvest. This came as a serious blow to Campaign activists, among whom there was a widespread feeling that the most important battle had been lost (*"já foi..."*).[182]

Nevertheless, the Campaign quickly pulled itself together, and the seminar proved important in redefining its internal dynamic and course of action. Indeed, it was decided to expand the Campaign and modify its course. The Campaign thus entered into "a new phase, with a new organisation and a new mode of functioning" (AS-PTA 2003a). It adopted a flexible membership, according to which any entity that committed to a set of basic principles could join the Campaign. It was decided that member organizations could use the Campaign's name and logo for their

[181] This is a summary of the main recommendations. See AS-PTA (2003c).

[182] Several activists interviewed were emphatic in this respect. Interviews with Gabriela Vuolo, Brasília (DF), 08/15/07; Andréa Salazar, São Paulo (SP) 10/09/07; and Marijane Lisboa, Porto Alegre (RS), 10/16/07.

actions, but would have to use their own name in organizing their actions and assume responsibility for them, so as not to commit other members organisations.

From then on, the Campaign rapidly expanded into a broad and flexible network of NGOs, associations, social movements and other groups. According to its coordinator, it now comprises over 230 entities (e-mail to author, June 8, 2009). Among them are a large number of consumer advocacy groups and consumer associations, as well as environmental, organic agriculture and small farmers organizations, alongside a vast variety of other groups. To give but a glimpse of the diversity of its membership, the Campaign has the support of the Indigenist Missionary Council (CIMI), the Association of Brazilian Geographers (AGB), the National Network of Grassroots Lawyers (RENAP) and the Workers Party agrarian and environmental caucus. A small number of these organizations form the Campaign's active core. This core has fluctuated over the years, but is currently formed of AS-PTA, IDEC, Greenpeace, Terra de Direitos (a non-governmental, human rights organization) and Via Campesina. Given the Campaign membership's great diversity, each entity preserves its autonomy and is held accountable for its words and actions.

The Campaign's basic principles are the key to understanding its stance on the issue (AS-PTA 2000). The first principle states that "the Campaign aims at establishing a broad democratic debate on transgenics within society—something that has not happened yet." The second principle—"Campaign member entities are not opposed to research or scientific progress"—is clearly a response to those who dismiss opposition to genetic engineering as Neo-Luddism. The third principle reasserts the precautionary principle—"Campaign member entities are opposed to

the adoption of new technologies before they are duly tested and before it is demonstrated that they are safe for peoples' health and the environment"—and stresses that precaution is a principle of international law incorporated into the Brazilian legislation. The Campaign adds that it is public knowledge that such assessments have not been conducted and that there is no consensus within the scientific community regarding these products' health and environmental innocuousness. The fourth principle draws attention to the need to assess the socioeconomic impacts of transgenics in Brazil, in particular on family farming. The fifth principle establishes that, in the event of the release of a transgenic species in Brazil, the detailed labelling of foodstuffs derived from genetic engineering should be compulsory in order to ensure the right to an informed choice. The sixth principle reiterates that the Campaign is opposed to the use of agrochemicals (chemical pesticides) in agriculture because "these products are extremely harmful to farmers, seriously compromising their health and that of consumers, contaminating the environment and making farmers dependent on the companies that produce them. The seventh principle reasserts members' commitment to agroecology as an alternative to the agricultural production model based on the use of transgenic seeds and agrochemicals: "agroecological agriculture uses and develops practices that preserve the environment, do not pose risks to farmers' health and result in the production of healthy foods, that do not pose risks to consumers' health. In addition, agroecological production is sustainable economically and market-wise, and can compete on an equal footing with other, less sustainable, agricultural production systems." The eighth principle establishes that the Campaign's member organizations are autonomous and accountable. Finally, the ninth principle states that

all demonstrations realized in the context of the Campaign for a GM-Free Brazil will be peaceful and free of any act of violence.

During that period, a sit-in was organized in the capital city, Brasília, to put pressure on Congress during discussions of the revised biosafety bill. Between September 12 and October 16, 2003, the *National Sit-in Against Transgenics, and in Favour of Brazilian Sovereignty and Healthy Food* gathered close to 500 people. The 34-daylong event included conferences and workshops on biosafety, demonstrations and public information. Rural social movements were denouncing the fact that "transgenic food production serves the interests of multinational seed companies, threatens farmers' autonomy, entails health risks and is detrimental to the environment because of the resulting loss of biodiversity" (Indymedia Brasil 2003).

Direct Actions (March 2006)

Among the direct actions organized in the context of the Campaign, two stand out. Both were organized under the auspices of Via Campesina, and happened a few days apart, in March 2006, their timing being carefully planned to coincide with international events. Indeed, Brazil was hosting two international conferences that month: the Second FAO International Conference on Agrarian Reform and Rural Development (ICARRD) held in Porto Alegre (RS), March 7-10, 2006; and the United Nations Convention on Biological Diversity (COP8/MOP3), held in Curitiba (Paraná), March 13-31, 2006.

Occupation of Aracruz Celulose

On March 8, 2006, 1,500 women from Via Campesina entered a laboratory and forest nursery of the Brazilian multinational pulp manufacturer Aracruz Celulose

in Barra do Ribeiro (RS) and destroyed seedlings to protest against the social and environmental consequences of the expanding monoculture of trees for the cellulose industry.

Aracruz Celulose is the world's largest producer of bleached eucalyptus pulp used in paper manufacturing, and is engaged in the research and development of transgenic trees. In 1998, it was the first company to obtain authorization to conduct laboratory tests from the CTNBio, for research on genetically engineered trees (Merlino 2007). Aracruz Celulose has two pulp mills in Brazil, one of which is located in Barra do Ribeiro, across the Guaíba river from the capital city Porto Alegre (where the action took place).[183]

Trees are being genetically engineered for traits of interest in industrial tree plantations. Two of these traits—herbicide tolerance (to withstand herbicides sprayings) and insect resistance (so they produce a toxin lethal to insects)—are the same as for agricultural crops. Trees are also genetically engineered for other traits, such as reduced lignin and increased cellulose to facilitate their processing into paper; faster growth to speed up the production process; and cold tolerance so they can be planted in colder climates.

These plantations of eucalyptus, pine and acacia have been dubbed *green deserts* or *silent groves* by critics, who stress that monoculture tree plantations are not forests, and that they lead to desertification and the extinction of biodiversity. An average eucalyptus tree consumes up to 30 litres of water per day, and their large-scale and intensive cultivation can dry up local water resources. Tree monoculture is

[183] The other pulp mill is located in the Northeast State of Espírito Santo, where the company is entangled in a lengthy and violent conflict over land with Tupiniquim and Guarani Indigenous people as well as *quilombola* (slave descendants) communities.

also criticized for causing soil exhaustion, taking over arable lands and leading to unemployment because it is highly mechanized.

Holding such an action on International Women's Day was of course symbolic, and the decision to conduct the action during the FAO meeting was designed to maximize its repercussions while limiting the risks of violent repression.[184] The action happened at dawn, and was carried out so swiftly that, before anyone knew what had happened, the women had already left the site and joined a massive march organized to celebrate International Women's Day in Porto Alegre. The action was unprecedented in several respects: it was the first time that such a far-reaching action was organized and conducted almost exclusively by women (the Peasant Women's Movement/MMC, in particular, played a key role); it was also the first direct action targeting monoculture tree plantations and drawing attention to the emerging issue of the genetic engineering of trees (Via Campesina Brasil 2006a).[185]

The action provoked admiration and outrage. It was condemned as vandalism by the (conservative) Brazilian press, but received widespread support from a range of prominent Brazilian and foreign academics, deputies, bishops and artists who signed a manifesto entitled "The Seedlings Broke the Silence" (*As Mudas Romperam*

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[184] Following the action, 38 participants were prosecuted for aggravated damage and theft, criminal conspiracy, holding hostage and money laundering. The offices of the women's organizations were searched and their bank secrecy broken. Some of the movement's leaders had to remain in hiding for months afterwards.

