

**BEYOND THE SCIENCE OF AGRICULTURAL
BIOTECHNOLOGY
CORPORATE TECHNOLOGY, LAW, AND LOCAL
CONTROL OVER FOOD PRODUCTION**

by

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ABSTRACT

Within ten years of their adoption in the mid-1990s, new agricultural biotechnologies have instigated dramatic physical and proprietary changes to agriculture in both the United States and Canada. A growing number of highly contentious lawsuits between farmers and agricultural biotechnology companies indicate that such changes may be socially revolutionary to agricultural production. Building on political economy and food regime perspectives, this dissertation asks to what extent the proprietary aspects of these technologies are reorganizing production in these countries, and what effect, if any, such reorganization has on the amount of control producers have over agricultural production. The answer is derived through four case studies involving lawsuits over genetically modified seeds—two in Mississippi, United States, and two in Saskatchewan, Canada. Each of the two case study regions includes an analysis of court documents and interviews with 35-40 litigants and broader stakeholders. My findings indicate that while many producers feel the technology provides immediate benefits to their individual agricultural production, the social reorganization resulting from the existing legal framework is reducing producers' control over their production process in many important ways, and suggest long-term concerns over such expropriation. This effect is more pronounced in Mississippi than in Saskatchewan. I argue that political economy of agriculture scholarship needs to be updated to incorporate this new legal element into its conceptual toolkit, which currently focuses on capital accumulation strategies in production and processing, not through legal mechanisms. Further, the case studies

provide evidence that local acts of resistance, legal and otherwise, are having an impact on the nature and extent of the technology's adoption in both regions. Therefore, the food regime perspective—a historical and geopolitical conceptualization of the advance of capitalism specific to food—needs to be amended to adequately take into account the role of activities within nations, such as in the legal arena, and their effect on the shaping of the global food regime. I argue that the shape of this regime is contingent on contested features, and concerns over declining state autonomy in global agriculture need to be qualified accordingly.

Keywords: agriculture; biotechnology; political economy; food regime; lawsuits; technology.

Subject Terms: Agricultural biotechnology; Agricultural biotechnology—Social aspects; Genetic engineering—Social aspects; Agricultural innovations; Technology—Social aspects.

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LIST OF ACRONYMS

APAS	Agricultural Producers Association of Saskatchewan
APHIS	Animal and Plant Health Inspection Service
Bt	Bacillus thuringiensis
CBAC	Canadian Biotechnology Advisory Committee
CBS	Canadian Biotechnology Strategy
CBD	Convention on Biological Diversity
CCC	Canola Council of Canada
CCGA	Canadian Canola Growers Association
CEPA	Canadian Environmental Protection Act
CFIA	Canadian Food Inspection Agency
CFS	Centre for Food Safety
CWB	Canadian Wheat Board
EMPA	Environmental Management and Protection Act
ETC	Action Group on Erosion, Technology and Concentration
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
FDA	Food and Drug Administration
FR	Food Regime
GATT	General Agreement on Tariffs and Trade
GE	Genetically Engineered
GM	Genetically Modified
GMO	Genetically Modified Organisms
GRAS	Generally Recognized as Safe
HT	Herbicide Tolerant
IP	Inadvertent Presence
IPR	Intellectual Property Rights
ITPGR	International Treaty on Plant Genetic Resources

LL	Liberty Link
NAFTA	North American Free Trade Agreement
NASS	National Agricultural Statistics Service
NBS	National Biotechnology Strategy
NFU	National Farmers Union
OAPF	Organic Agricultural Protection Fund
OIG	Office of the Inspector General
PBR/A	Plant Breeder's Rights/Plant Breeder's Rights Act (Canada)
PNT	Plants with Novel Traits
PPA	Plant Protection Act (United States)
PTO	Patent and Trademark Office
PVPA	Plant Variety Protection Act (United States)
RR	Roundup Ready
SCDC	Saskatchewan Canola Development Commission
SCGA	Saskatchewan Canola Growers Association
SOD	Saskatchewan Organic Directorate
SPS	Agreement on the Application of Sanitary and Phytosanitary Measures
SWP	Saskatchewan Wheat Pool
TA	Technology/Stewardship Agreement (United States)
TBT	Agreement on Technical Barriers to Trade
TNC	Transnational Corporation
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TUA	Technology Use Agreement (Canada)
UPOV	International Union for the Protection of New Varieties of Plants
USDA	United States Department of Agriculture
WHO	World Health Organization
WTO	World Trade Organization

INTRODUCTION

New technologies are not deployed in a historical vacuum. Rather, they are introduced into a particular set of social, economic, and ecological circumstances with established and knowable trajectories. (Kloppenborg, 2004: 4)

The Changing Face of Agriculture

In 1996, the first genetically modified [GM] crops were commercialized in North America. Adoption of these crops was subsequently rapid in both Canada and the United States, as was the proliferation of lawsuits between biotechnology companies and farmers. Just two years later, in August of 1998, the Monsanto Company brought legal action against Saskatchewan canola farmer Percy Schmeiser, alleging patent rights violation for the uncompensated use of its 'Roundup-Ready' transgenic canola seeds. The resulting legal struggle splashed across the Canadian news media when Schmeiser claimed that he had not deliberately obtained Monsanto's technology but had been involuntarily contaminated with it. Suddenly, the possibility of farmers being sued for patent infringement due to natural or involuntary processes became irrevocably associated with the new agricultural biotechnologies. This is not strictly a Canadian phenomenon. In the United States, the Centre for Food Safety [CFS] identified 90 lawsuits filed by Monsanto against farmers (CFS, 2005:31). Moreover, the issues of involuntary contamination were joined by concerns over restrictions on seed saving, restrictive technology agreements, and a host of other social concerns. Genetically

engineered seeds, as patented, self-reproducing “inventions,” have challenged both the traditional understanding of property rights and the historical dynamics of control over agricultural production more broadly.

The situation in Canada and the United States suggests that biotechnology is facilitating a social reorganization of agriculture, whereby biotechnology corporations are using patents, contracts and other legal mechanisms associated with the technology to expropriate ownership and control over agricultural production from producers. Further, the United States is a world leader with respect to the technology, and this reorganization appears to be enjoying global replication with the assistance of various international agreements, such as the World Trade Organization’s Agreement on Trade Related Aspects of Intellectual Property Rights [TRIPS]. It would seem that a new regime of food production, an “expropriationist” regime, is assured, with significant implications for global food security. This dissertation argues that while the trends are increasingly deeply set, local level activities—such as those that are occurring in the legal arena—can both influence the terms of the technology’s usage and even slow the process of adoption itself.

The fundamental basis of the reorganization of agriculture lies with the granting of patent rights on life forms. Life forms, such as seeds, are self-reproducible. The granting of proprietary rights over such ‘inventions’ lays ownership claim to untold varietal improvements from the selection efforts of plant breeders and farmers for generations’ preceding, by the addition of one patented trait. Further, it transfers this ownership of one of the most fundamental means of life—the ability to produce food—to a very concentrated sector. The result has been legal conflicts over seed saving and patent

infringement, as farmers resist the conditions of the transition to biotechnology adoption. Struggles over rights extend beyond the conflicts over seed saving brought by plant breeder's rights and patents, however. This genetic technology can spread through the environment, even against the wishes of the owner of the property where it establishes itself, through nature's processes, such as wind, birds, or water; transfer on farm machinery; dispersal during transportation; or through human error. Some crops, such as canola, which has very small seeds, are obviously much more amenable to spread than others. With this potential and probable transfer of patented genetic material to lands not covered by legal contract, a whole new property rights issue is initiated. Patents placed by biotechnology companies on inventions that cannot be completely contained offer a direct challenge to the rights of farmers to the products of their land. Biotechnology companies do not want to relinquish their ownership of genetic traits simply because some amount of their product escapes containment. At the same time, however, an affirmation of the ownership rights of biotech companies over self-reproducing agricultural inventions leaves farmers potentially liable for patent infringement over genetic material they may not want, or even be aware of, in their crops.

The exact extent of the legal conflicts is difficult to determine as only a limited number of cases proceed to trial and pre-court settlements typically require farmers to sign a non-disclosure agreement. These conflicts pit farmers with minimal access to funds against well-funded biotechnology companies asserting their right to protect their substantial investments. While the details of the Schmeiser case are contested, the significance of the issues is not. The emerging legal framework around agricultural biotechnology raises many questions about the impact on farmers as well as broader

issues of control over food production. Further, associated issues to the clash of rights brought by patents on life—such as the right to alternative agricultures and the imbalance of power between farmers and biotechnology companies—need to be investigated in the context of such shifts in control. The corporate structure of the new agricultural biotechnology industry itself raises serious questions regarding the transfer of control over food production from more local and broad based to that which is supranational and concentrated. With biotechnology, inputs can now be fully integrated with production processes to produce end products tailored to corporate visions and needs for profitability. Corporate concentration means that production choices are further reduced. For example, the Monsanto Company and E. I. du Pont de Nemours and Company (Dupont), the top two seed companies, account for 60% of the world's commercial corn market and 44% of the world soy market excluding China (derived from Monsanto, 2002, reproduced in Action Group on Erosion, Technology and Concentration [ETC], 2003). Proprietary ownership over germplasm has a significantly different meaning in the context of such concentration than when there are relatively diverse suppliers. This high level of corporate control could have the potential to render farmers, consumers, even nation-states increasingly irrelevant to agricultural production decisions.

For Schmeiser and those in his position, the legal tactics of biotechnology developers may seem to be nothing more than underhanded corporate bullying, the stripping of farmers' democratic and economic rights, and an assault on national sovereignty over food production, all in the name of private profits. Less nefariously, these conflicts represent the inevitable tensions that result from any technology induced production change, as the introduction of agricultural biotechnologies could herald the

eventual corporatization of one of the last holdouts from capitalist processes of production. In either case, the introduction of biotechnology into agriculture has the potential to reorganize many of the social aspects of agriculture, and intensify the economic restructuring already in evidence. While NGOs and some farmers' organizations have raised a fair amount of attention to these issues, there has been little scholarly research to follow it up. Due to the incredible speed with which agricultural biotechnologies are being adopted into the United States and Canada, it is critical that we gain an understanding of the social implications of this direction of development.

The Research Problem

Biotechnology is broadly defined by the Convention on Biological Diversity [CBD] as "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use" (Food and Agriculture Organization [FAO], "FAO Statement"). This study, and the current controversies, revolves around what many call the 'new biotechnologies': those technologies specifically involving genetic manipulation, such as in the creation of transgenics (organisms altered by the introduction of genes from another species). This is what is meant when the term biotechnology is used here. Commercial application of such agricultural biotechnologies began in the mid-1990s. Since then, biotechnology adoption has increased at an astronomical rate. From 1996 to 2004, biotechnology crop production area increased from 1.7 million hectares to 81 million hectares globally (James, 2004a). By 2005, it had reached 90 million acres, celebrated by the technology's proponents as its one billionth acre (when calculated cumulatively) (James, 2005b). Ninety-seven percent of global agricultural biotechnology occurs in just six countries. The United States is by

far the leader in agricultural biotechnologies, accounting for 55% of global production area, while Canada has just in 2005 slipped from the third to the fourth largest country involved (behind Argentina and Brazil), with almost 7% of global production area. China and Paraguay together account for about 5% with the remaining 3% spread over another 15 countries (percentages calculated from James, 2005b). Canada and the United States are the only developed countries with significant GM crop area.

While some innovative genetic modifications receive much public attention- for example, vitamin A infused rice and drought resistant cassava- to date such innovations have either failed to reach commercialization or remain statistically negligible contrasted with the two key genetically modified traits of herbicide tolerance and insect resistance. Herbicide tolerance allows crops to survive the application of herbicide, thus allowing weed kill even after crops have emerged. The most common herbicide tolerant crops are the Roundup Ready [RR] crops produced by the Monsanto Company. These crops have been genetically engineered to be tolerant to glyphosate-based herbicides, of which Monsanto's brand name is Roundup. Insect resistant crops have been genetically engineered to incorporate a pesticide, such as *Bacillus thuringiensis* [Bt], into all cells of the plant to protect it from insects. One or the other, or both, of these traits have been applied to a number of key agricultural crops—primarily canola, maize, soybeans and cotton. Minimal acreage is dedicated to a few other genetically engineered crops, such as squash and papaya.

The controversy over these crops has been heated. Popular media reports polarize those who view genetic modification in agriculture as the technological fix for hunger and nutrition-related disease against those who emphasize its negative environmental

implications and the high level of uncertainty and risk. Although the 'battle over biotechnology' has primarily highlighted its health and environmental risks, the real and potential impacts of the technology are both physical and social. The former includes such concerns as the health impact of genetically engineered foods, decreased genetic diversity, impacts on other species, and super-weeds. Such a rapid adoption of any technology is likely to cause significant social impacts, however. These concerns remain under-investigated, particularly with respect to developed countries. Social concerns primarily emphasize the growing property and control issues associated with the proprietary aspects of the technology. These concerns emphasize the rising corporate control over food resulting from widespread adoption of the technology: a loss of farmer's traditional rights to save seed, decreasing production choices, concentration of food supply ownership, a potential compromise of national food autonomy, and biopiracy and food security concerns, particularly for subsistence farmers.

This research draws its focus from the issue of "choice". It is concerned with the extent to which social control can prevail under conditions of increasing capital investment and concentration in sectors (such as agriculture) that are dominated by the global investment strategies of large transnational corporations [TNC]. This research focuses on the legal framework around biotechnology as the locus of struggles for control over agricultural production, and as a key component of the new corporate strategy for capital accumulation in agriculture both locally and globally. My overarching research question asks: To what extent is the introduction of corporate driven proprietary agricultural biotechnology initiating a social reorganization of agricultural production, and to what extent is any such reorganization affecting the degree of control that

Canadian and American farmers have over food production? I approach this question through four case studies of lawsuits such as Schmeiser's, conducted comparatively between the United States and Canada, the top biotechnology adopters amongst developed countries. To the extent that a degree of choice and social control around agriculture are retained, there remains the possibility that even the environmental and health issues associated with biotechnology can be resolved in a socially desirable way. That is, in a manner that the majority would find acceptable. Considering the rapid rate of biotechnology's adoption, there is some urgency to investigate questions of social control, assess key areas where regulatory policy needs to meet the pace of technological development, and question the viability of national regulation in the current globalized context.

The Literature

Similar to the popular media reports, scholarly research on biotechnology has highlighted its physical aspects, with a number of those in the social sciences eschewing the 'technological fix' perspective of world hunger (Boyens, 1999, 2001; Shiva, 2000b; Tokar, 2001). Many of these arguments drift uncomfortably close to technological determinism, viewing the technology itself as inherently good or bad for society. More convincingly, it has been argued that the benefits of the technology are more likely to be determined socially, not scientifically, (Kloppenburg, 2004; Lewontin, 2000; Middendorf, Skladney, Ransom and Busch, 2000). That is, the social benefits of the technology will be determined by the direction of its development and the uses to which it is put. For example, agricultural biotechnology can be directed towards the socially-motivated development of drought resistant crops or the profit-motivated development of

genetic use restricted technologies [GURTs], more commonly known as 'terminator' technologies (crops genetically engineered to be non-reproducing).

Partly due to the newness of the industry, much sociological research on agricultural biotechnology has been prospective in nature. Many of the limited empirical investigations are focused on regulatory aspects or are social constructionist in perspective, investigating the political presentation of genetic modification, or the public reactions to it (see for example, Anderson, 2001; Andree, 2002; Bauer and Gaskell (eds.), 2002; Cambrosio, Keating, Mackenzie, 1990; Jones, 2000, Mehta, 2001; Schurman and Kelso (eds.), 2003). Biotechnology is particularly amenable to social construction analysis due to competing definitions of nature, technology and risk. Insufficient sociological attention has been paid to aspects of power and control related to the technology, although some early efforts are evident (Busch, Lacy, Burkhardt, and Lacy, 1991; Goodman, Sorj and Wilkinson, 1987), particularly with respect to the differential impact of the technology and related international agreements on developing countries (Arends-Kuenning and Makundi, 2000; Falcon and Fowler, 2002; Mushita, 1989; Otero, 1992; Otero and Pechlaner, 2005). There is a growing body of work addressing the privatization of genetic materials, but the emphasis of this work is either again particularly focused on North-South power differentials or remains predominantly at the macro level (see for example, Barton and Berger, 2001; Grace, 2002; McNally and Wheale, 1998; Shiva, 2000a, 2000b, 2001). Scholarly work on power and control issues related to the proprietary aspects of the technology within developed countries is a highly neglected area. While legal communities are abuzz with the new application of patent law to seeds, there is a dearth of sociological analysis linking these proprietary changes in

agriculture with empirical assessments of their impact. Although more interest along these lines is increasingly evident (see for example Kloppenburg, 2004; Kuyek, 2005, Mascarenhas and Busch, 2006), it remains highly limited. Given the radical shift in agricultural practice that such proprietary technologies would seem to represent, there is a strong need to investigate the role of biotechnology in shifting control over food production within industrial countries such as Canada and the United States.