[185] In June 2007, CTNBio authorized field experiments with eucalyptus genetically engineered for rapid growth, increased cellulose and tolerance to glyphosate herbicide (AS-PTA Bulletin 377).

O Silêncio) in solidarity with the women who had taken part in the action (Via Campesina Brasil 2006b).[186]

Occupation of Syngenta Experimental Site

Less than a week later, three hundred members of the Via Campesina occupied an experimental site belonging to the Swiss multinational Syngenta in Santa Tereza do Oeste (west of the State of Paraná). Syngenta has the third largest share of the global seeds market and is at the forefront of research into agricultural biotechnology (ETC Group 2007a).

Earlier in March, IBAMA had inspected several properties in the region following a denunciation by civil society organizations that transgenic crops were being cultivated illegally in the buffer zone of an environmental protection area (Iguaçu National Park is a UNESCO world heritage site and a federal conservation area). Syngenta's experimental site was located at six kilometres of the park, in breach of a law imposing a ten kilometre buffer zone (Brasil 2003c). IBAMA confirmed that all activities involving GMOs that the multinational conducted at its testing site were prohibited and that actions would be taken. On March 21, IBAMA fined Syngenta for R$1 million [CAN$500,000], under the environmental crime legislation, for conducting field trials of transgenic soybeans and corn in the buffer zone of an environmental protection area. Syngenta had authorization from the CTNBio for its experiments, but not from IBAMA.

It is in this context that Via Campesina occupied Syngenta's experimental site on March 14, 2006, demanding that it put a halt to its experiments and pay the fine.

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[186] An English translation of the manifesto is reproduced in Desmarais (2007:174-175). For more details on the action, see Wiebe (2006).

Carried out the day after the opening of the UN meeting of the Parties to the Cartagena Protocol on Biosafety (MOP) in the State's capital city, Curitiba, the occupation attracted considerable media attention. An international delegation present at the UN meeting visited the occupation to show support. Syngenta appealed both IBAMA's fine and the State's expropriation decree. The appeal against IBAMA was rejected, but the fine remains unpaid at the time of writing.

The families remained on the site until November 2006, when Syngenta won a Court order to expel the occupants. They reoccupied the site later in November, when State governor Roberto Requião—an outspoken critique of transgenics—signed a decree to expropriate Syngenta in the public interest and turn the site into a centre for research and education in sustainable agriculture for small farmers and landless workers. When the decree was suspended, they relocated to a nearby settlement.

On October 21, 2007, Via Campesina decided to reoccupy the area to protest against the fact that Syngenta had not committed to putting an halt to transgenic experiments in the area and had still not paid the fine. The reoccupation proceeded peacefully, but a few hours later, Syngenta's private security guards showed up, opened fire and killed a local leader of the Landless Rural Workers Movement (MST). A security guard was also killed and several people injured in the clash. Following the incident, the federal police opened an inquiry into the links between Syngenta, the security firm implicated (*N.F. Segurança*) and the Rural Society of the West (SRO), an armed militia formed by large landowners that operates in the region (TDD/VC/MST 2008).[187]

[187] For a detailed account of these events, see TDD/VC/MST (2008).

In the meantime, Syngenta successfully lobbied the Brazilian Congress to amend the law in its favour. Sanctioned in March 2007, Provisional Measure n^{o} 327 modified the existing legislation to allow the cultivation of genetically modified organisms in conservation areas buffer zones (their cultivation remained prohibited in the conservation areas themselves and on Indigenous lands) (Brasil 2006b).

Significantly, the dispute was not over land but over transgenic seeds, and the gunmen were not hired by a large landowner but by a Swiss multinational. Following the incident, Via Campesina and other social movements demanded that Syngenta leave Brazil. Switzerland's ambassador to Brazil apologized for the murder committed on Syngenta's property, but Syngenta continues to deny any responsibility (TDD/VC/MST 2008).

Action Against Terminator

For three weeks, in March 2006, Curitiba, the capital city of the state of Paraná, hosted two United Nations meetings: the Meeting of the Parties to the Cartagena Protocol on Biosafety (MOP3), followed by the Conference of the Parties to the Convention on Biological Diversity (COP8). As an accredited journalist, I had access to the press room as well as to the main negotiations venues.

This was the eighth conference on biodiversity and, according to regular participants in these meetings, the mobilization was unprecedented for such a meeting. For the duration of the conference, the Landless Rural Workers Movement (MST) organized a GM-Free Encampment (*Acampamento Terra Livre de Trangênicos*) just outside Curitiba that gathered 6,000 peasants and activists. Every day, several thousands people formed a long corridor along the road that led to the

convention center, waving and greeting the buses of delegates as they came in. A parallel conference—the Civil Society Global Forum—was also held outside the convention center. It included a seed fair and various activities in defence of farmer-selected corn varieties.

One of the most controversial dimensions of the meeting was a proposal by Australia, Canada and New Zealand to allow Gene Use Restriction Technologies (GURTs) on a case by case basis. This would undermine the moratorium in place since 2000 and open the way to field trials. In response, an international coalition—the Ban Terminator Campaign—was formed in the months leading to the conference. During the conference, the Ban Terminator Campaign mobilized actively, briefing delegates on the issue, holding press conferences and public demonstrations. As a result, the issue became prominent, both inside the conference center and outside, where it was one of social movements' main demands.

On the day the issue was to be discussed, about forty women of the Via Campesina movement entered the plenary room and formed a row in front of the stage. Facing the audience, they held candles and signs with the words "Terminator, the Genocide Seed" (Appendix S). The chair of the session acknowledged the protest and thanked the women for "a heartfelt protest that many of us feel sympathy with." The women then left the room singing traditional songs under some delegates' applause.

When the item came up on the agenda, the tension was palpable. Australia, New Zealand and Switzerland spoke in favour of case-to-case risk assessment; the

G77[188], China, Argentina and Norway took position against. Acknowledging the impasse, the chair asked those countries in favour of case-to-case assessments to identify themselves (Canada did not come forward), and gave them an hour to drop the proposal or come up with an alternative proposal. When they came back to plenary, they announced that they would simply abandon the proposal. The moratorium was thus reaffirmed.

The Transgenic Corn Struggle

In the wake of the new biosafety regime, the National Campaign for a GM-Free Brazil mobilized again, this time against the impending authorization of the first varieties of GE corn. For a variety of reasons, both biological and cultural, the stakes are higher for corn than they are for either cotton (a non-food crop) or soybeans (a self-pollinating plant). Since corn is cross-pollinating, the risks of contamination are much higher. Moreover, Brazil is a center of diversity for corn, and the latter occupies a special place in Brazilian culture and society. Not surprisingly, the approval process of the first varieties of transgenic corn was marked by renewed civil society mobilization and new heights in the controversy over transgenics.

At the November 2006 monthly meeting of the Commission, the commercial release of a variety of transgenic corn—Bayer CropScience's Liberty Link—was on the agenda for the first time. Liberty Link corn is genetically engineered to be tolerant to the company's glufosinate-ammonium herbicide, commercialized under the brand name Liberty. However, a decision was postponed because of the lack of

[188] The Group of 77 is the largest intergovernmental organization at the United Nations. It was established in 1964 by seventy-seven developing countries and now counts 130 countries.

consensus among the Commission's members (eleven members abstained from voting). Following a civil lawsuit by civil society organizations[189], a vote on the commercial approval of GE corn was suspended by a court order making the vote conditional to the holding of a public hearing, as provided for in the Commission's bylaws (CTNBio 2006, Subsection III). On March 20, 2007, the Commission held a public hearing in Brasília on the commercial approval of seven varieties of transgenic corn.

Having responded to the court injunction, CTNBio was about to hold a vote at its regular monthly meeting two days later, when Greenpeace representatives walked into the meeting room, requesting observer status without the right to speak. A heated debate followed between the Commission members, Greenpeace's attorney and the Public Ministry representative.[190] Outraged, the Commission Chair cancelled the meeting.[191] The following month, a court order requested the Chair to open the meeting to the public, and the Chair chose to postpone the vote once again.

The previous day, President Lula had sanctioned a controversial provisional measure reducing the quorum for commercial approvals from two-thirds (18/27) to a simple majority (14/27) of the Commission members, with the clear objective of facilitating commercial approvals (Brasil 2006b). The provisional measure was another clear indication of government support for agricultural biotechnology.

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[189] The organizations who filed the civil lawsuit are Consultancy and Services for Projects in Alternative Agriculture (AS-PTA), the Brazilian Institute for Consumer Defense (IDEC), the Small Farmers Movement (MPA) and Terra de Direitos (TDD).

[190] The Constitution stipulates that the meetings of public bodies in which public matters are discussed must be open to the public. CTNBio 100ª Reunião Plenária, Brasília, 22 de março de 2007. The transcription of the meeting is available at www.ctnbio.gov.br.

[191] In May 2006, the Public Ministry's decision to have a representative attend the Commission's meetings had caused a similar stir.

Indeed, when asked by a journalist from *O Estado de São Paulo* if the government should state more clearly its policy on transgenics, the Minister of Science and Technology replied that the government had already done so by sanctioning the change of quorum (Fernandes 2007:108).

On May 16, 2007, after a protracted battle, the Commission approved the commercialization of Bayer's Liberty Link variety by 17 votes in favor and 4 votes against. It would not have been approved without the reduction in the quorum for commercial approvals. The Commission's members who voted against the release were the representatives of the Ministry of Agrarian Development, the Special Secretary for Aquaculture and Fisheries, a health specialist and the civil society representatives for family farming (the Ministry of the Environment voted to defer the decision). This was the first GE variety authorized commercially by CTNBio since the 2005 Biosafety Act, and the first variety of GE corn ever authorized in Brazil.

In a now classic scenario, four NGOs—AS-PTA, IDEC, Terra de Direitos and the National Association of Small Farmers (ANPA)—filed a civil lawsuit (ACP n^{o} 2007.70.00.015712-8/PR) against the Union, Bayer, Monsanto and Syngenta contesting the authorization of transgenic corn in the absence of biosafety norms (see diagram in appendix B). In June, Federal Judge Pepita Durski Mazini ruled in their favor, suspending the authorization and prohibiting CTNBio from deliberating over any other transgenic corn variety until studies were conducted and norms established for the coexistence of transgenic corn with conventional and organic varieties (two other varieties of corn, one from Monsanto and one from Syngenta, were awaiting CTNBio clearance). The preliminary ruling was confirmed later that month. In her

decision, Judge Mazini determined that the release of transgenic corn was also conditional on the establishment of post-harvest monitoring norms and that specific studies had to be conducted in the North and Northeast cotton growing regions of the country.

In July, IBAMA and the National Health Surveillance Agency (ANVISA) demanded that the National Biosafety Council (CNBS)—the highest authority on biosafety—revoke the authorization of Liberty Link corn. ANVISA expressed concern that the studies submitted by the companies in relation to the varieties' toxicity and allergenecity were inadequate and insufficient to guarantee their health safety (ANVISA 2007). IBAMA argued that the Liberty Link authorization should be cancelled due to the countless problems from which the process suffered and expressed concern that the conditions for preventing the contamination of traditional and farmer-selected corn varieties were not in place, and that no environmental impact studies had been conducted in Brazil (IBAMA 2007; Nodari 2007). Unimpressed, CTNBio proceeded with the approval of other transgenic corn varieties. In August, it approved a second variety of transgenic corn—Monsanto's MON 810[192]—and in September, it approved Syngenta's Bt11 variety.[193]

In August 2007, I attended the regular monthly meeting of the CTNBio, held at the Ministry of Science and Technology, in Brasília. It was one of the first meetings since the court injunction ordering that meetings be opened to the public. That day, in addition to the Commission members and industry representatives, the

[192] MON 810 is the only transgenic variety authorized by the European Community, but it has been banned by six countries (France, Germany, Greece, Austria, Hungary and Luxembourg) and is cultivated on less than one percent of arable land.

[193] Both varieties are genetically engineered to be resistant to the European corn borer.

meeting included the presence of representatives of the Campaign for a GM-Free Brazil and members of the Via Campesina—men, women and children. The meeting room was full, and some Commission members were visibly disturbed by the public presence. On the agenda that day was the commercial authorization of Monsanto's MON810. In order to authorize MON810 without contravening the judicial decision, just minutes before, CTNBio had hastily passed norms for the coexistence of transgenic corn with conventional and organic varieties, as well as post-commercialization monitoring norms. "Coexistence rules" are aimed at preventing genetic contamination between transgenic and non-transgenic (organic or conventional) crops in the fields. Post-commercialization monitoring norms have the same objective, but apply to subsequent stages (from harvest to industrialization). For both sets of norms, there were two proposals on the table: an initial proposal by the Commission Chair; and more elaborate proposals by the specialist on environmental issues and representative of the Ministry of Agrarian Development. However, the respective proposals were hardly discussed; the CTNBio Chair cut short the discussion and called a vote. The pro-transgenics majority within the Commission then approved the Chair's proposals for both post-commercialization and coexistence norms (CTNBio 2007b). In protest, seven Commission members left the room, and members of the Campaign staged a demonstration to denounce the way in which the Commission was dealing with the transgenic corn issue. Standing at the front of the room, they hold signs saying "Don't Contaminate Our Biodiversity", "CTNBio Hurts Brazil", "CTNBio: in Whose Interest?", "CTNBio: Irresponsible" and "Biodiversity: Peoples' Heritage" (Appendix T).

According to the Campaign for a GM-Free Brazil, these norms do not meet internationally-accepted standards and thus fail to fulfil the judicial decision. The coexistence norms approved are the following:

> To allow for coexistence, the distance between one commercial crop of genetically modified corn and another crop of non-genetically modified corn, located nearby, should be 100 (one hundred) meters or more, or else 20 (twenty) meters in the case the crop has a border of at least 10 (ten) rows of conventional corn plants of similar size and vegetative cycle to the genetically modified corn (Art.2). [CTNBio 2007a]

In a document entitled "Coexistence: The Case of Corn", the Ministry of Agrarian Development argues that the norm is inconsistent with the scientific literature, which shows that corn pollen travels much longer distances (up to 500 meters). It also argues that preventing contamination is much more complex than stipulating a minimum distance between crops. An effective plan would also require, for example, conducting gene flow studies in the different regions of Brazil; mapping the regions where farmer-selected varieties are produced; and introducing a liability system in case of contamination (Ferment et al. 2009).[194]

Meanwhile, the transgenic corn struggle continued. The Union appealed the judicial decision suspending the authorization of transgenic corn varieties. It argued that the judiciary could not interfere in a decision that was of CTNBio's exclusive jurisdiction, since this would represent a breach of the constitutional and administrative order. It also argued that maintaining the judicial prohibition was detrimental to the economy because of the alleged loss of productivity, and that it

[194] Some scientists argue that coexistence is a myth and that it is impossible to prevent genetic contamination by transgenic corn varieties; contamination is bound to happen given the nature of corn pollination (Altieri 2005).

would encourage the smuggling of GE corn. The Public Ministry came out against the appeal.