In order to investigate these new dynamics, agricultural biotechnology must be addressed with respect to two key sociology of agriculture literatures—the political economy and food regime perspectives—which can provide insight into both local and global processes in agriculture. From the classics to contemporary scholarship, political economy of agriculture literature provides many insights into historical capital accumulation trends in agriculture (see for example, Berlan, 1991; Buttel and LaRamee, 1991; Friedland, 2002; Friedman, 1995; Kautsky, 1988 [1899]; Lenin, 1964 [1899]; and Thompson and Cowan, 1995). Many of these trends demonstrate the piecemeal strategy to accumulation that has accompanied the natural limitations to the industrialization of agriculture (Goodman, 1991; Goodman and Watts, 1994). Scholars such as Goodman, Sorj and Wilkinson (1987) have provided conceptual tools to distinguish these processes from those that occur in wholesale industrial transformations. Agricultural biotechnologies have begun to overcome the natural limitations in agricultural production, and this suggests that a reinvestigation of political economy theories—and a concomitant expansion of explanatory concepts—may be necessary.

Kloppenburg (2004) is one scholar who has directly addressed the subject of technological change in agricultural crops from a sociological perspective. His resulting

account of the political and economic history of the commodification of the seed supports the point that the introduction of any new technology will be shaped by existing social relations. Specifically, Kloppenburg argues that capital had two routes to pursue in attempts to commodify the seed: technical and social. Technical routes are comprised of such things as crop developments whereby the second generation is not as effective as the first, motivating farmers to purchase rather than reproduce their seeds for the next year's planting. Historically, this has been evident in hybrid technologies. With respect to biotechnology, the development of terminator technologies would be the technological equivalent (Jefferson, Correa, Otero, Blyth and Qualset, 1999). Terminator technology has thus far been prevented from commercialization by widespread public protest. However, where technological routes are precluded, there is also a social route, which is enacted through establishing property value to germplasm. In the United States and Canada, this was historically accomplished through a number of legal protections, such as plant breeder's rights. With respect to biotechnology, technology agreements (grower contracts), and, finally, patent rights on germplasm have provided the ultimate social solution.

This dissertation extends the work of political economy of agriculture scholars such as Goodman et al. and Kloppenburg. In conjunction with technology dissemination strategies, as we shall see, there is some indication that this social strategy may be suggestive of an attempt to use the law not only for the purpose of commodification of the seed, but as a new capital accumulation strategy. I suggest the term "expropriationism" as a potentially necessary addition to the concepts developed by Goodman et al. to explain capital accumulation in agriculture. As noted by Kloppenburg,

however, new technologies are not developed and disseminated in a vacuum. While there are powerful political and economic forces driving the development of these technologies, there are also forces of resistance, both within and outside the legal forum. These socio-political forces will need to be accounted for in any trajectory of the technology's development.

Much political economy of agriculture scholarship is focused on local agricultural processes. There are strong arguments, however, that globalization has shifted the locus of regulatory rule making outside of the national sphere. Globalization scholars, for example, argue that as globalization has allowed capital to escape the bounds of the nation-state, these nation-states are now held hostage to the will of transnational capital as it plays one state against another, endlessly manoeuvring for the best comparative advantage (Strange, 1996, 2003; Teeple, 2000). Domestic restructuring along neo-liberal free market lines is the necessary consequence. Further, subordinate classes, who once had limited access to state influence, have no such representation at the global level. Thus globalization presents a serious disjuncture between supranational rule making and the potential for democratic input, as civil society is nationally bounded and consequently little able to influence global laws and processes (Teeple, 2000). Of course, there are dissenters to the perspective, who either outright discount the qualitative differences in global trade that globalization scholars propose or, even more interestingly, qualify any differences they do perceive as dependent on factors such as initial state power or national buy-in (McBride, 2001; O Riain, 2000; Weiss, 1997). While discounting the majority of the globalization thesis as it applies to Canada, Urmeter (2005) nonetheless argues that the term globalization is meaningless unless specified to a particular subject.

The globalization of agriculture is something that is specifically addressed by food regime scholars.

The food regime perspective articulates agriculture's historical evolution through the concept of successive "food regimes," most articulated by Harriet Friedmann and Philip McMichael (Friedmann 1992, 1993, 1995, McMichael, 1992, 2005; Friedman and McMichael, 1998). A food regime characterizes rule governed relations of production and consumption on a global scale (Friedmann, 1993). The concept's proponents have identified two past regimes, and characterize the current international structure of food production as similar to the 'world car,' whereby multinational corporations assemble processed foods from globally sourced components. These scholars further argue that the transnational restructuring initiated in the second food regime, in conjunction with the current wave of free-trade agreements, now severely compromises the ability of nation-states to control their national agricultures: "Indeed the restructuring of agriculture in all countries in response to the demand by transnational agrifood corporations for inputs to manufacturing and distribution networks, casts doubt on the very idea of nations as an organizing principle of the world economy" (Friedmann and McMichael, 1998: 112). Rather, the institutional structures that support agricultural production are increasingly supranational rather than national in nature. Consequently, the current period is one of transition to a third food regime, the features of which are particular agricultural manifestations of globalization tendencies more generally.

Both the globalization and the food regime perspectives tend to downplay the potential for local factors to affect these international relations, such as the shape of the third food regime. Further, nation-states are frequently conceptualized as if national goals

were irrelevant to national control over food production, and potentially mediating activities that occur within nations—such as through social movements or in the legal arena—are rarely included at all. However, there is good reason to believe that they do mediate. A growing body of scholarship provides evidence that local forces (including state policies, regional politics and community resistance) can affect the implementation of the neo-liberal globalism logic in agricultural production (see for example, Constance, Bonanno, Cates, Argo and Harris, 2003; Le Heron and Roche, 1995; Moran, Blunden, Workman and Bradley, 1996; Novek, 2003; Wells, 1997). Local responses to law are one of these forces. Clearly there are significant challenges to this globalizationist perspective that require further investigation with respect to biotechnology's impact on social control over agricultural production and to opposition by organized actors within civil society.

The Study

Given the importance of the empirical issues and the theoretical gaps around the subject of biotechnology, two sub-questions guide the research under my overarching research interest in the impact of corporate biotechnology, each with a theoretical counterpart: 1) to what extent has the introduction of agricultural biotechnologies initiated a social reorganization of agriculture, and how is any such reorganization affecting farmer control over agricultural production (and should political economy of agriculture theories be re-conceptualized as a result) and 2) to what extent are local factors (specifically, national regulations, and local legal and community resistance) affecting biotechnology development within the United States and Canada (and could the food regime perspective be strengthened by taking account of such resistance). The focus for both of these questions is the proprietary and control aspects of the technology. A

third, underlying question is the extent to which the social reorganization of agriculture has broader social impacts, such as for environmental sustainability and food security. While an investigation of these issues is beyond the scope of this research, the link to these issues is implicit. Corporations are driven by profit not social goals, and consequently a transfer of control from farmers and society to a highly concentrated corporate sector will have some impact on these issues. Linkages to these issues will be made where possible.

To investigate these questions, I have taken a case study approach—in the manner of Robert Yin (1982, 2003)—structured comparatively between two regions within Canada and the United States. Selected lawsuits over patented genetically engineered seeds were the focal point of my study in each region. The selection of these regions was determined by the location of lawsuits that were significant to the evolution of case law around the proprietary technology. The relevant lawsuits in Canada were self-evident. The Percy Schmeiser case in Saskatchewan was the first—and as yet only—case of patent infringement litigation against a farmer for genetically engineered seeds to make its way through the Canadian court system. The case was groundbreaking not only in Canada, but also internationally, as a result of the issue of patent infringement in the face of involuntary possession, an issue the court ultimately managed to avoid facing head on because of the unique features of the case. Following in its footsteps, and directly related to these same issues, was another case originating in Saskatchewan. Two organic farmers, Larry Hoffman and Dale Beaudoin, launched a class action lawsuit against Monsanto and Aventis (later Bayer) for the loss of their organic canola market due to contamination with genetically engineered organisms. This was the first incidence of

farmers going on the offensive in an attempt to impose liability on biotechnology developers for the technology's impact, irrespective of its authorized release. In the United States there is significantly more legal action between farmers and biotechnology companies, although no case has yet reached the federal Supreme Court or directly addressed the issues of involuntary contamination or corporate liability. Nonetheless, two lawsuits in Mississippi—the Scruggs case and the McFarling case—stood out for their incorporation of broader control issues into their patent infringement disputes. Monsanto launched these two suits against the farmers for saving seeds with Monsanto's patented technology. Through their defence, both cases acted as a direct attack on the new regime by challenging the validity of patents on plants, and—particularly in the Scruggs case—challenging the overall structure of technology dissemination, which is claimed to support a virtual cartel.

While there is a comparative element to the investigation of the introduction of agricultural biotechnologies between the two regions selected in Canada and the United States, it does not overshadow the greater goal of assessing how the technology's introduction affects farmers' control over their production. Each case study involves an investigation of the intellectual property context and the changes brought by the selected lawsuits (assessed through court decisions, related court documents, and interviews with litigants and their legal representatives), as well as broader interviews with agricultural stakeholders on the changes brought by the proprietary technology. Through these interviews, I investigate how biotechnology's introduction and its accompanying legal framework affect farmers: are they being economically 'bullied,' as some claim, by their inability to match corporate dollars on the legal front? Are farmers making production

choices (e.g. GMO adoption) based on a desire to avoid legal 'double-binds'? Are they facing a loss of control over traditional rights (such as the right to save seeds) for the sake of corporate patents, while facing a compromise of their own ownership rights (such as through contamination of organic crops)? How are farmers reacting to any perceived negative social impacts resulting from biotechnology's introduction? These interviews help gauge the impact of biotechnology on producer control (affirming or suggesting modification of political economy theories), and the impact of local resistance on the course of its development (potentially challenging globalization and food regime perspectives).

While the evolving body of legal precedents and regulations provide insight into the legislative framework unfolding around biotechnology, the interviews help get beyond the 'law on the books' to reveal the needs, perceptions, and, ultimately, application of this framework—the 'law in action' (Sumner, 1979; Greenbaum and Wellington, 2002). As these legal precedents are still unfolding in lawsuits such as those studied here, many of the repercussions will only be evident further down the road. However, widespread concern over the issues, preventative actions, and disjuncture between perceptions and the current state of jurisprudence, for example, are significant qualifiers of the 'law in action', and assist in predictions of the future impact.

Organization of the Text

This research first situates the issue of agricultural biotechnology in its theoretical and regulatory context, and then moves on to provide empirical evidence of the reorganization of agriculture and opposition to it in Saskatchewan and Mississippi. Chapter 1 draws heavily on political economy of agriculture, globalization and food

regime literatures. It argues that the advent of agricultural biotechnology is resulting in a novel form of capital accumulation in agriculture based on its proprietary aspects, and that this literature now requires a new conceptualization—for which I propose the term ‘expropriationism’—in order to account for these changes. Further, food regime scholars suggest that the increasingly globalized nature of food production, which biotechnology facilitates, results in a decline in state autonomy and regulatory ability over it. I argue that there is room in the perspective to accommodate for local level activities that can affect a nation’s role in the evolving food regime, and thus the shape of the regime itself. These activities include general acts of resistance to the technology and more specific acts in the legal forum, as documented in the legal cases outlined here.

Chapter 2 provides a background chapter to the regulatory context of the technology in Canada and the United States. It argues that Canada has played tag-along development to the U.S. biotechnology industry, and that while slightly more precautionary, Canada’s regulations are evolving in similar pattern, such that the two countries appear to be aligning in a pro-biotechnology global block. This block emphasizes weak regulation of risk and strong support for the proprietary rights of technology developers, with little or no associated liability. The European Union provides an alternative regulatory path, with specific national examples of regulatory development over the proprietary issues left unregulated in Canada and the United States. While Canada and the United States appear uninterested in moderating industry development, sub-national avenues of resistance are evident.

The empirical research is divided into four chapters, Chapters 3-6, two on each case study region. The first chapter of each region focuses directly on farmers’

experience with the technology, with particular attention to the technology's proprietary aspects and its effect on their level of control over production. The second chapter in each region focuses on the actual legal developments evident in the selected lawsuits. The Canadian case is first, chronologically, in large part because the proprietary aspects of biotechnology have found greater purchase there in public discussions about the technology. To some extent, this is likely because the Saskatchewan cases highlight the issue of involuntary contamination, whereas the Mississippi suits are specifically focused on the issue of patent infringement due to seed saving. As we shall see, however, the attempted introduction of RR wheat and the relatively high population of organic farmers plays a significant role in questioning control issues and raising resistance to the technology in Saskatchewan. While these dynamics are virtually absent in Mississippi, the resistance to the proprietary and control aspects of the technology have advanced much further in the legal arena, although with a different emphasis than in Saskatchewan.

Chapter 3 documents Saskatchewan farmers' experience with the technology. Interviews reveal that the majority of producers are supportive of the technology because of the time and efficiency gains it provides, and while the proprietary aspects of the technology—specifically Monsanto's technology agreement—were an irritant to some, the presence of alternative varieties mitigated this irritation somewhat. Resistance to the technology was hugely apparent with respect to unwanted technologies (such as RR wheat), those who were supportive of the Schmeiser case, and with respect to those who produced organically. There is strong evidence to suggest this resistance has affected the industry's development in the region. With respect to the lawsuits, in Chapter 4, we see that in the clash between the property rights of farmers and the patent rights of

technology developers, the trend has been supportive of the rights of the latter, with technology developers gaining some of the most important benefits of ownership while remaining exempt from its liabilities.

Chapters 5 and 6 present the Mississippi case. Interview data is presented in Chapter 5, with Mississippi farmers demonstrating much greater extremes in their relationship towards the technology. Greater weed and insect pressures in Mississippi contribute to an appreciation of the technology that borders on technological dependence. At the same time, there is a distinct sentiment that Monsanto wields a monopoly control that is leaving farmers powerless in the face of its dictates. Interestingly, while there is less expressed support for those involved in the Mississippi court cases than was evident in the Saskatchewan case, the points of litigation have a great deal of resonance with the concerns of Mississippi farmers more broadly, specifically on the counterclaims of patent misuse and antitrust. In Chapter 6, we see that while these issues are still under litigation, the trend again indicates that case law is evolving in a manner that discounts these concerns and upholds the rights of patent holders.

Lastly, Chapter 7 provides conclusions with respect to the empirical research questions outlined above, and with respect to the theoretical developments that this research suggests. I argue that there are clear trends that the rise of proprietary technologies introduces a new means of capital accumulation, and that this rise is decreasing farmers' control over agricultural production. While we are still in the early stages of deciding how the clash of rights raised by agricultural biotechnologies will ultimately be resolved (and there is still room for a dramatic shift), the trend is currently very supportive of this conclusion. The empirical evidence therefore suggests that there is

indeed support for a re-conceptualization of political economy of agriculture literature, and that legal means have facilitated new forms of capital accumulation in agriculture. I also argue that these trends are not globally inevitable, but that organized resistance may redirect the process. While lawsuits clearly represent a locus of struggle over these issues in Canada and the United States, there are signs of resistance to these proprietary and control changes both in the legal forum and in the broader community. To date, the impacts of this resistance have been piecemeal. Nonetheless, the evidence suggests that the shape of the next international regime of food production is not inevitable, but remains subject to local forces, both of reception and resistance.

CHAPTER 1

AGRICULTURAL BIOTECHNOLOGIES ON THE FARM AND AROUND THE WORLD: THE CHANGING FACE OF AGRICULTURE

As should be clear from the brief introduction, the new agricultural biotechnologies have brought a significant number of changes to the practice of agriculture and to the whole agricultural sector. Technology induced change is not new to agriculture, of course, and is well documented in scholarly literature. Biotechnology's proprietary aspect adds a new component to such change, however, and may even have the potential to instigate a social reorganization of agricultural production. Consequently, this aspect may require a reconceptualization of some of the main tenets of political economy of agriculture theories. Further, it is simply not possible to assess national agricultural change without attention to the global context, and their reciprocal influence. Even historically speaking, agriculture in North America has been internationally linked, and in fact has developed squarely in the context of international trade relations. The current era of 'globalization' suggests a trend of deepening global integration, and lends even greater significance to the international context of national agricultures. At the same time, to assume that local activities are irrelevant in the shaping of the global food regime is to greatly undervalue the myriad influences on the national and sub-national level: these influences form the legal and regulatory basis from which new technologies such as biotechnology are nurtured and can develop into international forces... or fade away completely.