In November 2007, the Superior Court of Justice denied the Union's request, thus maintaining the suspension of the authorization of Liberty Link corn. The Judge pointed out that evaluating the legality of administrative decisions was precisely the Judiciary's function. It added that the possibility of seed smuggling could not be used to justify legalization, and that the federal government had not convincingly demonstrated that the suspension was prejudicial to the economy (Gazeta Jurídica 2007). Moreover, the Judge considered that the necessity to establish biosafety norms had not been taken seriously. As she explains in her decision:

> It is certain that the judge does not have the technical knowledge necessary to specify which coexistence regulations must be developed by the Commission. Nevertheless, it is obvious, even for the average citizen, that the mere specification of a minimum distance between corn species is insufficient…. No biosafety measures, procedures, restrictions, etc. were established as stipulated by the Biosafety Act (Brasil/TRF 2007).

In January 2008, a federal judge rescinded the earlier decision, thus validating CTNBio authorization of Liberty Link. It argued that the CTNBio's mandate includes evaluating the risks involved in activities with GE organisms and that the legislation does not stipulate that region-specific studies are compulsory for commercial authorization. It also expressed concern that the suspension of the CTNBio decision on Liberty Link would delay the CTNBio deliberation process for the commercial authorization of other GE varieties (Gazeta Jurídica 2008a).

In February, the National Biosafety Council (CNBS) met exceptionally to examine IBAMA and ANVISA's request for review of the CTNBio authorization of Monsanto's MON810 and Bayer's Liberty Link varieties. By five votes in favour

and five votes against, the ministers and their representatives decided to postpone a decision. When the CNBS met again two weeks later, the Minister of Agriculture and the Minister of Science and Technology, along with five others, voted in favour of authorizing the two varieties. The Chief of Staff and CNBS chair Dilma Rousseff had made it clear that the government was in favour of the release of transgenic corn. In March, a Regional Federal Court unanimously confirmed the January ruling reactivating the CTNBio decision (Gazeta Jurídica 2008b). Three more varieties of transgenic corn were authorized in 2008, bringing the total number of transgenic corn varieties to six.

In May 2008, six civil society organizations[195] representing small farmers, organic farmers, consumers, environmentalists and human rights organizations took the case to the Compliance Committee of the Cartagena Protocol on Biosafety.[196] The case was presented before a meeting of the Cartagena Protocol in Bonn, Germany. According to these organizations, the Brazilian government, by authorizing transgenic corn in the absence of biosafety norms and proper studies, did not comply with its obligations to protect biodiversity under the Cartagena Protocol. Moreover, government inaction in the face of widespread evidence of illegal planting of transgenic corn, they argued, was a breach of its commitment to curb the illegal transboundary movements of living modified organisms. Such an initiative—a

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[195] The six civil society organizations are the National Association of Small Farmers (ANPA), Consultancy and Services for Projects in Alternative Agriculture (AS-PTA), Terra de Direitos, the Brazilian Institute for Consumer Protection (IDEC), Greenpeace, and the Organic Agriculture Association (AAO).

[196] The Compliance Committee is a mechanism of the Cartagena Protocol on Biosafety aimed at addressing cases of non-compliance among countries who are party to the Protocol.

formal complaint before the Compliance Committee by civil society organizations—was unprecedented (AAO et al. 2008; ANPA et al. 2008).

The introduction of transgenic corn varieties raised new challenges for the Campaign. Corn is a staple crop for small farmers and, as an open pollinated plant, it is highly vulnerable to genetic contamination. While they continue to mobilize at the political level, Campaign activists are intent on insuring that corn will not follow in the steps of soybeans, with widespread contamination leading to legalization "after the fact." Thus, the Campaign developed an approach that consists in working closely with small farmers toward "biovigilance" (*bio-vigilância*). The biovigilance strategy calls on small farmers to act as watchdogs to prevent the spread of illegal transgenic corn and the contamination of farmer-selected varieties. This strategy is testimony to the distinctive nature of the issue of transgenic crops, which can, by their biological nature, outplay political and judicial decisions.

Concluding Remarks

The Campaign has played a major role in the transgenics debate in Brazil over the last decade. First and foremost, it can be credited with triggering a public debate over agricultural biotechnology. The initial lawsuit launched by IDEC and Greenpeace was crucial in first raising awareness about the controversial dimensions of the new technologies and the problematic aspects of the approval process. The fact that GE crops' approval in Brazil was delayed for five years was a direct result of civil society mobilization. Throughout the debate, the Campaign's role as watchdog has forced the CTNBio to be more accountable and transparent, notably by obtaining that its meetings be opened to the public and that public hearings be held

prior to commercial authorizations. Civil society has won several cases in the lower courts, but has been less successful when it comes to higher courts of appeal.[197] The Campaign has also suffered several setbacks with the successive provisional measures, the revised Biosafety Act and the coexistence norms. However, its broader significance and success has been to bring greater transparency and a redefinition of the terms of the debate.

The Campaign's effectiveness stems from the fact that it is composed of a core of professionals who were able to position themselves as experts. Trained as lawyers, agronomists, etc., they can intervene in the debate on legal or procedural, as well as technical or scientific issues. They produce researched documents to back their claims and make concrete policy proposals. Some examples over the years include policy proposals on the conditions under which the illegal RR soybean harvest should be released (AS-PTA 2003c); a political analysis of the transgenic issue under the Lula government (Fernandes 2005); proposed revisions to the plant variety protection bill (ANA 2008); technical comments on the authorization of Liberty Link corn (AS-PTA 2007) and a proposal to revise CTNBio Resolution n^{o} 4 on coexistence (Ferment et al. 2009).

One of the Campaign's strengths is that it can draw on the social network formed in the 1970s in opposition to the Green Revolution's agricultural model (Pelaez and Schmidt 2000). Seeds were already an issue for rural social movements and NGOs prior to the advent of agbiotech. When the issue of the application of genetic engineering in agriculture arose in the mid-1990s, environmental and consumer organizations came together with organizations promoting alternative

[197] In the opinion of Marijane Lisboa (*op. cit.*), the higher the tribunal, the more vulnerable it is to political pressures.

agricultural practices to challenge the way in which GE technology was being pushed through.

The 230 organizations which endorse the Campaign are remarkably diverse. This diversity is reflected in the wide range of interventions, from voluntary reaping actions to public civil lawsuits, carried out by different members of the network. While each one works in its own sphere of activity, it does not do so in isolation. For example, while a human rights advocacy NGO contest a CTNBio decision in the Courts, it also provides legal support to the occupation of an illegal experimentation site. And while rural social movements carry out direct actions, they also mobilize in support of the NGOs' legal actions. The Campaign's grassroots support, however, comes from small farmers' organizations. Strategies such as "biovigilance" would simply not be conceivable without the grassroots network developed within the agroecological movement.

While the Campaign is solidly rooted in Brazilian civil society, it is also resolutely transnational. International networks, such as Via Campesina and Greenpeace's international genetic engineering campaign, are important instruments for concerted actions with national campaigns throughout the world. These transnational activist networks are important means of sharing information and keeping people up to date on the latest developments. They also come together at critical junctures to carry out specific actions. The Ban Terminator Campaign is one example. When, in the months leading to the UN Conference on Biological Diversity (COP8), it was revealed that the Canadian delegation would push to put an end to the international moratorium on GURTs, an international campaign was quickly formed.

Its work during the conference—with other delegations as well as with the general public—played a key role in maintaining the international moratorium.

For ten years, the Campaign has been actively involved in the debate over agricultural biotechnology in Brazil. By monitoring the CTNBio, contesting decisions in the courts, lobbying and organizing public demonstrations and direct actions, it ensured that essential questions were raised regarding farmers' autonomy, agricultural biodiversity, the ethics of patenting and food sovereignty. Its most important contribution has been to force a redefinition of the terms of the debate over transgenics away from a narrow focus on health and environmental risks toward broader issues of social and environmental justice.[198]

[198] Heller (2001b; 2002) makes a similar argument with regard to the Confédération Paysanne and the GE food debate in France.

CONCLUSION

Toward Farmers' Rights?

This dissertation combines an ethnographic analysis of how genetic engineering is transforming small farmers' seed practices in Southern Brazil with a broader analysis of changing seed regimes. Drawing on small farmers' account of the changes brought about by the so-called Green Revolution and, more recently, by genetically engineered varieties, I have explored the broader dynamics set in motion by the advent of plant genetic engineering. One dimension of these changes is the overhaul of global and national property rights and seed regimes. This is clearly illustrated in Brazil, which underwent a major revision of its legislation starting in 1996, including most notably the introduction of property rights in seed varieties. A second dimension of these changes is the transformation of the seed industry into the life sciences industry, also illustrated by the recent evolution of the Brazilian seed industry.

In Brazil, these developments encountered resistance among a network formed in the 1970s to contest the Green Revolution and its impact on the Brazilian countryside, and which brought together small farmers' organizations, NGOs and social scientists. This movement, which coalesced in the 1990s under the banner of agroecology, immediately identified genetic engineering as an extension and deepening of the Green Revolution paradigm—not a change of paradigm, as its advocates would have it. As we have seen in chapter 5 and 6, the National Campaign for a GM-Free Brazil has centred its struggle on irregularities in the National

Technical Commission on Biosafety (CTNBio) authorization process for transgenic varieties, and especially the lack of environmental impact assessments. This is largely because, I would suggest, these are the grounds on which transgenics can be challenged in the courts both at the legal and administrative levels. In the last analysis, however, the transgenics struggle is a clash in paradigms between proponents of industrial farming and proponents of an agroecological approach to agriculture.

My broader aim in conducting this analysis of the Brazilian transgenic seeds landscape has been to convey the complexity of the issues at stake. In many ways, my argument is in favour of greater complexity in how we approach agricultural biotechnologies. Framing the transgenics debate in terms of agricultural productivity or technology transfer leaves aside the most important dimensions of the issue. It is essential that the views of the small farmers who oppose these technologies be taken seriously because they have much to tell us about these technologies' broader impacts. These impacts are far-reaching, ranging from farmers' relationship with seeds to issues of agricultural and cultural biodiversity.

As I have argued both ethnographically and historically throughout this thesis, the key issue at stake in conflicts over transgenic seeds is seed saving. Small farmers who oppose genetically engineered varieties are not opposed to the technology itself; they are opposed to historical processes of dispossession that genetic engineering embodies and perpetuates. Awareness of dispossession is especially acute in a country like Brazil, where conflicts over land are deep-rooted and prevail to this day, and where memory of the Green Revolution is still vivid. Opposition to genetically engineered varieties among small farmers is rooted in their

mixed experience of the Green Revolution and their consequent transition toward an agroecological approach to agricultural production. They understand genetic engineering as an extension of the Green Revolution paradigm—one that is at odds with agroecology.

Small farmers' concerns over autonomy triggered by the Green Revolution are becoming more acute with the advent of genetic engineering in agriculture. As Porto-Gonçalves observes, "what is at stake [in the genetic engineering of seeds] is the separation of knowing and doing, producing and reproducing" (2006:220-221). In the moral economy of the seed, there are no distinctions between knowing, doing, producing and reproducing. Farmers own both the seeds and the knowledge embodied in the seed, precisely because they produce (sow and harvest) using saved seeds. With transgenic seeds, farmers own neither the seeds nor the knowledge. They still *produce* (they sow and harvest), but they no longer *reproduce* (save and re-use seeds). Importantly, and for the first time in human history, farmers no longer *own* the seeds; they merely are granted a limited license to use the seeds purchased. Even with (non transgenic) commercial seeds, farmers own the seeds they buy, and nothing prevents them from saving seeds for replanting. With genetic engineering, farmers are legally impeded from saving seeds. This is because, for the first time, transgenic seeds are covered by utility patents and Technology Stewardship Agreements.

Knowledge is a fundamental dimension of this process. With transgenics, not only are farmers dispossessed of ownership over seeds, but also, more importantly perhaps, they are dispossessed of the knowledge that flows from the fact that they themselves (re)produce seeds. When farmers obtain transgenic seeds from a

company, they do not know anything about where they come from, how they were obtained or how they will behave. There is a fundamental shift as knowledge about seeds moves out of farming communities into distant laboratories. In short, with transgenic seeds, farmers "do" but they no longer "know." And they "produce" (plant), but they no longer "reproduce" (replant). In other words, farmers still sow, but since they are prevented from saving seeds, they are dispossessed of ownership of the seeds and deprived of knowledge about them.

It is these profound changes in peasants' relationship and access to seeds that I call "biological dispossession." Biological dispossession is evidenced in the growing restrictions regarding the scope of seed-saving provisions in national legislation and international intellectual property rights (IPRs) agreements. It is best illustrated by the development of Genetic Use Restriction Technologies (GURTs)—a technology that confers the patent owner direct biological control over a plant's reproductive capacity. As we have seen, dispossession is also a recurring theme in small farmers' narratives about the genetic engineering of seeds.

As Randeria notes, "if in the age of globalization and of economic Empire, political violence has been replaced by legal violence… resistance to it is also articulated in the language of law (2007:2)." Indeed, the growing marginalization of seed saving in national and global seed regimes has spurred a movement in defence of *farmers' rights*. Farmers' rights aim at contesting the delegitimization of traditional seed-saving practices in the new intellectual property rights regimes for plant varieties by adopting the language of farmers' rights as a way "to demand greater material recognition of their contributions and better measures to protect their autonomy" (Borowiak 2004:511).

The concept emerged in the 1980s within the ambit of the Food and Agriculture Organization (FAO). In 1989, it was officially endorsed in FAO Resolution 5/89 as the "rights arising from the past, present and future contributions of farmers in conserving, improving, and making available plant genetic resources, particularly those in the centres of origin/diversity" (FAO 1989). The resolution also states that plant genetic resources are a common heritage of humankind, and that they should be freely available for use. Farmers' rights were reasserted in the FAO Seed Treaty, which recognizes "the enormous contribution that the local and indigenous communities and farmers of all regions of the world… have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world" (FAO 2001 Art. 9).

The Seed Treaty has been criticized as a recognition of farmers' rights in principle, but of intellectual property rights in practice. Indeed, it does not address the question of how these rights are to be implemented (an issue largely unresolved to this day) and leaves the responsibility for realizing farmers' rights to national governments. Hence, it recognizes the "rights that farmers have to save, use, exchange and sell farm-saved seed/propagating material, *subject to national law and as appropriate*" (FAO 2001 Art. 9.3, emphasis added). This may be changing, however. In June 2009, following intense negotiations and political arm-twisting, the parties to the Seed Treaty adopted an amended resolution on farmers' rights with stronger wording that "encourages member countries to review all measures affecting farmers' rights and remove any barriers preventing farmers from saving, exchanging or selling seed" (ETC Group 2009). However, as Borowiak observes,

"the reality is that TRIPS [Agreement on Trade-Related Aspects of Intellectual Property Rights] and breeders' rights have the force of capital behind them whereas the FAO and farmers' rights do not" (2004:534).