This chapter will first look at relevant sociology and political economy of agriculture literatures, for what they can contribute to an analysis of capital accumulation strategies in agriculture. It outlines how these literatures apply to the current case of agricultural biotechnologies, and where they fall short in explaining developments related to the new technology. Given the very particular form of proprietary emphasis that biotechnology brings to agriculture, it is suggested that these literatures need to be modified to accommodate this new dimension. Specifically, it will be suggested that two theoretical concepts of agricultural industrialization identified by Goodman, Sorj and Wilkinson (1987)—appropriationism and substitutionism—now need to be joined by a third, which I term expropriationism. While the former two terms emphasize capital accumulation strategies in the spheres of production and processing, the latter term is suggested as a response to a potentially novel strategy, based on the proprietary changes that accompany the new technology. The introduction of a plethora of new laws and contractual obligations with the technology—prohibitions on seed saving, grower contracts, patents on seeds, and even incentive agreements and restrictions on herbicides—all suggest a significant shifting of what was previously under producer control to biotechnology companies, with an associated shifting of economic benefit. Consequently, the term ‘expropriationism’ seeks to address these changes and act as a theoretical addendum to political economy explanations, where they fall short with respect to capital accumulation strategies related to agricultural biotechnology.

Secondly, this chapter will seek to place agriculture in its global context by looking at theories about globalization more broadly, and then specifying to agriculture and food using the food regime perspective, which conceptualizes an emerging

internationally regulated and corporate dominated third food regime. The goal is to situate agriculture in its global context in order to assist in understanding the international restraints on national agricultures, and in order that the ensuing analysis can serve to question and extend this theoretical perspective, where applicable. The focus will again be on the issue of control over agriculture; specifically, whether nations can regulate agriculture according to their national priorities, or whether they are impotent actors under globalized capital and international trade agreements. The proprietary aspects of the technology, operating in this case at the international level (with respect to international property rights and related international agreements), are a central focus. This chapter argues that we can theoretically strengthen the food regime perspective by allowing for greater acknowledgement of the reciprocal impact of nation-state activity on the shaping of the third food regime.

The most convincing approaches to globalization incorporate factors that affect differential integration into the current wave of global economic restructuring, rather than strictly advocate or deny the concept. Similarly, the prospective third food regime, like globalization itself, is a contested project, and resistance will likely be key to determining its shape. What resistance might be significant enough to alter the path to the projected, socially problematic, third food regime? The conceptual incorporation suggested here for political economy of agriculture theories (incorporating biotechnology's expropriationist aspects) may be indicative of a local factor that garners significant enough resistance to shift national priorities. Indeed, local resistance to biotechnology's expropriationist tendencies could prove a reciprocal force strong enough to reflect upward on globalization tendencies and change the face of the emerging third food regime.

Ultimately, I suggest a framework for theorizing changes in agriculture brought by the introduction of biotechnology that accommodates local changes and places them in their broader global context.

Down on the Farm: The Industrialization of Agriculture?

The sociology and political economy of agriculture literatures have identified many trends in industrialization common to agriculture. New political economy of agriculture literatures, for example, have highlighted historical trends of industrialization that are applicable to agriculture: increased capitalization, concentration of agricultural input suppliers and output purchasers; substitution of independent producers with agribusinesses; increased productivity; the externalization of environmental costs; and the transformation of consumption patterns, among others. In some cases, the parallels with industrialization are drawn to the extent of rejecting agriculture's analytical separation from industry (Goodman and Watts, 1994:3). Nonetheless, despite the similarities, agriculture has retained a number of distinctions from industry due to its particularities as a nature-based process. Many aspects of agriculture deviate from typical capital accumulation patterns, and consequently theoretical distinctions are required.

Similar to the proposition argued by Goodman and Watts (1994), I argue that the natural processes of agriculture in fact do render it exceptional to industrialization. Scholarly works that account for rather than artificially downplay this exceptionalism provide the greatest insight into agricultural development, and the greatest predictive capacity for its future development. In particular, the conceptual tools of appropriationism and substitutionism, developed by Goodman, Sorj and Wilkinson (1987), provide an analytical framework through which many historical as well as current

developments in agriculture can be viewed. As noted, developments in biotechnology may introduce new forums for capital to meet agriculture that cannot be accounted for by these concepts, and legal means may have joined these traditional capital accumulation strategies in agriculture. Further, legal altercations over the issue of infringement and involuntary contamination highlight growing issues with respect to the genetic ownership that directly pit the rights of farmers against the rights of industry. Biotechnology critics additionally claim that contamination issues legally intimidate farmers from continuing production with anything other than genetically engineered seed stock. Consequently, while supportive of the concepts developed by Goodman et al., this section suggests that a new concept, incorporating these legal issues, needs to be added in order to account for these changes, while retaining the ability to articulate agriculture's exceptional development.

Conceptual Tools in the Political Economy of Agriculture

While early political economy of agriculture literatures have found some resonance of the experience of agriculture with broader theories of industrialization, it was not without some theoretical cost. Goodman, Sorj and Wilkinson (1987) state that classical attempts at theorizing agriculture's position in capitalist development have resulted in conceptual distortions and debates inappropriately focused on social relations of production or the relative benefits of peasant versus capitalist modes of production (145). Such attempts at draping agriculture in the conceptual cloak of industrialization, they argue, overlook the central problematic of agriculture in capitalist development; that is, its status as a natural process. Where agriculture's natural aspects produce impediments to wholesale industrial transformation, capitalist development finds other

ways of incorporating agriculture into its processes. Notably, it finds ways of incorporating discrete elements of agrarian production, as will be discussed in more detail presently.

The attempts to draw agriculture into broader theories of industrial restructuring did not stop with classical approaches. Goodman and Watts (1994), identify the concept of 'Fordist agriculture' as one such attempt, whereby political economy and regulation theories have tried to overstate agriculture's industrialization in an effort to reject its exceptionalism from industry. Consequently, agrarian political economy imported concepts wholesale from industrial restructuring literatures. However, Goodman and Watts argue that the Fordist agriculture conceptualization fails under empirical assessment. Specifically, while aspects of the processing and input sectors of agriculture may demonstrate Fordist tendencies (e.g. high volume, standardized production and consumption), the conceptualization cannot be sustained with respect to labour at the point of production or to regulation. The significance of such conceptual slippage is not minor. Rather, they argue that washing over agriculture with the 'gloss of Fordism' overlooks important exceptions that need to be explained, and consequently distorts a significant analytical question: "how does the organization of agricultural production and rural space change under different regimes of accumulation and modes of social regulation?" (Goodman and Watts, 1994:15). This way of thinking puts agriculture firmly under the umbrella of its broader political economic context, but without creating a forced marriage of industrialization concepts and empirical evidence.

The concepts of appropriationism and substitutionism developed by Goodman, Sorj and Wilkinson (1987) are one means of addressing the organization of agricultural

production in this way. While their book is now somewhat empirically dated, the concepts hold their explanatory value for many processes in agriculture today, an indication of the usefulness of this kind of conceptualization for making future predictions. This conceptual specificity also provides insight into how local level processes are mutually conditioning of global ones, a perspective which will be expanded on further in this research. The two concepts overcome the above theoretical errors precisely because they focus on the way in which agriculture is exempted from traditional industrialization. Goodman et al. argue that agriculture, as productivity rooted in the natural processes of the earth, could not be brought wholesale under the control of capital due to the natural limitations of land, time (plant and gestation cycles) and biological processes (photosynthesis). This may change with the advent of biotechnology, as will be discussed, but to date, capital has had to find other means of infiltrating the sector. In response to the natural barriers presented by agriculture, capital has pursued a piecemeal and discontinuous path of agricultural industrialization. The two means it has found of doing so have been appropriationism and substitutionism.

Appropriationism is defined as the “discontinuous but persistent undermining of discrete elements of the agricultural production process, their transformation into industrial activities, and their re-incorporation into agriculture as inputs” (1987:2). By definition, therefore, appropriationism occurs in the production sphere of agriculture, where competitive industrial capitals “create sectors of accumulation by re-structuring the inherited ‘pre-industrial’ rural production process” (8). The trajectories of appropriation therefore depend on the particular history already in place. For example, in 19th century Britain, where land was restricted and labour plentiful, early accumulation strategies

focused on “high farming” (the replacement of farm produced animal fodder and organic manure by purchased oil-seed cake and fertilizers (28)). In the United States, on the other hand, land was plentiful, and consequently appropriation strategies initially focused on mechanization and automotive engineering (e.g. the replacement of horses and labour with tractors). As the agronomic problems of mechanization and extensive cultivation later became evident in the US, these trajectories merged. Further details of such appropriationist processes of accumulation are provided in great detail by Goodman et al, and in the works of other scholars, such as Berlan’s (1991) treatment of the ‘power age’ and Kloppenburg’s (2004) treatment of the introduction of hybrid technologies.

Substitutionism follows a similar process with respect to the replacement of agricultural products with industrial ones. While appropriationism seeks to advance capital accumulation in all facets that can be replaced in agricultural production, substitutionism seeks to replace the agricultural end-products with non-agricultural ones, rendering agricultural products into industrial inputs for manufactured products. Thus, substitutionism mainly occurs in the processing of agricultural products, and seeks to “interpose mechanized industrial processing and manufacture between the source of field production and final consumption” (Goodman et al., 1987: 60). The first substitutions of processed farm products resulted from mechanical processes of adding value (e.g. flour milling). Preservation technologies, such as canning and refrigeration, provided another avenue for substitutionism. The advances in distribution capabilities that these technologies brought facilitated the international division of labour and the vertical integration of capital. Goodman et al. suggest that a transition to a qualitatively new form of substitutionism can be evidenced in the production of margarine, an “early example of

industrial substitution as product creation” (69). Margarine broke the tight association between agricultural product and end-product by using cheap industrial raw materials in place of rural ones to create an industrially blended substitute for butter. This represented a significant change for the status of agriculture: “In the case of margarine, agricultural products definitely assume the status of industrial inputs, being used interchangeably as determined by cost and technical criteria” (69). Margarine, therefore, was a fully industrial food product. From this point on, the power of substitution in accumulation strategies only expanded, reaching its apparent zenith in our current age of bio-industrialization.

Noteworthy for our purposes here is the historically and naturally contingent process of capital accumulation that appropriationism and substitutionism characterize. Scientific and technological developments are key factors for these processes as they provide new opportunities for capital advancement. Further, state policy and the manner in which capital adjusts to it affect future accumulation strategies. For example, while the US government’s policy institutionalizing production surpluses—which will be discussed in more detail below—relegated market forces around grains “to a secondary role,” this ultimately became the foundation of a new appropriation strategy, as cheap grains supported the expansion of the “livestock feed and fattening industries” (13-14). The state is also central to accumulation strategies as an essential backer of technological innovation. These local level processes reveal the dynamic nature of the resulting agro-industrial complex, in which capital responds to the intersection of history, state policy, and advances in science and technology. Their importance to the evolving global food agenda will also be more evident shortly. Ultimately, these accumulation strategies have

functioned to minimize the economic significance of agricultural production and reduce the power of farmers, who are increasingly sandwiched between successful accumulation strategies in the input and output sectors.

With the introduction of agricultural biotechnologies, the opportunities for appropriation and substitution of agricultural production are vastly expanded. Goodman et al. argue that biotechnology may indeed even herald a new epoch in agricultural appropriation strategies. While biotechnology has advanced significantly since Goodman et al. made their predictions, nearly 20 years ago, the strength of their abstractions of the means in which capital confronts nature is such that they remain applicable to current developments. The processes of industrialization have historically worked to render the elements of agricultural production “increasingly measurable and predictable, diminishing the uncertainties of nature” (120). The advent of biotechnology provides opportunities to further diminish the importance of nature and bring it under even greater industrial control: bacillus thuringiensis and Roundup Ready technologies are cases in point. With these types of technologies, biotechnology assists in appropriationism through the creation of “tailor-made plants ‘engineered’ specifically to meet the requirements of automated, controlled environment agriculture” (122).

Substitutionism is another venue where biotechnology introduces seemingly limitless means to change the face of agriculture, and move food production even further under the auspices of bio-industrialization. Early substitutionism that was conducted using the separation and fractionation techniques of chemical engineering can now occur with even greater separation from natural processes with the assistance of industrial microbiology (123). The dramatic changes possible in the food industry from the use of

biocatalysts were already ably demonstrated in the case of high fructose corn syrup, developed through the process of mutagenesis. The process made possible the use of corn (subsidized by surplus policies in the US), and eventually other grains, in the place of cane sugars as sweetener inputs for the processing industry. The result was a dramatic loss for tropical countries (Friedmann, 1992). Genetic engineering provides the means to further improve such biological catalysts, drastically increasing the ability to submit agriculture to industrial control through disaggregating agricultural products into variously substitutable components that can be globally sourced and resourced, according to industry dictates. Most recently, the use of biotechnology in the creation of bio-ethanol has resulted in the substitution of a food product (corn) for a fuel product, with devastating consequences for food security in countries such as Mexico (Elias, 2007).

While never completely distinct processes in any case, biotechnology provides significant opportunity for heightened convergence of the processes of appropriationism and substitutionism—with biotechnology, food crops can be genetically engineered with specific traits desired by processors. This linking furthers the potential for corporate domination already evident in the input and processing sectors, and exacerbates concerns that farmers will be powerless between the two. In fact, the high degree of corporate integration—for example, every major seed company currently has some form of direct link to a chemical company (Middendorf et al, 2000)—consolidates power over the food supply into a limited number of hands. As this concentration increases, the potential for alternatives decreases.

Already there is considerable evidence of such concentration. Concentration is such that the top ten companies control almost 75% of the global biotechnology market,

50% of the commercial seed market, and 84% of the pesticide market (ETC Group, 2005b). Given the linkages between these sectors, many of these are the same companies. While many biotechnology companies are losing money, a few are making large profits. In 2004, the top ten biotechnology companies accounted for 72% of revenues (but only 14% of research and development) (ETC Group, 2005b). The Monsanto Company, a litigant in all the lawsuits considered here, is one of these companies. The company's posted second quarter net income in 2007 was \$543 million; \$440 million for the same period in 2006 (Gillam, 2007).

In 2004, Monsanto accounted for 88% of the total GM crop area planted globally. With respect to key GM crops Monsanto's global market share is extremely high: 91% in soybeans, 97% in maize, 63.5% in cotton, and 59% in canola (statistics compiled from ASAA and Monsanto, compiled by ETC Group, 2005a). In 2005, the Monsanto Company purchased Seminis, a vegetable seed company, and became the world's largest seed company at the same time as becoming the instant market leader in global vegetable seeds. Consequently, Monsanto now controls 31% of the bean, 38% of the cucumber, 34% of the hot pepper, and 29% of the sweet pepper market share globally (ETC Group, 2005a). One can only speculate that a push in genetically modified vegetable seeds is to follow.

While biotechnology provides countless means to extend traditional capital accumulation strategies in agriculture, the technology provides a major breakthrough in privatization strategies around the 'seed', something that has previously faced many historical impediments. Thus the privatization of germplasm provides an effective exemplar of capital's struggle to accumulate in agriculture, and of biotechnology's

seemingly ultimately decisive role in this struggle. Kloppenburg's seminal *First the Seed* (2004) is a political economy treatment of the commodification of the seed in the United States. Kloppenburg is therefore particularly insightful with respect to capital accumulation patterns in the one aspect of agriculture—the seed—where the natural process of reproduction has prevented its full commodification. His research responds to the questions: “Have plant breeding and seed production become a means of capital accumulation? If so, how has this been accomplished and what have been its effects?” (2004:8). He argues that capital has pursued capital accumulation in seed production through 2 routes—one technical and one social. The development of hybrid seed is the ultimate example of the technological route. Social routes include legislation designed to protect plant breeders, such as the commercial protection of plant matter afforded under the Plant Variety Protection Act (PVPA) in the United States and the Plant Breeder's Rights Act (PBRA) in Canada.

Kloppenburg's broad historical survey of the political economy of agriculture in the United States demonstrates that the choice of technologies is highly dependent on the economic interests involved. For example, while the reproducibility of the seed was a major impediment to commercial profitability, this was finally overcome in the 1930's through the advent of hybrid technologies. According to Kloppenburg, this was a social not a technological choice in seed development, primarily driven by agitation from the seed industry. He argues that the choice of hybridization over open-pollinated varieties was a purely commercially motivated choice, and is testament to the capacity of private interests to affect the direction of technological development. According to Kloppenburg, public sector development and disbursement of seed varieties was a major impediment to

the commercial seed industry until seed production gave way to commoditization through the advent of hybrid technologies (which prevented commercial grade regeneration) in the 1930's. Thus the direction of technological development is not inevitable and value neutral, but arises out of the intersection of political and capital accumulation strategies. In the US, the culmination of this has been a progressive loss of public control and reorganization of research for commercial purposes, such as through the relegation of the public sector to basic research, which the private sector then applies and commercializes. A similar reorganization is occurring in Canada around the biotechnology industry, as we will see in Chapter 3.

Up to now, legislation protecting plant breeders and hybrid technologies have only provided a partial solution to capital accumulation in agriculture. As we have seen, biotechnology now allows for far greater gains. Ultimately, in a bid to finally end the impediments to accumulation in germplasm, the biotechnology industry has produced patented germplasm and terminator technology (still under development), both of which require the farmer to purchase seed afresh each planting season. While the former legally precludes regeneration, the latter prevents it physically. Already withdrawn once due to public outcry, terminator technology is once again under hot contestation. This technology raises considerable risk factors to food security, highlighting concerns already raised by the development of the technology according to profit rather than social dictates. For example, while opportunities for socially beneficial agricultural biotechnologies abound—e.g. drought resistant or salinity tolerant crops for food insecure regions— thus far corporate biotechnology has emphasized those developments that can produce the greatest profit, and consequently the emphasis has been on promoting high

intensity chemical farming of a limited number of mono-cropped varieties for regions already historically producing surpluses. As Kloppenburg notes, “what is profitable is not always coterminous with what is socially optimal” (2004:150). While the physical aspects of biotechnology certainly raise some social questions, the research questions here are concerned with its proprietary aspects.

The proprietary aspects of biotechnology are multifaceted and ethically complex, and cover such issues as the morality of patents on life, the social significance of seed saving, global equity, and shifting property rights, among others. The granting of general utility patents on plants and/or components of plants was not a forgone conclusion, however, but was again a social decision that required extensive effort on the part of industry, and a supportive state environment. Eventually, a corporate friendly proprietary framework was accomplished for biotechnology:

[B]y 1994, within 21 years of the advent of microgenetic engineering technology, the ‘bio-industrial complex’ had achieved the categorization of biotechnological products and processes within the realms of the patentable at both the US PTO and the EPO, had persuaded the European Commission to draft a Directive on biotechnological patenting in the Community, and had laid the foundations for the globalization of intellectual property rights through the GATT and the UN Convention on Biological Diversity, with the objective of securing worldwide patent protection for the products and processes of modern biotechnology (McNalley and Wheale, 1988:310).

As genetically engineered seeds are produced and sold as patented inventions, seed saving is prohibited. Both the PVPA and the PBRA provided a farmer’s exemption, whereby a producer could save seeds for personal reuse, although not for resale. Under the general utility patents granted for genetically engineered seeds, farmers no longer have this exemption and must obtain their seed commercially for every planting. The

control over the food supply this legal fact grants to corporations is a source of much contention. While proponents of the technology state that those who object can simply respond by not purchasing the technology, opponents claim that conventional (non GM) seeds are increasingly difficult to obtain, and, even more significantly, that greater food security issues should not be decided on the cost-benefit calculations of individual farmers. Further, concerns over corporate control of the seed supply by legal fiat become extremely problematic when reproduced on a global scale, reaching the areas of many of the world's poorest farmers.

Although state support of the intellectual property rights of the biotechnology complex may be a calculated geopolitical move in countries such as the United States and Canada, as will be discussed in Chapter 2, it has nonetheless opened the door to significant clashes of rights between farmers and biotechnology companies. While genetically engineered crops may be patented inventions, they are self-reproducing patented inventions. Consequently, this patented genetic technology can spread through the environment in numerous ways, even against the wishes of the owner of the property where it establishes itself. This potential, even probable, transfer of patented genetic material to lands not under patent contract initiates a whole new form of property rights conflict. Farmers, who traditionally have had the right to the products of their land, can find themselves in direct conflict with biotechnology companies, who claim the right to their patented invention, wherever it ends up.

The result of this clash of rights initiated by the self-reproducing patented technology is a series of questions. With respect to involuntary contamination, who owns the resulting progeny, farmers or biotechnology companies? What kind of loss can

farmers be exposed to through such contamination? Can farmers be held liable for patent infringement for involuntary contamination? How much contamination makes a crop subject to patent infringement? When such clashes result in patent infringement lawsuits, are fair resolutions possible between farmers and biotechnology companies? Are farmers able to defend themselves or are lawsuits reaching settlement based on farmers' inability to match corporate dollars on the legal front? Biotechnology companies claim the extension of their ownership rights to succeeding generations is necessary for them to recoup their investment in the invention. However, is this ownership associated with any of the traditional responsibilities of ownership? For example, are biotechnology companies responsible for removing unwanted spread of their technology? Are they liable if their technology creates negative impacts, such as if organic producers lose their ability to farm organically due to genetic contamination?

In sum, these questions ask whether farmers are facing a loss of control over traditional production rights (such as the right to save seed, and the right to the products of their land) for the sake of corporate genetic ownership rights. At the same time, they ask whether any potential gain of corporate ownership rights is associated with traditional responsibilities of ownership (e.g. responsibility for contamination). Whether farmers are subject to a loss on both fronts is still being determined. The resolution of the legal basis of these questions is the exact subject of the lawsuits that are currently unfolding in the United States and Canada. Ultimately, these questions suggest that a new form of capital accumulation may be occurring. Further, this new form of accumulation may itself expedite the transition to GM crops through legally supported genetic occupation, economic intimidation, and the closing off of production alternatives. Overall, the new

issues raised by the technology are suggestive of accumulation trends that cannot be accounted for with the concepts of appropriationism and substitutionism. While resolution on many of these issues is still pending, sufficient activity has occurred to ask the empirical question of how these issues are beginning to be resolved, and to follow it with the theoretical question of whether this represents a new form of accumulation in agriculture.

The current work expands on the ideas in Kloppenburg's work, with a more specific focus on the proprietary changes brought by agricultural biotechnologies. The emphasis here is on how agricultural biotechnologies affect farmer—and ultimately societal—control over agricultural production. As can be recalled from the introduction, my overarching research question asks: To what extent is the introduction of corporate driven proprietary agricultural biotechnology initiating a social reorganization of agricultural production, and to what extent is any such reorganization affecting the degree of control Canadian and American farmers—and by extension society more broadly—have over agricultural production? It is suggested here that a new capital accumulation strategy—termed expropriationism—may be acting to further reduce farmer and societal control over the production system. Like appropriationism and substitutionism, the state plays a key role in the support of this accumulation strategy. Given the high degree of contestation around the technology, the possibility remains that the state could change its pro-biotechnology position, and regulate the industry according to more social dictates. The significant and abrupt overstepping of farmer's rights implied by the patent lawsuits has provided a catalyst for even broader civil society response and has intensified the pressure on governments resulting from social movement agitation and lobbying efforts

around GMOs. However, there is no shortage of arguments that globalized capital and capital friendly transnational agreements have compromised national regulatory ability to the point where nations can no longer control their national interests even when motivated to do so. Ironically, then, just when opposition to the technology seems to be reaching its head in many developed countries, it may nonetheless be unable to affect any significant change. If globalization renders nation-states incapable of independent regulation, then nation-based struggles over biotechnology are immaterial, and the corporate regime of accumulation will prevail.

Globalization and the Food Regime Perspective: The Decline of the Nation-State?

Whatever else can be asserted about the concept of globalization, it has garnered an indisputable amount of both popular and academic attention: it is alternately feared and revered, endorsed and debunked. Some of the problems with establishing globalization's empirical robustness arise from the fluidity of its definition. In a comprehensive analysis of the concept, Peter Urmetzer (2005) argues that a significant problem with the concept is its ambiguity, evident in a 'globalization of everything' approach that conflates different processes without justification and leads to a free association of unsupported assertions:

The problem with the 'globalization-of-everything' position is that while some processes may be highly globalized (e.g. communications and television, in particular), others are less so (e.g. the movement of people). And where one process could potentially be harmful to governments (e.g. the unfettered movement of people), others are likely to

be only minor in their impact (e.g. the Internet). Unfortunately, the globalization argument does not allow for such distinctions (Urmetzer, 2005: 23).

Urmetzer finds three elements that are common to most definitions of the concept: globalization involves increased cross border movement (economic, political, cultural, etc.); whenever it started, it is universally seen to have accelerated in the post-war period between the 1960s-1980s; and, lastly, it is seen to cause a weakening of the nation-state (2005:37). This last point is perhaps the most significant for the resonance that the concept has for anti-globalization protesters and with respect to our concerns about the nation-state's ability to regulate its own agricultural system. More descriptively, Urmetzer contends that the globalization argument is "impregnated with the political rhetoric of powerful corporations and feckless states," and that this rhetoric has subsequently "leaked into and contaminated the academic debate" (Ibid.).

Obviously, the extent to which concerns over state autonomy are merely political rhetoric is highly significant to questions of control over national agricultures. If such concerns are merely rhetoric, then national regulatory control over agricultural biotechnologies should be subject to a great degree of state autonomy, irrespective of deep corporate involvement. Alternately, should states indeed be powerless, we can expect to see international homogenization of weak biotechnology regulatory regimes in spite of differing national visions around the technology, and in spite of sub-national opposition and protest against it.

Arguments associating processes of globalization with a weakening of national regulations, and in fact, with the decline of the nation-state itself, can be found in countless academic works, a review of which is not necessary here. While there are

variations in emphasis and degree of subscription to the 'loss of autonomy' argument, Strange (2003) provides a good, general representation of the position:

[T]he impersonal forces of world markets, integrated over the postwar period more by private enterprise in finance, industry and trade than by the cooperative decisions of governments, are now more powerful than the states to whom ultimate political authority over society and economy is supposed to belong. Where states were once the masters of markets, now it is the markets which, on many crucial issues, are the masters over the governments of states (Strange, 2003:128).

Aside from the globalization of finance, most quantitative assertions of the globalization argument have now been put aside in favour of representations of globalization as a qualitative break from the past. Technology development, corporate concentration and transnationalization, and supranational trade agreements codifying corporate-friendly trade rules on a global scale are some of the key features identified that distinguish the current trade regime from those of the past, and contribute to the shifting power balance between capital and nation-states.

Technology is a key factor in this shift in the state vs. market balance of power because it changes the terrain of wealth from that of territory to that of market share (Strange, 2003). Teeple (2000) argues that it was changes in technology that underwrote each of the successive periods of capitalism (175). Society is currently in the early stages of a new technology revolution, including information technologies and genetic engineering (Castells, [1996] 2000). Consistent with these views, the significance of technology for the international restructuring of agriculture and food systems should soon be apparent. A significant promoter of technological advance, of course, is capital; and capital concentration is another key factor in the shifting state-market balance of power. While capital has operated on an international basis in the past, the current phenomenon

of the transnational Corporation, or TNC, is a new feature backing the current form of globalization. The TNC is argued to be historically distinct from the internationalization of capital evident in previous eras, as it represents:

...the supersession by capital of the nation-state as its historically necessary but now redundant social and political framework. It is a process in which the main actors become the TNCs and all the circuits of capital become global in nature with a distinct global framework; and the national economy—and its associated borders, policies, and programs—becomes a fetter (Teepie, 2000: 179).

Unfettered capital arguably leaves nations hostage to its whims, as business interests play each state against the other in the pursuit of the best comparative advantage. In this scenario, attempts to regulate industries—such as the biotechnology industry—run counter to the business friendly environment necessary to attract capital. Teeple terms this new global economic organization a ‘new reality.’

Another key factor in the new reality under globalization is the rise of international agreements. Supranational agreements institutionalize free trade regimes and a corporate friendly global framework. Such agreements constrain the regulatory autonomy of nation-states. For example, as we will see in chapter three, the right of the European Union to ban GMOs was the subject of a challenge at the World Trade Organization (WTO). Further, their newly minted GMO regulatory framework—including strict traceability and labelling requirements—may also be considered in contravention of the WTO’s free trade regime. Globalizationists therefore argue that such supranational organizations provide an enabling framework for the creation of a “single, unified, global market” (Teepie, 2000:179). This global market has no place or tolerance for the social priorities of national governments or their citizens.

Of course, the globalization argument has its share of naysayers. While scholars such as Teeple unequivocally project a decline in state capacity, others, such as McBride and Shields (1997), argue that globalization does not require such downsizing, but that pressures to downsize have been the result of domestically motivated pressures to promote free market operation. Urmetzer similarly concludes that there is no case for globalization as an inevitable external force weakening the autonomy of nation-states. Rather, he argues that the concept covers an age-old debate about the appropriate level of state intervention (intervention versus laissez faire capitalism). Echoing McBride and Shields, he argues that in his case study of Canada the myth of globalization serves mainly to make ideologically based decisions appear immutable (Urmetzer, 2005:204). While not wholeheartedly accepting the structure/agency dichotomy of many of these perspectives, the very existence of the dichotomy makes important contributions to suggesting the shape of the evolving global dynamics. Most convincing, are attempts that blend these perspectives with suggestions that while new constraints on governments do exist, they are relative and not absolute, allowing states a great variety and degree of adaptation strategies (see Ó Riain, 2000; Weiss, 1997). With respect to supranational agreements, for example, while it probably is the case that globalizationists overestimate their constraining nature (there is ample evidence of countries ignoring such constraints), it is also the case that many countries do comply with such agreements, and often in ways that are restrictive of, if not directly contrary to, national goals and objectives. To dismiss this reality as based on a case of national false consciousness or weak national will is theoretically unsatisfying.

Theories that provide a perspective of globalization as part of an economic continuum may go some way to resolve the theoretical divide. The American based social structures of accumulation [SSA] theory and the French based regulation theory, for example, provide a broader context to the globalization debate by situating it in analyses of the long-run course of capitalism. SSA literatures are more quantitative, being concerned with rates of accumulation, and regulation theories are more qualitative, being more concerned with non-quantifiable changes, as will be evident in the emphasis on technology, replication and integration patterns identified in the regulation theory based food regime perspective. Nonetheless, both theories share an interest in long waves of capital accumulation and the institutions that support them. Such theories postulate that capital requires a relatively stable environment for investment, and this environment is made up of economic and non-economic factors, ultimately manifested in the institutions of society. The state plays a central role in determining the nature of such institutions. For example, capital accumulation is mediated by the state in areas such as investment in raw materials, organization of the labour process, and the selling of products profitably enough for future capital investment (Gordon et al, 1994). Such state mediation can be specific (e.g. through taxation) or more general (e.g. through financial policies), but in combination it sets the stage for a relatively stable SSA, or regime, in which capital accumulation can occur.

The post WW II period is widely seen to represent such a stable regime of accumulation, presided over by the institutional structures of the Bretton Woods Agreement and a commitment to Keynesianism. Ó Riain argues that in this post war period of stability national economies “were tied together through a negotiated regime of

multilateral trade but buffered from the full effects of these international markets by institutions limiting trade and capital flows” (Ó Riain, 2000: 188). This stability is widely seen to have come to an end with the collapse of Bretton Woods in the 1970s. The SSA, regime, and related theories differ on what triggers crisis in the system, although they agree that when the institutional structures of a given regime no longer support capital accumulation, restructuring of the institutions is required to overcome the economic instability. This restructuring process emerges out of a “complex economic, political and ideological process” (Kotz, 1994a: 58). The end result of which is not predetermined, but is “likely to be shaped by the relative power and the respective objectives of capitalists, workers, and other economic groups” (Gordon et al. 1994:19).

The relevance of this perspective to the following analysis is that it casts globalization as neither an either/or proposition, but as the culmination of active struggle. Since the collapse of the post-war period of stability, the “free market agenda of privatization, liberalization, and deregulation has been aggressively pushed on the rest of the world” (Wolfson, 2003:259). However, as we will see with respect to the globalization of agriculture and food, citizens groups and various social movements are actively seeking to socialize this agenda, sometimes with significant success. The question of globalization is really a question of whether its underlying principles of neo-liberalism will evolve into a sufficiently stable institutional structure for a new period of capital accumulation (Ibid). This perspective qualifies debates about globalization, and consequently the internationalization of agriculture and food, as contested paradigms. Further, the effectiveness of this contestation differs in different regions and nation-

states. Before pursuing this argument further, I will specify the globalization debate to the globalization of food.

The Food Regime Perspective

Food production has much salience for globalization questions, as it is both practically and symbolically tied to national autonomy; an association made explicit by the food regime (FR) perspective. The concept of the food regime was pioneered by Harriet Friedmann and developed further in work by Friedmann and Philip McMichael (Friedmann, 1992; 2000; 2004; Friedmann and McMichael, 1989; McMichael, 1991; 1992). The FR perspective is rooted in regulation theory's qualitative point of view of capital accumulation as occurring in distinct regimes, each with particular traits and institutional structures that characterize the period. A food regime is a historically bounded period of norms and expectations that govern all actors in the production and consumption of food on a world scale (Friedmann, 2004:125). More specifically, it is an "international political-economic relation linking food production and consumption to dominant historical forms of capital accumulation" (McMichael, 1991:74). Consequently, the shape of the evolving food regime is entirely fixed to the key features of globalization more broadly. Further, the food regime perspective is attentive to the association between the capitalist advance in agriculture and food and the entity of the nation-state.

Through two successive food regimes, the FR perspective argues that the ties between agriculture and the state have been considerably more significant than the simple provisioning of citizens in their territories. In fact, the FR perspective associates the "rise and demise of the nation-state with the rise and demise of commercial agriculture as a coherent economic sector" (McMichael, 1992:345). We are now considered to be in a

period of transition to a third regime. The contours of this regime are yet to be determined, but are projected to comprise rising corporate power and declining state regulatory capacity, along lines familiar to globalization arguments.

As in much globalization scholarship, the food regime perspective is influenced by debates over the tensions between global and local, and the disjunct often produced when global theory is applied to local empirical assessment. However, to some extent it has resolved these debates by withdrawing from local-level analysis and, some might argue, from a greater theorizing capability in consequence. The next section will first provide an outline of the key features of the food regime perspective and of the historical internationalization of food. It will then briefly raise some of the critiques to the perspective, highlighting two related weaknesses: Firstly, nations and state policy have received little attention in FR investigations of the development of the global food regime, as if national goals were irrelevant to national control over food production; Secondly, the theory fails to acknowledge potentially mediating activities that occur within nations, such as in the legal arena, and how these might affect these national goals and, consequently, national integration into the food regime.