In the last decade, farmers' rights have become a central demand of peasant movements world-wide. Farmers rights are often used as a shorthand for the right to save seeds; while the latter is indeed central, farmers rights encompass much more. Indeed, peasant movements have a more encompassing understanding of the concept. According to the Via Campesina, farmers' rights include the right to conserve biodiversity; to achieve food security; the right to land, water, and air; to appropriate technology; to define the control and handling of benefits derived from the use of genetic resources; to develop models of sustainable agriculture and; to use, choose, store, and freely exchange genetic resources (Borowiak 2004:529). In other words, farmers' rights are *the rights to the means to achieve food sovereignty*. Via Campesina stresses farmers rights' historical and collective character, dating back to the practice of agriculture and kept in force through farmers' preservation of agricultural biodiversity; and the fact that they are inextricable from the associated knowledge of which farmers are the repository (Via Campesina 2004).

The farmers' rights approach seeks recognition of the contribution of farmers alongside that of breeders, using a language of rights that is intelligible to the international community. This strategy, however, is fraught with difficulties. Contrary to breeders' rights, farmers' rights prove difficult to enact because they involve collective rather than individual knowledge, historical as well as current contributions, and traditional knowledge rather than new knowledge. As Borowiak (2004:532) rightly suggests, "because farmers' rights do not actually contest

breeders' rights per se, proponents tend to implicitly concede the legitimacy of the IPRs regime," and goes on to add that the danger is to legitimize the inequities it claims to address (Borowiak 2004:511). To paraphrase Escobar (1994:220), farmers are acknowledged as having rights in seeds only to the extent that they agree to treat seeds as capital. Peasant organizations are fully aware of these contradictions. In an official position statement, Via Campesina (2001) states that farmers rights "are eminently collective; they should therefore be considered within a different legal framework from those of private property and intellectual property."

As I have argued, what is at stake in genetic engineering in agriculture is much more than agricultural productivity; it is above all identity, autonomy, knowledge and culture. In fact, the transgenic seeds struggle is about "life itself" in two distinct but related meanings of this phrase. Firstly because what is ultimately at issue are plants' reproductive capacities. Secondly because, as stands out in small farmers' narratives, what is at stake for them is their very livelihood, the possibility to continue to exist as small farmers and peasants. This belies the often-heard argument that opposing transgenic crops is a luxury that only food-secure consumers in rich countries can afford; on the contrary, for many small farmers in the global south, it is a matter of vital importance. As one of the small farmers interviewed stated succinctly but eloquently: "If the possibility to reproduce seeds disappears, culture itself will disappear along with it."

APPENDICES

APPENDIX A

THE TRANSGENICS CONTROVERSY IN BRAZIL: A CHRONOLOGY
(This is a summary of the main events discussed in this thesis.)

1988		
	October 5	Federal Constitution establishes precautionary principle
1992		
	June 5	Brazil signs UN Convention on Biological Diversity
1995		
	January 1	WTO created; TRIPS Agreement enters into force
	January 5	*Biosafety Act* is passed, creating the CTNBio
1996		
	May 14	Revised *Intellectual Property Act*
	June	CTNBio meets for the first time
	—	First evidence that RR soybeans are being cultivated illegally in RS
1997		
	April 25	*Plant Variety Protection Act*
	April	CTNBio approves RR soybean for field testing
	December 14	Greenpeace action against imported U.S. RR soybeans (SC)
1998		
	September 16	IDEC and Greenpeace obtain a preliminary injunction prohibiting the Union from authorizing the production of RR soybeans
	September 24	CTNBio authorizes RR soybeans
	October 4	Fernando Henrique Cardoso is reelected president Olívio Dutra (Workers Party) is elected in Rio Grande do Sul
	November 27	RS proclaimed “Transgenic-Free State”
	December	IDEC and Greenpeace obtain an injunction in the federal justice establishing the compulsory segregation of GE crops
1999		
	March 3	Governor Dutra signs decree making EIA compulsory in RS

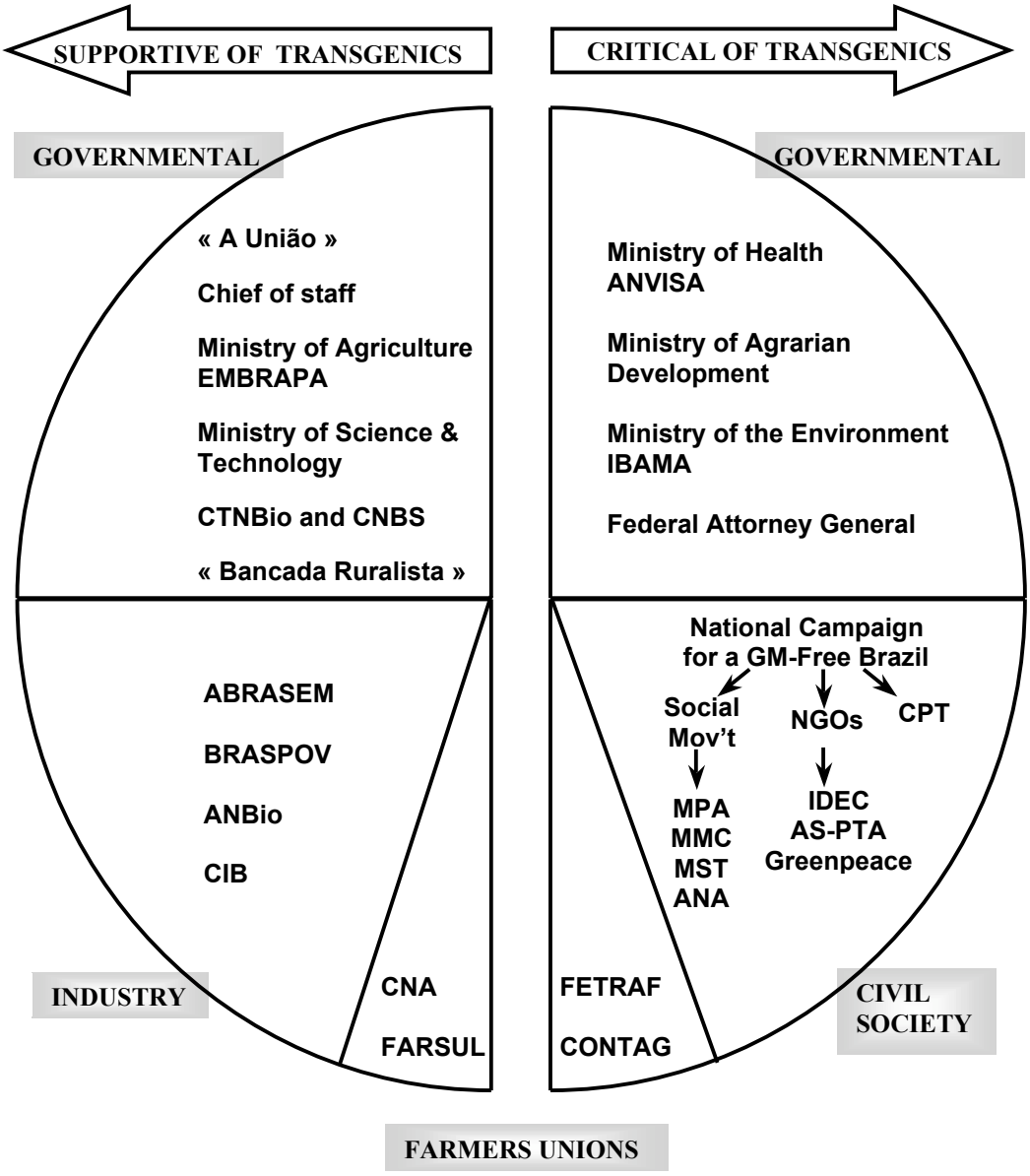
	May 27	Workers Party files a direct action of unconstitutionality against the decree implementing the Biosafety Act
	June 18	RR soybean: first injunction favourable to IDEC and Greenpeace
	August 10	RR soybean: June 1999 decision confirmed
	October	RS State Department of Agriculture tests, seizes and incinerates illegal RR soybean crops
	November	Farmers hold demonstrations, blockade roads and hold inspectors hostage in retaliation.
	November 23	Launching of the National Campaign for a GM-Free Brazil
	November 25	Creation of the Ministry of Agrarian Development
	December	RS State Legislative Assembly approves a bill giving the federal government exclusive responsibility over inspections
2000		
	February	Greenpeace prevents unloading of 30,000 tons of GE corn imported from the U.S.
		Manifesto for a GM-Free Brazil
	June	Ship prevented from unloading GM corn from Argentina in RS following denunciation by Greenpeace
	June 26	Civil lawsuit: initial decision favourable to IDEC
	June 30	CTNBio authorizes importation of GE corn
	July 6	Federal government takes position publicly in favour of GMOs
		IBAMA withdraws from the civil lawsuit
	August 8	RR soybean: new decision upholds June 1999 decision
2001		
	January 26	Voluntary reaping action in Não-Me-Toque (RS)
	May 24	President Cardoso signs a decree normalizing the CTNBio
2002		
	October 27	Lula da Silva is elected president
2003		
	January 1	President Lula da Silva takes office
	January 24	Launching of the International Seed Campaign
	February	Inter-ministerial Commission
	March 18-20	Seminar “Transgenic Threat: Civil Society Proposals”
	March 26	First Provisional Measure (n^{o} 113)
	August 5	Revised *Seed Act*
	August 12	Civil lawsuit: June 2000 decision suspended
	September 16	Monsanto announces technological fee on RR soybean
	Sept.12-Oct.16	National Sit-In Against Transgenics