Similar to food regime proponents, this chapter argues that we are indeed entering into a new era, or regime, of food production. It is predicted that biotechnology will play a lead role in this new regime. In contrast with such scholarship, however, and based on insights drawn from globalization literature, it argues that national autonomy is unlikely to be eradicated by globalization and its attendant supranational agreements, although important qualifications—particularly with respect to region—need to be made, and restraints acknowledged. Consequently, a greater emphasis on agency needs to be

incorporated into the FR perspective in order to make a comprehensive theoretical framework of the global political economy of food. This agency can be found in national and sub-national contests for control, that ultimately can affect integration into the FR. Biotechnology is one issue area where this struggle is occurring, and the expropriationist tendencies tentatively identified in the first section are a potential motivator of such struggle. While acknowledging the significant limitations of macro assessments, the dangers of failing to acknowledge global patterns in fear of over-generalizing a particular nation's tendencies is perceived to be greater. In response, a framework that acknowledges global context while remaining empirically rooted in the local is suggested.

The First Food Regime: The Settler-Colonial Regime

As should now be clear, the FR conceptualization offers a historical and geopolitical perspective on the advance of capitalism specific to food. In their seminal paper on the perspective, Friedmann and McMichael (1998) conceptualize two distinct food regimes in the period between 1870 and 1973, with the earlier regime setting the preconditions for the following. The emphasis here will be on the second regime, as the precursor to our present era and to our concern with the continued possibility of national regulation over agricultural systems.

The first food regime, the “Settler-Colonial” regime, covered the period between 1870 and 1914—a period of British global supremacy. This was a period of ‘extensive’ accumulation, and, as in the succeeding regime, this first FR contained opposing movements between the state system and an international division of labour. On the one hand, colonialism “re-divided the world economy into vertical power blocs” and

subordinated the agricultural hinterland to the industrial metropole (Friedmann and McMichael, 1998:98). On the other hand, the staples relationship between metropole and settler states facilitated the emergence of the state system. Friedmann argues that while long distance trade had existed since 1500, its impact was mediated by perceptions that governments were responsible for protecting the food supply. The repeal of the Corn Laws (import protection for domestic producers) in 1846 effectively ended this role and “created a trans-oceanic market in basic foods (and an ideology of free trade to justify it)” (2004:126). The result was “the first price-governed market in an essential means of life” (2004:125) that carved out a structure for commercially specialized agriculture in an international division of labour. This established an international relationship where settler states facilitated national development in the metropole by providing cheap provisions (wheat and meat) for the new proletariat, while the staples relationship facilitated their own national development, and established “an alternative post-colonial system organization of the world economy” (McMichael, 1991:74).

According to Friedmann and McMichael, at the close of the first food regime around the turn of the century, three new agriculture-industry relationships had been established: 1) complementary production (e.g. tropical products from colonies) was replaced by competitive production based on comparative advantage (e.g. basic foodstuffs from settler states), anchoring the first international division of labour; 2) agriculture began to develop as a capitalist economic sector (through initiating the processes of appropriation and substitution in the input and processing sectors); and 3) commercial agriculture, while internationally organized, remained contained by nationally organized economies (1989:102). In sum, the first food regime facilitated the

emergence of the nation-state system and saw the development of international trade relationships around food that were the predecessors of the agrifood complexes of the second regime.

The Second Food Regime: The Surplus Regime

The first food regime went into prolonged crisis and finally collapsed through the instability of the depression and World Wars (Friedmann, 2004). The second FR arose out of the new economic relationships forged in the post World War two period, and continued with relative stability from 1945 to 1973. This second regime—the “Surplus Regime”—was an American led project that saw American style policy replicated internationally. This regime was based on “intensive,” rather than extensive, accumulation strategies, predominantly characterized by the growth of agrifood complexes that were built on the international division of labour initiated in the first regime. As in the first regime, the second regime again bridged oppositional tensions: in this case, the completion of the state system through de-colonization balanced against transnational restructuring of agricultural sectors by agrifood capitals, perhaps at the expense of the nation-state system itself. It is this last point that resonates the most with globalization literatures and sparks the greatest concerns over the evolving shape of the third regime.

The second food regime is by far the more complicated and interconnected, reflecting increasingly integrative processes occurring around capital on a global scale. Friedmann (1993) proposes that tension between two processes—replication and integration—formed the basis of this second regime. Replication was evident in the export of US style agriculture. After the Second World War, the United States arose as an

economic world power, heavily driving the post-war reconstruction. While the US was strongly in favour of free trade, it was motivated to protect its farmers who were a powerful constituency and who remained dependent on the system of exports established in the Settler-Colonial regime. Consequently, the US set a policy agenda that suited its domestic need to protect its farm sector—namely through trade restrictions and farm supports—and impelled international trade rules to match this agenda. Under this hegemonic regulatory structure, the American model of national agriculture was replicated by other states. Thus agriculture became a trade exception to international rules, creating a “new pattern of intensely national regulation” (32).

Therefore, the early stages of the second FR the post-war rules prioritized national regulation of agriculture. Countering this process, however, was the process of increasing integration in agrifood as capital was freed through liberalized trade. Agrifood capital investment “tended to integrate the agro-food sectors of Europe and the United States in an Atlantic agro-food economy” (Friedmann, 1995: 514). This integration was facilitated not only by trade rules but also by technological advancements, such as preservation technologies, that increased the potential for mass production and dissemination. The resulting integration and internationalization of food relations facilitated the rise of specific agrifood complexes; specifically, the wheat, livestock and durable foods complex (Friedmann, 1992). Each of these complexes represented a web of intersecting production and consumption relations. Ultimately, not only was American style agriculture and regulation replicated throughout the third world, but so was its diet.

The most politically significant of the food complexes was the wheat complex. The American agriculture model of industrialization and farm supports made grain

surpluses a substantial problem in the US. The problem was resolved through the device of food aid. Food aid, through Public Law 480, allowed the US to resolve its surpluses by flooding Third World countries with heavily subsidized grain. Cheap imports shifted diets to wheat and turned Third World countries from food self-sufficiency (or even exporters) to food dependence. Even with the export of the high productivity American model of agriculture through the Green Revolution—a “major effort to internationalize the process of appropriationism” (Goodman et al, 1987:44)—shifting world prices increased third world debt, and increased the pressure on production for export to finance this dependency.

Integration was further facilitated by food preservation and processing technologies. The durable foods complex arose through the transition of food into long lasting, high value, manufactured products through these processes. Agricultural goods became an intermediate ingredient to manufactured commodities rather than a direct consumer product. Therefore, a key feature of the durable foods complex has been the appropriation and substitution of discrete elements of agriculture and their transformation into components for integration into the agrifood complex, as outlined by Goodman et al. This increases the vulnerability of third world countries whose tropical products can be substituted with generic fats and sweeteners, as we saw with the introduction of high fructose corn syrup. Friedmann argues that this process raises even greater control issues than evidenced by the monopolization of markets in the wheat complex (Friedmann, 1993:374). For example, McCain’s requirement of genetically standard potatoes for its frozen chips production “reorganized traditional agricultural communities in Eastern Canada,” as monopoly contracts “specifying most aspects of production subordinated

family farms and created a monoculture region” (Ibid.). Non-compliance can result in the food processor simply changing its supply source.

Regionally unbounded integration is most evident in the livestock complex, which links monoculture crop production and industrial livestock operations through the capital-intensive feedstuffs industry. While initially nationally organized, “once crop and livestock producers were linked by corporations, inputs in principle could come from anywhere,” and quickly did. For example, the mid 1970s market instability resulted in the US near monopoly dropping to two thirds as Argentina and Brazil stepped in to fill the gap (376). The exemplar of the livestock complex is the “world steer,” characterized by Sanderson (1986) in his investigation of Latin American integration into the cattle and meat sector. The world steer demonstrates the qualitative difference from the previous regime of accumulation, whereby: “international economic integration of the nineteenth century, which relied primarily on commodity circulation, has been supplanted by a holistic integration of the cattle sector in production” (Sanderson, 1987:124, italics in original). Not only does corporate integration link globally sourced feed, production and consumption, but the world steer represents the internationalization of industry norms as well, such as preferred cuts of meat and production methodologies (confinement feeding over lean beef technology), leading to a truly integrated complex.

Inequality has followed hard on the heels of integration. The livestock complex would seem to represent the epitome of the geographic inequality behind the food regime. Latin American countries, forced to exploit their comparative advantage in cattle production, supplant subsistence producers and create grain deficits to produce meat for high-income developed world markets, with significant negative impacts on the

population. Production for export of other non-traditional agricultural products—e.g. exotic foods and flowers—has similar negative effects (Friedmann, 1993:50). Therefore, while major American companies benefited from the export of the American model of agriculture through sales of equipment and chemicals, Third World countries were caught in a scissors: “One blade was food import dependency. The other blade was declining revenues from traditional exports of tropical crops” (Friedmann, 1993:38). The integration within these complexes has been furthered by integration between them, as pulp from Brazil’s orange juice industry and Tapioca from Thailand join maize and soya as protein inputs for feedstuffs production (Friedmann, 1992:376).

In sum, the FR concept is historical, geographical and political. Historically, it outlines the trajectories that help shape the characteristics of future regimes. Politically, it is based on differential power relations. The first FR resulted largely from British colonial, emigration, and free trade decisions. The second also arose from a series of political decisions, particularly those of the United States, where policies around protecting American domestic agriculture and the resolution of the resulting surpluses came to define a global regime of agrifood accumulation. Geographically, it divided the world into agrifood power blocks, albeit not immutable ones, as each of the agrifood complexes arose “within the politically bounded economic space of the west” and “created general conditions for the third world” (Friedmann, 1992:371). This geopolitical organization forms the basis of the evolving third food regime.

The Third Food Regime?

Both Friedmann and McMichael propose that the post war food regime ended in the 1970’s, as a result of increasing anarchy and instability in world markets. The

collapse of the regime is specifically attributed to the food crisis triggered by the first grain sales to the Soviet Union in 1972-3, which undermined the implicit rules governing surplus. However, the rise in oil prices, the collapse of the Bretton Woods system, the debt crisis and rising export competition further destabilized the regime. McMichael (1992) asserts that the collapse of Bretton Woods left nation-states scrambling to negotiate their competitive position in the world economy (353). The food regime, it must be emphasized again, is attuned to accumulation structures in the world economy more broadly.

As in the first FR, the legacy of the second is poised to set the course for the third. The regime of surplus and agrifood complexes has left a legacy of ever expanding transnational economic organization. The contours of the third regime are set to build on this legacy with increased agro-industrialization, more flexible global sourcing, and exacerbated southern dependency. The legacies of the second regime also predict a greater ability for TNC's to forum shop, both for inputs and for the best corporate environment, resulting in instability for the exporters of agrifood inputs and the promotion of de-regulation in competing regions.

Ultimately, the third regime is likely to be an extension of the integration tendencies in the second regime. A fundamental difference, however, is with respect to the national regulation and organization of agricultures, which is increasingly unviable under the dual pressures of transnational agrifood capital and the rise of supranational agreements. McMichael (1992) proposes the foundation of the next food regime to be the product of two processes: "the internationalization of food production and markets... and the substitution of global for national regulation" (345). This weakening of the capacity

for national regulation was dramatically evidenced by the failed 1974 US embargo on grain exports to the Soviet Union, when state regulation was circumvented by the transactions of TNCs (Friedmann, 1992:52).

Essentially, the third regime will specialize many globalization tendencies to food, through globally sourced production and consumption, transnational economic organization, limited regulation, supranational trade rules, and the end of national agriculture. Whereas previously, agriculture represented the “largest gap between national regulation and transnational economic organization” (Friedmann, 1995: 512), this is unlikely to persist. Consequently:

Two basic processes are at work: the development of a system of independent, liberal national states, and the industrialization of agriculture and food. We argue that each was the condition for the other in the period 1870-1914, but that accumulation by agro-food capitals has in the late twentieth century so subdivided and restructured agriculture everywhere—on the basis of highly protective state policies—that the capacities of states and the state system for further regulation are in question (Friedmann and McMichael, 1989: 94).

The similarities of this perspective with the globalizationist position are evident. Food regime proponents see internationalized agrifood capital as operating above and beyond the reach of national regulation. Overall, the perspective presents compelling insights into globally directed corporate agricultural strategy, raising the prospect that the high degree of corporate vertical integration will have the potential to render farmers, consumers, and even nation-states increasingly irrelevant to agricultural production decisions. The rapid introduction of corporate controlled biotechnologies into agriculture will only exacerbate such concerns. As noted, biotechnology helps deconstruct farm products into interchangeable components, and thus facilitates substitutionism and global

sourcing strategies, while the technological packages offered by life sciences corporations further the integration of input sellers and output purchasers. It is not difficult to make projections of an agricultural future typified by agrifood corporations dictating the production of crops specifically genetically modified for particular processing sectors. Ultimately, if allowed to develop, biotechnology appears likely to underpin the agricultural system of the third regime. Consequently, there is a significant probability that the emerging regime will be a corporate biotechnology food regime.

There are indications that the regional blocs of the second regime are also shifting. Certainly new agricultural countries are emerging on the production for export scene. Further, new countries such as Brazil and China [verify these are gaining countries] are gaining as major producers of GM crops. Nonetheless, a key motivator of the new regional blocs will depend on the strength of the intellectual property rights regime (globally and within different nations) and on the distribution of ownership of genetic material. While the number of commercial genetically engineered products is still in its early stages, the patenting of germplasm has already escalated astronomically. However, most of the world's germplasm is found in the South, in developing countries, whereas most biotechnology companies are based in Northern, developed countries. Intellectual property rights protect the rights of these predominantly Northern technology developers, not the rights of those who provide the source of the original germplasm. Consequently, Shiva (2001) claims that Northern patenting of Southern germplasm constitutes a form of recolonization. McNalley and Wheale (1988) propose that the patentability of life is producing a global hierarchy that reinforces the inequalities between the advanced industrial countries and the less developed countries, by favouring

those who have gene technology over those who do not. Evidence of this is already emerging: for example, “In 1996, the US earned \$30 billion from royalties and licenses. On the other hand, the South spent \$18 billion for buying patented technology in 1995” (Shiva, 2001:28). Monopoly of the world’s genetic resources may ultimately be a significant form of global power in a new regime of accumulation.

While the scenario outlined for the third regime does not seem very optimistic, Friedmann and McMichael acknowledge two possible futures. Friedmann (1993) calls these alternatives private global regulation or democratic public regulation. The first is as outlined above, and sees the corporate advantage institutionalized in trade agreements, with states acting as local enforcers in a global laissez-faire system. The second also hypothesizes a decline in state power. However, it suggests that while agrifood complexes can circumvent national policies, local initiatives can still work to reconnect (or relocalize) production and consumption relations. For example, privileged consumers have the opportunity to assert demands on the producers of food to meet community criteria such as healthy, sustainable, socially conscious, and even locally produced, food. While the third regime is most likely to follow the contours laid out by the second, social movements of all kinds have an opportunity to struggle to define the food regime. McMichael argues that while “transnationals and biotechnology will clearly be major actors” in the prospective regime, the outcome is highly dependent on the international regulatory framework (1992:352). It is here where I propose that the local meets the global: as national law and regulation become forums for local opposition to the technology, the potential of affecting this regulatory framework, and the shape of the corporate biotechnology food regime, drastically increases.

The Critiques

While the food regime provides a strong framework for conceptualizing the historical relationship of agriculture to the global economy, it has also been subject to a number of critiques. Most notably, the conceptualization is accused of operating from a macro-level pedestal, casting sweeping generalizations about the internationalization of agrifood production, while ignoring significant deviations from such generalizations. Such deviations are frequently cast in national terms, although they are often expressed or motivated by sub-national factors. Notably, many case studies highlight social factors that affect regulatory and legislative processes, and that consequently compromise integration into the food regime, or globalization project more generally. It is here where the first inklings of a framework for linking the local and the global are found.

Le Heron and Roche (1995) propose that the food regime conceptualization is supported by a theoretical hierarchy that captures the “interplay between evolving accumulation and regulation processes,” but is “surprisingly silent on geography, accenting historical over geographic insight, except in coarse geopolitical terms” (1995:24). Consequently, the concept lacks an explicit treatment of the national and local regulatory dimensions that affect differential integration into the food regime. Focusing on New Zealand, Le Heron and Roche identify the interplay of globalization and sustainability ideas as key to its differential incorporation into the third food regime. While it is difficult to accept sustainability as a strong restructuring tendency generalizable outside the New Zealand experience, their analysis provides a clear perspective on how local regulation and political negotiations affect differential integration into the regime. Moran et al. (1996) draw on examples from New Zealand and

France to argue that particular nations retain characteristics distinct from the global agrifood transformation patterns identified by the food regime perspective, distinctions that the concept is of limited value in explaining. They argue that farmer strategies, such as producer cooperatives and their effect on commodity chains, have been able to influence differential national integration into the regime.

Whether with respect to the food regime concept specifically, or with respect to globalization more generally, there are numerous case studies documenting differentiation from the key tendencies identified by the globalization of agriculture: global sourcing, deregulation and corporate restructuring. This differentiation is most often the result of some form of local resistance. Constance et al. (2003), for example, conduct an investigation of global sourcing through a case study of chicken production in Texas. Contrasting the implications of food regime literature, their assessment reveals that the success of such corporate strategies is not predetermined, and that the decoupling of community benefits from economic development creates significant community resistance. Novek's (2003) investigation of hog farming in Manitoba similarly found the globalization logic disrupted by conflict and grassroots opposition. Wells' (1997) case study of industrial restructuring in California's strawberry industry, found a counter-intuitive rise and fall of sharecropping to globalization trends. This provided evidence that restructuring "may be an intentional tactic pursued by certain sorts of producers to help them mitigate locally experienced political challenges" (1997: 250), rather than an inevitable and value neutral response to technological and economic shifts in the world market, as structural explanations might have it.

While community responses to globalization in agrifood are definitely a key factor, they are not the only local forces shaping the face of globalization. Conducting a case study of globalization in four significant agrifood commodity chains, Friedland (2004) concludes that “globalization—in its spatial sense—is extremely uneven, possibly especially in agrifoods” (Friedland, 2004:14). The same is concluded for economic concentration, for which he finds a slow tendency towards concentration, with an emphasis on concentration in specific segments of commodity systems. Essentially, there are mixed tendencies to agrifood concentration and globalization, depending on a raft of social and technical factors, such as the expansion of refrigeration capacity and the distribution of income. Reminiscent of appropriation and substitution strategies, capital expands where it can, when it can, and how it can: but it can’t always.

Perhaps the most systematic critique of the food regime perspective comes from Goodman and Watts (1994). Their main concern with the food regime is with the degree of coherence or “regimeness” that it portrays, and they question to what extent the concept is consequently “vulnerable to the charge of hyper-structuralism, of reification, and not least of papering over any sense of agency” (20). Indicative of the findings of the scholars above, Goodman and Watts argue that there is significant international evidence of different patterns of replication and integration. In response to this evidence, they ask:

[H]as the shift from post-war stability to the crisis of the post-1970 period been too readily characterised as a historic victory of transnational capital without sufficient attention to massive instabilities (productive and institutional) and frictions (active and passive resistance) within the ‘new’ internationalization of agriculture? (21).

In essence, they critique the food regime perspective for over-emphasizing the homogeneity of the spatial reorganization of agricultural production. They argue that it

ignores significant differentiation from these patterns. Further, they argue that supranational agreements are unlikely to subordinate the nation-state in the manner that food regime proponents suggest. Complementing scholars such as Urmetzer, Goodman and Watts find significant state contravention of trade agreements, indicating continued national autonomy. Further, they point to evidence from the North American Free Trade Agreement [NAFTA] experience that deregulation in one sphere produces re-regulation in another, revealing, “how unlikely, in fact, is a free trade regime” (23).

In sum, these cases provide no shortage of exceptions to the global agrifood tendencies outlined by the food regime perspective, and indicate that state subordination needs to be significantly qualified rather than conclusively predicted. If the revelations of the above critiques were to be expressed in one sentence it would be: “Social forces count.”

Not to over-value the critiques, ideas about national difference and consequent differential integration into the regime are implicit in the food regime perspective. If nothing else, its historically comparative basis makes more than adequately clear the consequences of national strategizing on the formation of each regime. In fact, there is ample evidence that Friedmann and McMichael are fully aware of the political decisions behind the making of the food regime. For example, according to Friedman, while regional blocks were evident in the post-war restructuring, “states replicated the US regulation of national sectors, but adapted policies to their locations in the food regime” (1993: 32). While such differentiation is acknowledged, however, it is articulated specifically to the historical dynamics under discussion. This implicit awareness fades when it comes to projecting the contours of the third food regime. Consequently, what

might actually be most lacking is the translation of this implicit understanding into abstract concepts for theorizing.

In response to criticisms of the food regime perspective, McMichael (1996) argues that they arise from a lack of understanding of its purpose. He responds to critiques that the food regime is silent on geography, local revitalization and agricultural diversity by stating that the food regime is not an empirical or a theoretical construct, but rather a concept that specifies the political history of capitalism specific to food, in a historically comparative way (1996:48). Consequently, while the concept helps understand these dynamics, he argues that:

[I]t is not a construct with which one can actually theorize (or account for the endless empirical details of) the world's agricultural and food systems. The concept is historical, and therefore not generalizable beyond the particular history being conceptualized (49).

However, while the FR does not suggest, nor is it necessary that it do so, that it wants to account for the "endless empirical details," it is unnecessarily limiting for it to resign itself to a historical construct. Attempts regularly taken in the name of the food regime perspective to predict the contours of the third regime would seem to further support the contention that its goals are more significant than the simple telling of interesting history. In order to move beyond this limitation, however, the food regime perspective needs to acknowledge its theorizing potential, and explicitly articulate the factors that affect integration into, and differentiation from, the global agrifood restructuring it proposes. Such theoretical strengthening would go far to assist in the interpretation of the impact of supranational agreements, the potentially mediating

activities that occur within states, and, ultimately, the shape of the evolving third food regime.

Goodman and Watts critique of the food regime perspective, and of the repercussions of an uncritical translation of industrial restructuring literature to the specific case of agriculture and food, is thought provoking, however it runs the risk of swinging the conceptual pendulum to the other extreme, forgoing the identification of broad patterns for the sake of conceptual specificity. For example, they discount the perspective's ability to specify the mechanisms leading to a stable third regime, arguing that it conceptualizes the agrifood economy through a highly flawed core-periphery dependency model, which hypothesizes crude North-South agrarian restructuring and overlooks the differentiation of Southern States. While such differentiation certainly exists, by choosing it as their emphasis they risk neglecting commonalities that have very serious implications, particularly for those at the more vulnerable end of Southern differentiation. For example, if Sanderson's (1987) case study of cattle production in Latin America can be generalized in any way (and indications are that in many ways it can) the repercussions of such changes should not be overlooked:

The emergence of the "world steer" has shifted power away from the primary producer; it has "disarticulated" consumption from the national economy (and certainly from the rural economy); and, it has created negative effects in foodstuff production and land tenure. The combined effect has been to help make the poor poorer, the malnourished more malnourished, and the heralded era of "rural development" a bureaucratic nightmare (146).

While no one claims these effects to be exactly replicated throughout the region, their appearance with any sort of regularity is sufficiently troubling that differentiation hardly seems justification for neglect.

The Local Meets the Global: A Framework for Analysis?

At heart, such concerns with national differentiation versus a global food regime are really about the meeting of the global and the local, and how theory can accommodate this meeting. Our first hint at resolution may be provided by Lourdes Gouveia's (1997) case study of globalization restructuring in Venezuela. Gouveia concludes that while efforts to enrol Venezuela in the globalization project have been heterogenous and at times ineffective, "the fingerprints of the neo-liberal agenda can still be detected" (1997: 316-17), often with significant impacts on the population. Gouveia's case study is significant in its own right, but perhaps her most valuable contribution is her well-balanced perspective on the broader purpose of sociology in this problem. Pointedly, she questions whether the eagerness to document heterogeneity might become an end in itself, leading social scientists to fail to identify relatively stable institutional arrangements that organize and profoundly affect people's lives. She suggests that while we should be "mindful" of deductivist characterizations of globalization, this mindfulness should not prevent us from assessing the very important transformations occurring in the relationship between the state, the market and civil society:

[T]he analytical task does not come to an end with the discovery of diversity, heterogeneity, or the fact that all actors have some degree of power.... [I]t is important to complete the analytical loop and return to the macro level for a simultaneous interrogation of data and historical constructs to determine whether, despite diversity, broader socio-structural changes can still be identified. (316)

It is with the intention of keeping this delicate balance in mind that the present research is structured. In practical terms, striking the macro-micro balance would require an empirical focus on local interactions, while remaining attentive to how these local interactions fit into broader patterns. Negotiating this balance appears to have advanced

much further in globalization literatures than those specific to food. For example, long wave theories of capitalism allow us to accommodate difference while looking at broader patterns, as they do not see social structures of accumulation, or regimes, as absolute but rather temporary periods of stability, subject to change. Such institutional structures will differ in different nations as well as for different accumulation regimes. The globalization/food regime debate can therefore be seen as a debate about the shape and supporting institutions of the next wave of capitalist accumulation. This is not a passive, theoretical debate, but one that is actively being battled by players on all sides.

Suggesting an organizing principal that can accommodate both global and local, McMichael (1996) argues that their distinction is a false opposition, as each is a condition of the other. He argues that globalization is a historical project, best understood by contrasting it with the previous project of developmentalism, the post-war political strategy propagating nationally managed economic growth. Hence, he suggests that we are best served by problematizing globalization as a new set of institutional and ideological relations, whose application is partial and contested: "communities scramble to reposition themselves either through finding niches in a new global economy or through resistance to global pressures" (25). Similarly, Ó Riain (2000) argues that globalization is a political project, and that while states "may be threatened," they are also "the primary actors that will continue to shape the process itself" (206). He posits that in the post WW II golden age of capitalism, a particular state-market-society set of relations was institutionalized in advanced capitalist countries that affected relations far beyond them. Now that the stable post WWII order has weakened under globalization, new state-market-society relationships must be forged. Not all states will homogeneously

arrive at the same set of relationships, however, as the spheres of state, market and society are mutually shaping and historically contingent:

[T]he relations among them are inevitably tense, due to the inherent dilemmas of reconciling market, society, and state in a capitalist economy. Paths of economic development are determined by the variety of ways in which these tensions are reconciled through combinations of state, market and society. The way in which these three spheres shape one another becomes the central determinant of an economy's fate under globalization. (Ó Riain, 2000: 191).

Essentially, while the context of the weakening of the preceding era's set of relationships elicits pressures felt globally, the response of each state will depend on their national differences. This does not mean it is completely unpredictable how states will be integrated into the new regime, and that we should simply revert to documenting heterogeneity, as Gouveia warns against. In his analysis, Ó Riain considers four dominant models of state-market interaction—liberal states, social rights states, developmental states, and socialist states—and their operational options in the post WWII period, and finds that in each model particular alliances “between state and society shaped participation in markets in a different way” (2000: 200). In this way, he provides a semi-structured perspective of global restructuring, without reverting to a one dimensional North-South new regime scenario the likes of which Goodman and Watts object so strongly. Echoing McMichael, Ó Riain states, “Globalization does not consist of an inevitable march to a neo-liberal order but is a politically contested process in which different state-market models of interaction come into conflict locally, nationally, and transnationally” (188). How nation-states react to this globalization project will drastically affect the shape of the coming food regime.

In the same manner that globalization cannot be considered homogeneous, however, the intentions of any given nation-state are not homogeneous. Rather, these “intentions” (whether towards globalization ideas more broadly or specific agrifood policies) are a rough consensus, ultimately achieved through many varied struggles. Gouveia builds on McMichael’s perspective of globalization as partial and contested, to conceptualize multiple globalization projects. She suggests that a multitude of actors are involved in reformulating the relationship between market, state and society, and consequently multiple globalization projects “intersect, modify, or contradict one another” (1997: 309). The result is a globalization that is not tidy and coherent, but arises out of contradictory results: some promote the ideological underpinnings of the neo-liberal thrust of globalization, some are counter-thrusts that undermine them. With respect to food, there is ample evidence of movements resisting the parameters laid out by the emerging corporate food regime: sustainability movements emphasizing local production and consumption; consumer demand for organics; citizen resistance against intensive livestock production; sub-national initiatives banning GMOs, to name a few. Incidents of contestation, many of them locally successful, are abundant. It remains to be seen how powerful such countering visions will be. Alternative futures are possible, as even Friedmann and McMichael’s two projected futures suggested, however weakly.

Therefore, in this research I will take the position that a new global paradigm is on the horizon, much in the manner described by globalizationists, or, with respect to agrifood, by food regime scholars. I characterize this third regime emerging under the globalization paradigm as a corporate biotechnology regime. However, following on the ideas raised here, whether this regime will ultimately emerge as expected under the

globalization paradigm is contested. Should the global economic paradigm complete its shift to globalization, states will be differently integrated into it, although regional patterns will be evident, as in previous regimes. Even within states, integration does not occur homogeneously. Rather, the economic reorganization can be seen to be occurring as globalization 'projects', some facilitating and some countering the neo-liberal agenda. The corporate biotechnology food regime can be conceptualized as one such project. What remains to be seen is what factors will influence this project, and whether and how these factors can shape national priorities around it, and perhaps even the evolution of the third food regime.

Factors for Resistance: Corporate Biotechnology as Contested Project

While the contours of the corporate biotechnology food regime appear already fairly clearly demarcated, the previous discussion indicates that it is far from inevitable, particularly given the high contestation that surrounds biotechnology. Opposition to the technology is readily apparent both nationally and internationally. McNalley and Wheale argue that the social re-ordering caused by modern biotechnology and biotechnological patenting has created social conflict and provoked an opposing social movement (1998: 326). This social movement has challenged the unspoken transfer of power by eroding the "apparent neutrality and anonymity" that lies behind it.

[I]ts challenges force the 'bio-industrial complex' to produce justifications, for example, for its regulatory policies and corporate strategies, justifications which so often reveal the inequity of its conduct, structure and performance (325).

Transnational social movements of all types are on the rise. Holzer (2001) argues that as nation-states have lost legitimacy with respect to their ability to regulate in the

new TNC dominated neo-liberal regime, transnational social movements have become an important source of direct challenge to corporate power. Transnational consumer boycotts are one such example. Friedmann (1993) and Busch and Bain (2004) note that wealthy consumers can directly confront companies with their demands, thus “substituting consumer demand for citizen demand, market accountability for governmental accountability” (Busch and Bain, 2004:335). Beck (1992) introduces the term “sub-politics,” to describe such actions where groups apply pressure in non-political forums when social futures appear increasingly independent of the influence of the voting public. In this manner, irrespective of national complicity in the development of the corporate biotechnology food regime, TNCs could be “confronted with a situation where the legitimacy of their operations may be challenged no matter what their legal status” (Holzer, 2001:80).

Given the importance of state support of intellectual property rights for commercial biotechnology, those factors which can either directly or indirectly affect this support will be of key importance to the development of the biotechnology regime. In his study of the globalization of agrifood commodity chains, Friedland (2004) concludes:

To the degree that nation-states resist the specific forms of integration being promulgated through the World Trade Organization, national regulatory apparatuses could impede accelerated global economic concentration (2004:15).

If we take this as true, then it is necessary to assess what factors could affect the setting of national objectives in this way.

The above food regime based case studies were important both for their critique of the perspective, and for what they reveal about common causes and sites of resistance

to the globalization paradigm. Social conflict, such as community-level resistance, featured prominently in these cases, particularly where de-regulation left communities exposed to corporate strategies that had negative community impacts. In their Texas chicken production case study, Constance et al. concluded:

...the opening of local communities to globalization lacks institutions capable of buffering the unwanted consequences of the growth of capitalism and controlling its most powerful actors. This situation engenders fierce resistance and creates a contested terrain in which corporate power is resisted and redefined even in conditions in which the demands of local residents are grounded in discourses parallel to those of corporations (2003: 117).

Of particular interest to the case of biotechnology, is that the “parallel discourses” referred to above are discourses around property rights. The loss of property value resulting from the high intensity production was not addressed in the corporate plans, and, ultimately, “it was the issue of property that served as a catalyst for resistance” (116). Similarly, it is the issue of property that is finding significant resonance in the lawsuits around biotechnology. Given the new dimensions that the proprietary aspects of agricultural biotechnologies bring to agriculture, both with respect to patent infringement and contamination issues, such legal issues are identified as key sites for agitation for national regulatory input. The practical impact of this agitation is far from clearly defined, however.

Moran et al. draw on Clark’s (1992) conception of real regulation, to suggest that regulation is a social practice that occurs in an economic, cultural and geographic context, and evolves from overlapping contests for power. They suggest that the inability of food regime theory to account for national differentiation rests on its failure to incorporate these social foundations of regulation, which they claim to be “sufficiently

distinctive and powerful to differentiate national and regional organization of rural production” (Moran et al. 1996: 256). Significantly, Moran et al emphasize the role the law plays in such real regulation:

To understand changes in the regulation of rural production it is also necessary to explore the formulation and interpretation phases of contestation, during which existing policies and practices are actively negotiated and renegotiated (respectively) by a range of lobby groups. Social actors, whether involved or not in the first round of formulation, create the pressure to re-formulate or repeal legislation if they do not like the original legislation in the courts, planning processes and its social application (249).