	September 8	Civil lawsuit: June 2000 decision reactivated
	September 25	Second Provisional Measure (n^{o} 131)
	November 24	Brazil ratifies Cartagena Protocol on Biosafety
2004		
	June 28	Civil lawsuit: New decision overturns previous decision; authorizes the CTNBio to waive EIAs (ban on RR soybean upheld)
	October 14	Third Provisional Measure (n^{o} 223)
2005		
	March 17	CTNBio approves first variety of cotton (Bollgard/Monsanto)
	March 24	Revised *Biosafety Act*; Creates the *National Biosafety Council* Regularizes RR soybean and Bollgard cotton
	June 20	Federal Public Prosecutor files a Direct Action of Unconstitutionality against the Biosafety Act
	July	Monsanto introduces "dual remuneration" system
2006		
	March 8	Occupation Aracruz Celulose (RS)
	March 13-31	UN Biodiversity Convention, Curitiba (PR)
	March 14	Occupation Syngenta (PR)
	March 23	Action against Terminator at the Biodiversity Convention
	July 26	*National Policy for Family Agriculture Act*
	October 29	Lula da Silva is re-elected president.
	December 5	CTNBio authorization for transgenic corn suspended following civil lawsuit
2007		
	March 20	Public hearing on seven varieties of transgenic corn
	March 21	Provisional Measure n^{o} 327 (reduces CTNBio quorum)
	May 16	CTNBio authorizes the first GE corn variety (Liberty Link/Bayer)
	June 15	Civil lawsuit against CTNBio authorization of Liberty Link
	June 28	Federal Court suspends CTNBio authorization of Liberty Link
	August 16	CTNBio authorizes a second GE corn variety (MON810/Monsanto)
	August 17	Public hearing on transgenic cotton varieties
	September 20	CTNBio authorizes a third GE corn variety (Bt11/Bayer)
	October 21	Peasant leader killed in the reoccupation of Syngenta's experimental site
	November 23	Appeal against June 28 decision rejected

2008		
	January 11	June 28 decision overturned; LL corn authorized
	February 12	CNBS votes in favour of authorizing LL corn
	March 4	Federal Court decision favourable to LL corn authorization
	June 17	Public hearing on proposed modifications to the Law on Plant Variety Protection
	August	Value of royalties increases
2009		
	March	Farmers unions file class action against Monsanto (contesting royalties and prohibitions on the right to save seeds)
	May	Court upholds royalties on RR soybeans

APPENDIX B

WHERE THE MAIN ACTORS STAND ON TRANSGENICS



EMBRAPA: Brazilian Agricultural Research Corporation
CTNBio : National Technical Commission on Biosafety
CNBS : National Biosafety Council
ABRASEM : Brazilian Seed Producers Ass.
BRASPOV : Brazilian Plant Breeders Ass.
ANBio : National Biosafety Association
CIB : Biotechnology Information Council
CNA : National Agricultural Confederation
FARSUL : Agricultural Federation of Rio Grande do Sul

ANVISA : Nat. Health Surveillance Agency
IBAMA : Brazilian Environmental Institute
MPA : Small Farmers Movement
MMC : Peasant Women's Movement
MST : Landless Rural Workers Movement
ANA : National Articulation of Agroecology
CPT : Pastoral Land Commission
IDEC : Institute for Consumer Protection
AS-PTA : Consultancy and Services for Projects in Alternative Agriculture
FETRAF : Family Farming Workers Fed.
CONTAG : National Confederation of Agricultural Workers