While the lawsuits around biotechnology will not immediately reverse the national direction of orientation with respect to biotechnology, they can play a part. Significantly, McMichael argues that biotechnology’s impact will depend on its still contested regulatory framework (1992: 352). Local level losses of control through expropriationism are then strong possibilities for opposition that could have broader effects. As Friedmann and McMichael note, in order for this opposition to ultimately effect the shape of the future food regime, they would then have to move beyond their local site and become institutionalized:

Ultimately the success of local projects depends on their combination and co-ordination at higher levels, to replace the policies (and confront the powerful interests associated with them) favouring a global orientation of both production and consumption (Friedmann and McMichael, 1989: 113).

Conclusion

Drawing on the globalization and food regime literature, a perspective of the globalization of agrifood is emerging that provides space for the third regime to be partial and contested, rather than inevitable, at the same time as falling into roughly coherent

(and perhaps predictable) geopolitical patterning. This research proceeds on the theoretical assumption that there is globalization, but it is differentiated globalization: states and regions will take different adaptive strategies to global economic pressures and will consequently be differentially integrated into the globalization project. This assumption is directly applicable to perspectives of the globalization of food. However, while Friedmann and McMichael incorporate a significant amount of national differentiation in their food regime perspective (contrary to some critic's views), it is less evident in projections about the evolving third regime than in the historic specificity of characterizations of the last two regimes. The strengthening of the food regime perspective to the realm of theory may then simply be a matter of making explicit awarenesses that are already implicit, in the manner of the globalization literatures outlined above.

The prospective third food regime is characterized here as a corporate biotechnology food regime, and is one manifestation of globalization. Accepting the rough geopolitical contours that we are likely to see in this emerging food regime, the conceptualization of globalization as a project, or projects, provides a means of analysis into how nations will be differently integrated into this regime. The corporate biotechnology food regime, as one such project, is subject to opposition and contestation over its terms. While the food regime is ultimately a global phenomenon, the negotiation of its terms occurs at the national and sub-national level, and is influenced by a number of local factors.

As we saw in the first section on the political economy of agriculture, biotechnology's introduction into agriculture has already initiated a number of local level

changes. Consequently, while Goodman, Sorj and Wilkinson's conceptualization of appropriation and substitution provide a strong basis for analyzing changing capital accumulation strategies in agriculture, the proprietary aspects of biotechnology have begun to raise new issues that these concepts seem inadequate to address. There is increasing evidence of a clash of rights between farmers and biotechnology companies, and early indications that this clash is finding resolution in favour of companies. Accordingly, questions arise about whether farmers are losing control over their production. A new concept, expropriationism, is suggested for the proposed theoretical gap, subject to support by further empirical investigation. As we saw in a number of critiques of the globalization concept as applied to agriculture, property issues are an important factor in motivating local opposition and finally local differentiation from globalization trends. I suggest that the expropriationism associated with the introduction of agricultural biotechnology may be a similar motivating factor.

While local differentiation is important in itself, the goal is to "complete the analytical loop," as suggested by Gouviea. According to Friedman and McMichael, it is possible for the institutional manifestation of local projects to replace the policies of globalization. Therefore, whether through lobbying, social movement pressure, or the more direct tack of institutional change through legal precedent, there is potential for such local activity to affect the global food regime. Consequently, while this research is based on a local level empirical investigation of the manner in which the legal framework around agricultural biotechnologies is affecting producer and societal control over agriculture, the analysis is informed by—and hopes to inform—global ideas about agrifood.

CHAPTER 2

THE COMING OF THE THIRD REGIME? AGRICULTURAL BIOTECHNOLOGY REGULATION IN CANADA, THE UNITED STATES, AND THE EUROPEAN UNION

Introduction

As noted in the Introduction, the United States is the world leader in agricultural biotechnology adoption, accounting for 55% of global area, while Canada is the fourth largest country involved, with 7% of production. Together these two countries account for 62% of the global area dedicated to GM crops, and are, in fact, the only developed countries with significant GM crop area. Outside of these two, the majority of biotechnology production area is in developing countries, with Argentina being the second largest producer of GM crops, by area. The European Union, by contrast, has minimal biotechnology, as will be discussed, with the most notable production (0.11% of global area) occurring in Spain (percentages calculated from James, 2005b).

The risks of genetic engineering have been documented in many forums and will only be outlined here. Most prominent in outcries over the physical risks of the technology have been concerns over human health risks and risks to the environment: human health risks over allergenicity and toxicity (e.g. introducing new proteins into the human diet, some with pesticidal properties, or putting known allergens into unexpected foods); unexpected repercussions from crop modifications (e.g. insecticidal crops having negative impacts on non-target species, with broader ecosystem impacts); the risk of

mutations of genetically engineered crops (e.g. if GM crops cross with similar but undesirable species, potentially creating superweeds). Risks of biotechnology obviously are deeply tied to concerns over the unprecedented intervention in life, and concerns that the uncertainties in the science preclude a full understanding of the potential repercussions of this intervention. The fact that any interventions in life create self-reproducing products vastly exacerbates concerns over the physical risks. Lastly, while the first generation of biotechnology crops focused on traits designed for the benefit of agricultural production (e.g. herbicide tolerance and insect resistance), the second generation emphasizes applications designed for the benefit of consumers, such as crops engineered for nutritional or medical benefits. These second-generation agricultural biotechnologies include pharmaceutical crops; crops that have been engineered to have pharmaceutical properties, such as blood thinning agents or contraceptives.

The intention here is not to emphasize the risks of the technology at the expense of its potential benefits, but an understanding of the risks to be regulated is required for the purposes of assessing regulation. Given the range of risks, limitations in knowledge, and diversity of applications, the rapidity of adoption exacerbates the need for regulation, as does the sheer volume of the technology in the environment. It would seem national regulation of the risks of biotechnology would be paramount.

While debates over the physical risks of the technology have been widespread, the social risks outlined in the introduction have received far more limited attention. On the one hand, a strong proprietary framework is necessary for the development of the industry. On the other hand, given the fact that crops are self-reproducing, providing intellectual property protection on these 'inventions' leads to inevitable clashes between

farmers and technology developers. Once again, legislation addressing these clashes would seem paramount to maintaining the social benefits of the technology.

Just at the time when the need for national regulation would appear to be at its most pressing to protect the social interests of a nation-state, however, critics charge that international laws preclude such autonomous action. This chapter provides the regulatory background for agricultural biotechnology in my case study regions and examines whether nation-states are indeed powerless in the face of international regulations. The first section provides an outline of international regulation relevant to agricultural biotechnology. The second section outlines national biotechnology regulation in the United States, Canada and the European Union, and argues that the former two are acting in concert to create a low-regulation pro-biotechnology block, while the latter demonstrates significant independence from these lax regulatory trends. The third section comments on these trends and outlines important domestic factors that can influence national priorities around the technology. Lastly, I conclude that there is evidence supporting the continued viability of national regulation. I suggest that domestic pressures—such as local acts of resistance both inside and outside the legal forum—can still act as a significant force for national policy setting, and thus can affect the unfolding of the third food regime.

International Regulation of Biotechnology

The General Agreement on Tariffs and Trade [GATT] began in Geneva in 1948. Since that time, international trade regulation has evolved through numerous rounds of negotiations involving increasingly more member countries. The Uruguay Round was the 8th round of GATT negotiations, and from this Round the World Trade Organization

[WTO] was brought into existence in 1995. Agriculture became a critical component of the Uruguay Round, as the United States and its allies promoted agricultural trade liberalization in an attempt to curry Southern buy-in (through promised expansion of access to Northern markets), prevent loan default, and gain important concessions in other forms of trade liberalization and intellectual property protection (Buttel, 2003: 155). Thus the WTO is pivotal to the internationalization of agricultural biotechnologies, both for its concern with agriculture and for its concern with intellectual property protection. While the WTO agreements regulating trade are the most influential, a number of other international agreements have been or are in the process of being developed around such issues as equity of biological resource sharing and international standards setting. The Convention on Biological Diversity [CBD] and the International Treaty on Plant Genetic Resources [ITPGR], under the auspices of the United Nations, are two such agreements. A summary table of these agreements and the participation of Canada, the United States and the European Union can be found in Appendix A.

As an international trade organization, the agreements of the WTO are all ostensibly geared towards the goal of facilitating trade among nations. Towards this goal, the WTO encourages member states to make their national regulatory standards conform to international ones: this push to regulatory harmonization is the basis of much concern regarding the demise of national regulatory autonomy. Three WTO agreements highly relevant to the regulation of biotechnology are the agreements concerning the conditions under which a country can set food safety policies (the Agreement on the Application of Sanitary and Phytosanitary Measures [SPS]), technical regulations and industrial standards (the agreement on Technical Barriers to Trade [TBT]), and intellectual property

protection (the Trade Related Aspects of Intellectual Property [TRIPS] agreement).

Canada, the United States and the European Union are all members of the WTO and thus subject to its agreements.

The purpose of the WTO's SPS and TBT agreements is to address the concern that national policies adopted for the purpose of protecting consumers would effectively act as discriminatory trade barriers. These agreements set out guidelines in order to prevent this occurring. The SPS agreement, for example, is related to food safety and animal and plant health. Article 2.2 of the SPS agreement states that:

Members shall ensure that any sanitary and phytosanitary measure is applied only to the extent necessary to protect human, animal or plant life or health, is based on scientific principles and is not maintained without sufficient scientific evidence... (Cited on Codex Alimentarius Website, "Codex").

Further, the agreement states:

To harmonize sanitary and phytosanitary measures on as wide a basis as possible, Members shall base their sanitary and phytosanitary measures on international standards, guidelines or recommendations, where they exist, except as otherwise provided for in this Agreement (Ibid: Article 3.1).

While countries may set their own regulations, they must be 'scientific' and can only apply regulatory measures to the extent necessary for protection. Consequently, they are encouraged to use international agreements that aid in establishing benchmarks for what is scientifically necessary. The Codex Alimentarius, presided over by the Food and Agriculture Organization [FAO] and the World Health Organization [WHO], is one such source of benchmarks. The Codex Alimentarius is an international standards setting agency created in 1963. The agency coordinates the design and promotion of food standards, guidelines and codes of practice for the dual purpose of protecting consumers

and harmonizing standards to ensure fair trade practices and facilitate international agricultural trade (Codex Alimentarius website). The SPS agreement considers the standards set by the Codex as “scientifically justified” (ibid). Thus adherence to these standards can prevent trade disputes. These standards are also found in regional free trade agreements such as NAFTA, where the Codex sets the basic requirements to be met by member countries. Nonetheless, even the most well-intentioned ‘scientific’ basis of decision-making is subjective, and disagreements on the making of these standards occur. For example, an important issue around biotechnology that the Codex currently has under consideration is the question of whether foods containing genetically engineered organisms should be labelled for consumers. This is a very ‘hot’ issue for the marketing of such products, given that without such labels there is no way for consumers to boycott or avoid the products once they have been approved. Consequently, the United States is strongly against such labelling. The European Union, on the other hand, is strongly in favour of it, and has already adopted such regulations in its own community, as we shall see.

While the SPS and the TBT are relevant to agricultural biotechnology by ensuring that products of biotechnology have access to markets, the TRIPS agreement is designed to ensure the economic returns that make the development of such products possible in the first place. Biotechnology developments are high risk, require large capital investment and are very slow to reach commercialization. Consequently, Dutfield (2003:153) argues that the patent portfolio itself becomes the means of garnering investment and staying in business. For this reason, intellectual property protection forms the basis of the biotechnology industry.

The TRIPS agreement of the WTO requires member countries to have a system in place for the protection of intellectual property, with some implementation deadline variation between developed (1 year), developing (5-10 years depending on initial protections), and least developed (11 years) countries (WTO, "Legal Texts"). The TRIPS agreement designates that patents must be available "for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application" (WTO, TRIPS: Article 27.1). However, there are some allowable exceptions, such as plants. Articles 27.2 and 27.3 lay out the full exemptions:

2. Members may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by their law.

3. Members may also exclude from patentability:

(a) diagnostic, therapeutic and surgical methods for the treatment of humans or animals;

(b) 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. The provisions of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement.

Consequently, on the basis of Article 27.3b, plants are an allowable exemption from patent protection. Unfortunately, this section has also been the subject of much controversy and debate, not the least because a definition of what would constitute an 'effective *sui generis* system' was never provided. One *sui generis* system acceptable to

the TRIPS in the same manner the Codex standards are acceptable to the SPS is the model provided by the Conventions of the International Union for the Protection of New Varieties of Plants [UPOV]. The UPOV provides a model for Plant Breeder's Rights [PBRs] that are enacted in a number of countries, such as the United States and Canada.

The first UPOV Convention was in 1961, and provided a means to provide intellectual property protection over plants while allowing for broad exceptions for farmers and breeders, which would not be available under a patent system. Subsequent revisions have tightened the Convention. The majority of signatory countries currently belong either to UPOV 1978 (as does Canada) or to UPOV 1991 (as does the United States). The later version of UPOV significantly improves the protection offered to technology developers: it increases the duration of monopoly protection from a minimum of 15 to 20 years; makes farmer and plant breeder exemptions previously mandated under the earlier version a matter of national choice; and removes the prohibition on double protection, whereby any species eligible for Plant Breeders Rights protection were not eligible for patent protection (Dutfield, 2003: 191). While UPOV is its own organization, it is partly monitored by the World Intellectual Property Organization [WIPO], operating under the auspices of the United Nations.

Of the number of international treaties and agreements that govern biotechnologies, there is little doubt that the World Trade Organization [WTO] agreements and its affiliated organizations and agreements are the most established and the most influential global regulations affecting biotechnology. However, concerns with genetic resources related to such issues as equity and biodiversity have motivated other international agreements with non-market agendas, such as the Convention on Biological

Diversity and the International Treaty on Plant Genetic Resources for Food and Agriculture, and their global regulatory impact is still unfolding.

By far the most important of these other international agreements is the Convention on Biological Diversity and its later supplementary agreement, the Cartagena Protocol on Biosafety. The Convention on Biological Diversity [CBD] was negotiated under the United Nations Environmental Protocol. Over 150 countries signed the document in 1992, and it entered into force in 1993. Canada, the United States and the European Union are all signatories. The CBD has three main goals: “the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources” (CBD, “Sustaining”). The heart of the CBD is a concern for protecting humankind’s common heritage of genetic diversity, and the CBD advocates the use of the precautionary principle towards this aim: “where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat” (CBD, “Sustaining”).

In 2000, the parties to the CBD adopted a supplementary Protocol, the Cartagena Protocol on Biosafety. This Protocol agreement focuses on protecting biodiversity by managing the risks from living modified organisms. Thus the Protocol outlines a number of procedures: an Advanced Informed Agreement procedure for the import of living modified organisms; a reaffirmation of the precautionary principle; and it establishes a Biosafety Clearing-House to “facilitate the exchange of scientific, technical, environmental and legal information” regarding living modified organisms and to provide assistance to parties to implement the Protocol (CBD, “Background”). With respect to the

Advanced Informed Agreement, the Protocol outlines information and decision-making requirements of both importing and exporting parties in the trade of living modified organisms. Most importantly, article 10 stipulates that a lack of scientific certainty regarding negative impacts shall not prevent an importer from deciding against their importation:

Lack of scientific certainty due to insufficient relevant scientific information and knowledge regarding the extent of the potential adverse effects of a living modified organism on the conservation and sustainable use of biological diversity in the Party of import, taking also into account risks to human health, shall not prevent that Party from taking a decision, as appropriate, with regard to the import of the living modified organism in question as referred to in paragraph 3 above, in order to avoid or minimize such potential adverse effects.” (CBD, “Article 10”: Article 10.6)

Consequently, the CBD emphasizes markedly different concerns than the WTO.

This is no doubt in part due to the fact that the CBD negotiations were conducive to NGO input, whereas the negotiations that led to the creation of the WTO excluded civil society groups from the process (Butell, 2003: 163). It is therefore no surprise that while the United States signed the original CBD in 1993, it did not ratify the agreement or sign on to the Cartagena Protocol. While Canada ratified the CBD in 2001, it has not done so for the Biosafety Protocol. Nonetheless, the CBD is not the only such agreement.

The Food and Agriculture Organization of the United Nations, for example, is generally supportive of biotechnology and of its potential to increase production and alleviate hunger and food insecurity. At the same time, however, the FAO acknowledges the technology has certain environmental and health risks, and that there is an imbalance in the benefits of the technology, given that it is produced by the private sector for those with the purchasing power in high-income countries (FAO, “FAO Statement”).