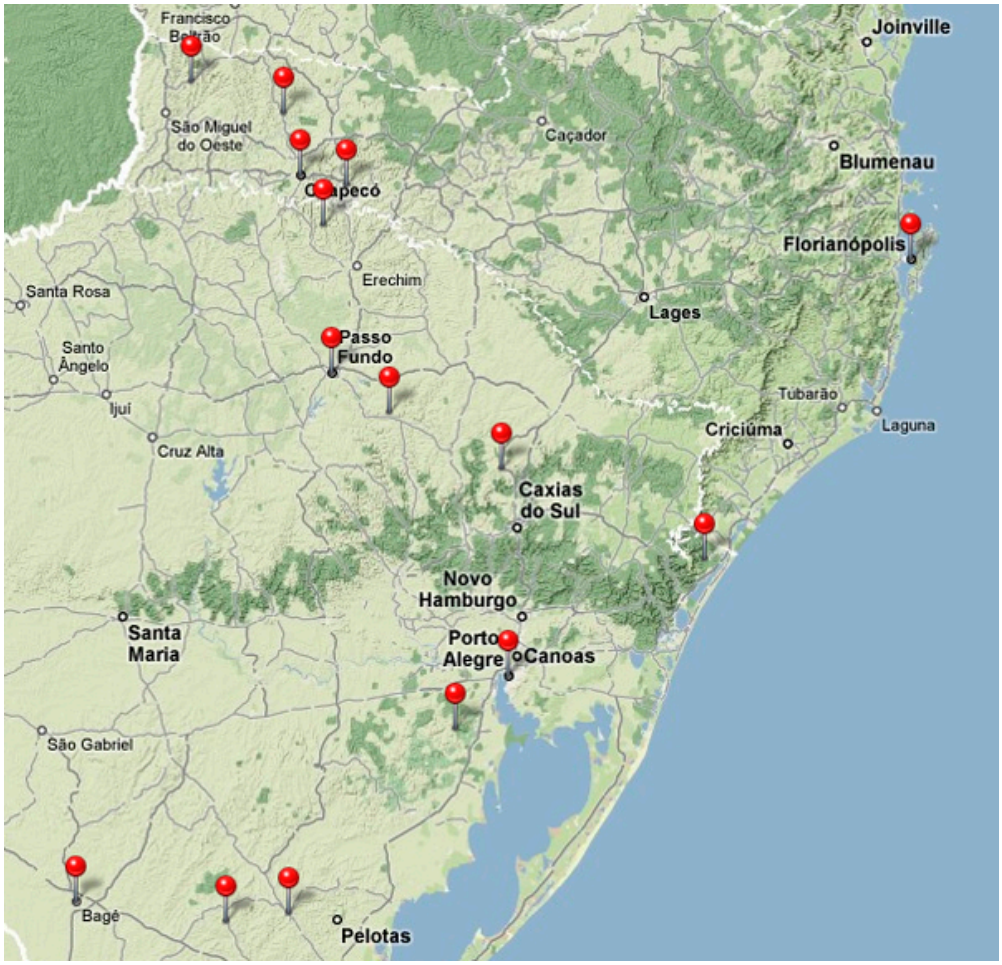
Appendix C

Land Pilgrimage, Cruz Machado, Paraná, August 22, 2004

Credit: Mayra Lafoz

Appendix D
Map of Brazil

Appendix E
Map of Interviews and Seed Fairs



Each dot represents a cluster of interviews.

Appendix F

"Transgenics: The Fear of Novelty" October 29, 2003

Appendix G

"Sixth Farmer-Selected Seed Fair: Preserving the Sources of Life"

Appendix H

"Welcome to the Farmer-Selected Seed Fair"

Appendix I

Arts and crafts made from corn and seeds

Appendix J
Seed Exchange

Appendix K
Místicas

Peasant Path

"Sr. João Felix's private property"

Appendix L

Mística: Fourth National Farmer-Selected Seed Fair, Anchieta (SC)

Appendix M
Small farmers' seed banks

Northern littoral (RS)

Northwest region (RS)

Serra Gaúcha (RS)

Appendix N

Monsanto announces it will collect royalties, September 2003

CORREIO DO POVO GERAL TER«A-FEIRA, 16 de setembro de 2003 ó 5

Ministro Ruy Rosado È homenageado no TJ/RS

Destacado seu exemplo ao Judici·rio nacional

O ministro Ruy Rosado de Aguiar J´nior, recentemente aposentado do Superior Tribunal de JustiÁa (STJ), foi homenageado por sua dedicaÁ„o ao Judici·rio, em sess„o solene do Tribunal de JustiÁa do Estado (TJ/RS), no inÍcio da tarde de ontem. AlÈm de ministro, ele foi promotor de JustiÁa, juiz do Tribunal de AlÁada, desembargador do Tribunal de JustiÁa, corregedor-geral da JustiÁa e coordenador-geral da JustiÁa Federal. O retorno do ministro ao Estado foi saudado na cerimÙnia pelo desembargador Alfredo Guilherme Englert, que, em 1994, havia feito o discurso de despedida, quando da partida do colega para Bras'lia, onde assumiu o cargo no Superior Tribunal de JustiÁa.

Englert lembrou a atuaÁ„o do homenageado na presidÍncia da 5 C‚mara CÍvel do TJ/RS e o seu empenho pela implantaÁ„o dos Juizados Especiais. Englert defendeu que os magistrados pertencem ao n'cleo essencial do regime democr·tico, porque sua autonomia È subordinada somente ‡ ConstituiÁ„o, o que considera um obst·culo tanto ao liberalismo exacerbado quanto a transformaÁıes revolucion·rias de qualquer governo. O discurso foi concluÌdo com elogios ao trabalho do ministro, considerado marco referencial de julgador em todo o pais. ìO trabalho de vossa excelÍncia extrapolou o prÈdio do STJ para ser ra mificar por todo o Brasil, ressaltou.

CRISTIANO SANTIANNA

Reencontro com os antigos conhecidos

Para o homenageado, a cerimÙnia foi um momento de alegria e de reencontro com antigos conhecidos. Ruy Rosado observou que sempre soube que retornaria ao TJ/RS para prestar contas da sua jurisdiÁ„o. ìProcurei n„o me afastar da tradiÁ„o da magistratura ga'cha, cujo conceito e significativo prestÍgio comprovei a todo instante, em qualquer auditÙrio do pais, e tentei ser nada mais do que is so: um juiz do Rio Grandei, declarou. ìO que fiz de acerto foi apenas uma tentativa de expressar o que um juiz deste tribunal faria no mesmo lugar.Ó

Na sua avaliaÁ„o, a JustiÁa atravessa um momento dificil, pela incerteza das reformas do Judici·rio e da PrevidÍncia, agravadas pela incapacidade de resposta 'til ‡ crescente demanda. Entretanto, o ministro considera que a JustiÁa ga'cha busca qualificaÁ„o e aprimoramento, citando a criaÁ„o dos Juizados Especiais, que considera a melhor inovaÁ„o para a prestaÁ„o da jurisdiÁ„o feita no pais. ìTemos, enfim, um tribunal que administra recursos com competÍncia, a ponto de dotar todas as comarcas de excelentes condiÁıes fÍsicas. Por tudo isso, um Estado que se destacou pelo pioneirismo na busca de tantas soluÁıes inovadoras certamente encontrar· meio e modo de superar as dificuldades presentesî, concluiu.

Appendix O

Banner of the Peasant Women Movement with slogan of the Global Seed Campaign

"MMC/SC in the Struggle for the Defence of Seeds;
People's Heritage Serving Humanity"

Appendix P

Government Omission, Carta Capital, July 18, 2007

Appendix Q

Transgenic varieties authorized for commercial production in Brazil as of July 2009

Species	Brand Name/ Event	Characteristic	Company	Year Authorized	Cultivated Illegally Since
SOYBEAN	Roundup Ready (40-30-2)	Herbicide resistance	Monsanto	2005	1996
CORN	Liberty Link (T25)	Herbicide resistance	Bayer	2008	
	YieldGard (MON810)	Insect tolerance	Monsanto	2008	
	Bt11	Insect tolerance Herbicide resistance	Syngenta	2008	
	GA21	Herbicide resistance	Syngenta	2008	
	Roundup Ready (NK603)	Herbicide resistance	Monsanto	2008	2005
	Herculex (TC1507)	Insect tolerance Herbicide resistance	Dow/DuPont	2008	
COTTON	Bollgard (531)	Insect tolerance	Monsanto	2005	2004
	Liberty Link (LLCotton25)	Herbicide resistance	Bayer	2008	
	Roundup Ready (1445)	Herbicide resistance	Monsanto	2008	
	WideStrike (MXB-13)	Insect tolerance Herbicide resistance	Dow	2009	
	Bollgard 2 (15985)	Insect tolerance	Monsanto	2009	

Adapted from: AS-PTA (www.aspta.org.br)

Appendix R

Logo of the National Campaign
for a GM-Free Brazil

LIVRE DE TRANSGÊNICOS

CAMPANHA NACIONAL
POR UM BRASIL LIVRE
DE TRANSGÊNICOS

Appendix S

Action of the Women of Via Campesina Against Terminator
at the United Nations Convention on Biodiversity,
Curitiba, Paraná, March 23, 2006

Credit: Ban Terminator Campaign

Appendix T

Action against GE corn during a CTNBio
meeting, Brasília, August 20, 2008

Credit: Wilson Dias Abr

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