Consequently, the FAO also oversees the International Treaty on Plant Genetic Resources [ITPGR], which was adopted in 2001 and entered into force in 2004. The ITPGR is concerned with the fair and equitable sharing of benefits from the use of plant genetic resources, and has 110 signatories. While Canada, the United States and the European Union are all signatories, only Canada has ratified the agreement. Conservation and sustainable use are key components of the ITPGR. It is similar to the CBD—in fact, the ITPGR claims to be “harmonized” with the CBD—although its concerns are more specifically aimed at the food and agriculture industries (Nottenburg and Sharples, “Key Organisations”: np) and its emphasis appears to be more weighted to obtaining its goals through “increased public funding and dialogue” than that of the CBD (FAO, “Statement”). The impact of ITPGR remains to be seen. Ultimately, the role of the FAO is to provide “assistance” to member countries, and at last “the responsibility for formulating policies towards these technologies rests with the Member Governments themselves.” (“FAO Statement”). Of course, this ‘assistance’ can be quite significant when guidelines are incorporated into international agreements, such as with respect to the role of the Codex Alimentarius in the WTO’s SPS agreement,

It is beyond the scope of this chapter to assess the future potential of these international agreements or the politics behind their creation and implementation and potential future significance. Suffice it to say, the WTO agreements represent the most powerful driving force behind the agricultural biotechnology industry to date. With the international regulatory structure in hand, I will now turn to national regulation of agricultural biotechnology in the United States, Canada and the European Union. Given that the United States pioneered the biotechnology industry (Dutfield, 2003: 144), and

remains at the forefront of acreage devoted to agricultural biotechnologies, it can likewise be expected to have had a head start on the regulation of agricultural biotechnology. Thus I will address the United States first, then Canada, and then the European Union.

National Regulation Of Agricultural Biotechnologies

The United States

With respect to its established uses, the United States appears to be at the forefront of a full-scale transformation of some of its key crops into transgenics. For example, in 2004, while the adoption of transgenic corn reached 19.3% of global corn hectares, it made up 45% of corn hectares in the United States; transgenic cotton was 9.0% of global cotton hectares, but accounted for 76% of U.S. production; and transgenic soybeans made up 48.4% of global soybean hectares, but a full 85% of U.S. soybean hectares (global statistics are from James, 2004b; U.S. statistics are from Pew Initiative, 2004, "Genetically Modified"). In some states of the United States adoption rates are even higher: already 79% of the corn and 95% of the soybeans in South Dakota, and 97% of the cotton in Mississippi, are transgenic (Pew Initiative, 2004: "Genetically Modified").

Consequently, the United States is the undisputed leader in biotechnology: with respect to its early experience with the technology, its amount of dedicated crop area, its degree of transgenic transformation in a number of crops, and its relative power in comparison with other biotechnology producing countries. Further, 75% of publicly traded biotechnology companies are based in the United States, in comparison with 15% in Europe and 8% in Canada (ETC Group, 2005b). Given its dominant role in

biotechnology, and the dominance of the role that the United States has traditionally played with respect to global agriculture, the manner in which the country regulates the new technology will have added salience.

The history of biotechnology regulation began early in the United States. While agricultural biotechnologies were only commercialized by the mid 1990s, the promise and peril of biotechnology's various applications had already entered the scene well before then. Medical biotechnology, for example, produced the first approved genetically engineered drug, human insulin, in 1982. Federal regulatory oversight of biotechnology began in 1976 with the National Institute of Health (NIH) Recombinant DNA Guidelines; however, they were of limited applicability, and voluntary outside of institutions with NIH grants (Marchant, 1988:168). In addition, the release of genetically engineered organisms into the open environment created new considerations. At about the same time genetically engineered insulin was approved, the first application for open release of a genetically engineered organism was applied for, with respect to the "ice-minus" bacteria to reduce frost damage in strawberries and potatoes. The result was citizen opposition, legal challenges and delays, and ultimately a "turf battle" over regulatory jurisdiction erupted (169). The "ice-minus" was finally the first legal, environmental release of a genetically engineered organism, but it did not occur until 1987 (ETC Group, 2003). In response to the regulatory chaos, the Administration set up an interagency working group in 1984 to resolve the regulatory issues.

Already the economic potential of the industry had been recognized, and the goals of the working group were to ensure health and environmental safety, "while maintaining sufficient regulatory flexibility to avoid impeding the growth of the infant industry"

(United States, Federal Register, Office of Science and Technology Policy (OSTP), 1986:23302). The policy motivation behind the working group was simple:

The underlying policy question was whether the regulatory framework that pertained to products developed by traditional genetic manipulation techniques was adequate for products obtained with the new techniques. A similar question arose regarding the sufficiency of the review process for research conducted for agricultural and environmental applications” (Ibid:23302).

The working group concluded that, “for the most part, these laws as currently implemented would address regulatory needs adequately” (Ibid: 23303). In sum, this conclusion backed an overall policy position regarding the ‘substantial equivalence’ of new genetically engineered products to conventionally produced ones. Consequently, biotechnology products were to be regulated, like their conventional counterparts, according to the uses to which they were put (their end products) rather than the process by which they were produced.

The policy result of the working group was the *Coordinated Framework for the Regulation of Biotechnology*, finalized in 1986. The *Coordinated Framework* outlined in detail the roles of different agencies with respect to the regulation of biotechnology, and the different legislation that they would regulate under. It used a “mosaic of existing federal law” (Ibid: 23303), and provided detailed information about which aspects of biotechnology were to be regulated by which agencies, and under which statutes. Allowing for departmental shifts and amendments, the *Coordinated Framework* remains the basis for biotechnology regulation in the United States today.

Under this regulatory “mosaic,” biotechnology in the United States is primarily regulated by three main agencies: the Food and Drug Administration [FDA], the

Environmental Protection Agency [EPA] and the United States Department of Agriculture [USDA].

Broadly speaking, the FDA is responsible for food, feed and food additives, or the safety of consumed products. The FDA policy “is based on existing food law, and requires that genetically modified foods meet the same rigorous safety standards as is required of all other foods” (USDA, APHIS website, “Regulatory Oversight”). The EPA is responsible for pesticides and novel microorganisms. Essentially, the EPA ensures the safety of chemicals and biological pesticides through setting tolerance limits. For example, it is responsible for setting tolerances of herbicides on herbicide resistant crops, and the pesticide in pest resistant plants, two key genetic engineering applications. With respect to agricultural biotechnology, the USDA is the lead agency. Under the USDA, the Animal and Plant Health Inspection Service (APHIS) is responsible for protecting U.S. agriculture from pests and diseases, and it regulates the introduction of new organisms into the environment. Given the system of regulating according to end use, some products require regulation by more than one agency due to the mixed application of some biotechnology products (e.g. food and pesticide). For example, while the EPA regulates the pesticidal properties of plant incorporated protectorants in insect resistant crops such as Bt corn (e.g. by setting pesticide tolerances), the regulation of the actual plant itself (e.g. the importation, transportation and planting) is regulated by the USDA through the office of Animal and Plant Health Inspection Services (APHIS).

Products of genetic engineering are ‘regulated articles’ and APHIS has jurisdiction over the release of such articles into the environment. Authorization of field tests of new genetically engineered crops can be applied for either under the permit or the

notification system. Permits are required for high-risk crops, such as pharmaceuticals or industrial compounds. Notifications are required for “familiar crops and traits considered to be low risk” (USDA, APHIS, website, “Regulatory Activities”). Both systems require the submission of protocols to meet performance standards, and while field trials are ongoing, crops are subject to monitoring and compliance inspection by APHIS. Following field-testing, application can be made for non-regulated status. APHIS assesses the application based on studies and data that must be supplied by the applicant. While both regulated and non-regulated products can be commercialized, once deregulated, a product no longer requires any monitoring. The first product to be deregulated in the United States was Calgene’s Flavr Savr tomato, deregulated in 1992.

The concept of substantial equivalence that underlies the U.S. regulatory framework is readily apparent in the policies of each agency. For example, APHIS’ requirements for ‘familiar crops and traits’ is such that the majority of genetically engineered crops can be applied for under the vastly streamlined ‘notification’ process: in 2004, 97% of GMO field trials were notifications (Pew Initiative on Food and Biotechnology (Pew), 2005:2). The FDA has a similar approach. The FDA has authority over substances that are added to food, either as food additives (which require pre-market review and approval) or as substances that are generally recognized as safe (GRAS). The determination of GRAS is not made by the FDA, but by the food manufacturer, although a voluntary “affirmation” process does exist which can provide pre-market guidance (Pew, 2001:20). In general, genetically engineered foods are considered GRAS. The FDA finds, “many of the food crops currently being developed using biotechnology do not contain substances that are significantly different from those already in the diet and thus

do not require pre-market approval” (United States, Federal Register, Office of Science and Technology Policy, 1986:23310). It is important to emphasize that it is the food producer who makes the determination of safety based on substantial equivalence, and while it is acceptable that “the burden of proof regarding safety remains with the manufacturer” (Pew, 2001:21), there is a concern when the final decision regarding safety is similarly in their hands.

Lastly, once marketed, the products of biotechnology are considered the same as conventionally bred products with respect to labelling. Labelling of products as containing genetically engineered material is voluntary in the United States.

Canada

Statistical data regarding the adoption of agricultural biotechnologies in Canada are far more difficult to obtain than with respect to the United States, no doubt in part due to the drastically smaller size of the industry. Canada accounts for approximately 7% of global agricultural biotechnology, for a total of 6.1 million hectares as compares with the 49.8 million hectares grown in the United States (James, 2005b). The Canadian regulatory framework for biotechnology was developed about 7 years after the American one. While there are differences, a fair amount of similarity between the U.S. and Canadian regulatory systems for biotechnology is readily apparent.

The Canadian Government’s official relationship with biotechnology began in 1983, with the launching of the National Biotechnology Strategy (NBS). This early strategy focused on “R&D and human resources development” rather than regulation (Government of Canada, Industry Canada, 1998: 4). In 1988, the Canadian

Environmental Protection Act (CEPA) was developed, and questions were raised at the time whether special provisions for the regulation of biotechnology should be made (Bjorkquist, 1999: 19). The decision was made instead to amend a number of federal statutes to accommodate the new technology, in a manner similar to the American approach. Leiss and Tychenko (2001) argue that a “business as usual” attitude to biotechnology regulation (e.g. incorporating it under existing legislation) was made possible by conceptualizing it under a “very broad definition” of biotechnology (Leiss and Tyshenko, 2001:324-5).

Consequently, in 1993 the Regulatory Framework for Biotechnology was announced. The regulatory framework had six key principles, that were announced to be “the basis of a federal regulatory framework for biotechnology” (Government of Canada, Canadian Food Inspection Agency. “Federal Government”). These 6 principles were:

- maintains Canada’s high standards for the protection of the health of workers, the general public and the environment;
- uses existing legislation and regulatory institutions to clarify responsibilities and avoid duplication;
- continues to develop clear guidelines for evaluating products of biotechnology which are in harmony with national priorities and international standards;
- provides for a sound scientific database on which to assess risk and evaluate products;
- ensures both the development and enforcement of Canadian biotechnology regulations are open and include consultation; and
- contributes to the prosperity and well-being of Canadians by fostering a favourable climate for investment, development and adoption of a sustainable Canadian biotechnology products and processes. (Ibid)

Therefore, a notable similarity to the American framework is the Canadian move to regulate under existing statutes. However, unlike the American coordinated framework, which contains almost 50 pages detailing definitions and designating regulatory authority under various acts, the Canadian framework exists in little more than its news release and a question and answer document highlighting its six key principles. It is seemingly a shadow of its American counterpart. In 1997 a renewal process for the National Biotechnology Strategy was launched, the end result of which was the 1998 Canadian Biotechnology Strategy (CBS). Under the CBS, the Government of Canada's commitment to the 1993 framework was reaffirmed, and consequently it remains the basis of biotechnology regulation in Canada today.

Currently, the regulation of biotechnology in Canada is carried out by three main agencies: Health Canada, the Canadian Food Inspection Agency [CFIA] and Environment Canada. The CFIA is the lead agency with respect to biotechnology regulation, and is responsible for fertilizers, feeds and seeds. Environment Canada serves an umbrella function, assuring that environmental assessments of health and environmental impacts are made. Health Canada is responsible for food safety. As in the United States, there is some regulatory overlap between these agencies. For example, Environment Canada is responsible for environmental risk assessments of new substances with respect to toxicity unless another agency performs this assessment. For biotechnology products, such assessments are performed by the CFIA. Health Canada and CFIA assessments are conducted according to the dictates of each agency, and authorizations are granted independently. Consequently, the Canadian system is again a composite of 'product based' as opposed to 'process based' assessments.

Genetically engineered plants are regulated by the Plant Biosafety Office of the CFIA under the policy for regulation of plants with novel traits [PNTs]. Plants with novel traits “may be produced by conventional breeding, mutagenesis, or more commonly, by recombinant DNA techniques” (Government of Canada, CFIA). The CFIA is responsible for the importation, environmental release and registration of PNTs. It serves a similar function as APHIS in the United States. CFIA monitored experimental field trials are subject to “reproductive isolation,” which denotes “conditions that mitigate the transfer of pollen” and not necessarily a contained setting (such as in a greenhouse or laboratory) (CBAC, 2002: “Canadian Food Inspection Agency”). The CFIA reportedly monitors the test site over the years while the technology developer collects its agronomic and environmental impact data (Ibid). If the developer believes the product has commercial potential, the onus is on it to provide a scientific information package in its application to the CFIA for unconfined release of the genetically engineered product into the environment and marketplace (Ibid). The CFIA makes its assessment based on this data, and if no risks are apparent it will grant authorization for unconfined release.

The Canadian Biotechnology Advisory Committee [CBAC] was created in 1998 to provide government with independent advice on policy issues associated with biotechnology. While the CBAC claims that Canada is the “only country where regulatory oversight is triggered by ‘novelty’” (CBAC, 2002: “Canada’s Approach”), evidence of the same concept of substantial equivalence that formed the basis of the American regulatory system is readily apparent throughout the Canadian regulatory framework. For example, with respect to Health Canada:

The basis of Health Canada’s safety assessment process is the principle that novel foods can be compared with traditional foods that have an

established history of safe use, and that this comparison can be based on an examination of the same risk factors that have been established for the counterpart food (CBAC, 2002: “Regulatory Structures”).

The concept is also explicit in the CFIA mandate, where it soon becomes clear that, practically speaking, ‘novelty’ and ‘substantial equivalence’ operate in a strained conceptual association. While PNTs are “not considered substantially equivalent” to plants of the same species, the lumping of other forms of plant breeding as potential PNTs necessarily associates the regulation of genetically engineered plants with those of conventional breeding.

As in the United States, the concept of substantial equivalence extends from the regulatory framework to the marketing of the product. Once commercialized, labeling of genetically engineered products is permissible in Canada, but conducted on a voluntary basis (see, Government of Canada, Canadian General Standards Board, 2004).

Pro-Development in the North American Block

As should be clear from the above comparison, while there are differences between the Canadian and American systems for regulating the products of agricultural biotechnology, they are very similar. Both the Canadian and American federal regulatory frameworks regulate biotechnology under existing statutes, subjecting products to a patchwork of regulatory agencies and statutes, some of them overlapping. Both are “product” rather than “process” oriented, assessing products for their end uses and allowing no special provisions for the method by which they have been produced. Both are based on the concept of substantial equivalence, whereby the products of biotechnology are not seen to differ from the products of conventional breeding. Both rely on data submitted by the product’s own manufacturers for their assessments of a

product's safety. Both conduct their assessments on a case-by-case basis, and appear to address the potential uncertainty of this approach with a fair amount of agency-industry consultation. Both believe that labelling of such products should only be done on a voluntary basis.

While informal consultation and harmonization has obviously been a factor, there has been at least one attempt at formal harmonization between Canada and the United States. In 1998, The CFIA, Health Canada and the USDA participated in bilateral discussions "to compare and harmonize where possible, the molecular genetic characterization components of the regulatory review process for transgenic plants" and to "discuss and prioritize future areas of cooperation and information exchange" (CFIA, Health Canada, USDA. 1998: "Canada"). Whether formally or informally motivated, the Canadian and American systems demonstrate a vast degree of regulatory convergence. In addition to these regulatory similarities, however, both the Canadian and the American frameworks have also been subject to significant criticisms that they are failing to meet the regulatory requirements of the new technology. Most significantly, incorporating the regulation of biotechnology under existing legislation does not allow for regulation of the unique issues raised by the technology, and that may fall in the gaps between regulatory authorities designed for conventional crops. Further critiques raise concerns over regulation based on the concept of substantial equivalence, the strong pro-development stance of both governments, and on the practical incidents that provide physical evidence of regulatory failure.

In Canada, prolonged public pressure over the risks of biotechnology prompted the three key regulatory agencies responsible for biotechnology to commission an

independent review of their regulatory system by the Royal Society of Canada. In its 2001 independent report, the Royal Society recommended a more precautionary approach to the regulation of biotechnology, and it ultimately made 33 recommendations towards strengthening the Canadian regulatory standards. Notably, it suggested the need for an independent auditing process of the scientific and ethical aspects of biotechnology regulation and raised serious concerns over the potential for science based risk assessment due to:

- the conflict of interest created by giving to regulatory agencies the mandates both to promote the development of agricultural biotechnologies and to regulate it;
- the barriers of confidentiality that compromise the transparency and openness to scientific peer review of the science upon which regulatory decisions are based; and
- the extensive and growing conflicts of interest within the scientific community due to entrepreneurial interests in resulting technologies and the increasing domination of the research agenda by private corporate interest. (Royal Society of Canada, 2001)

Specific to the issue of substantial equivalence, the Royal Society concluded that the CFIA's "framing of 'substantial equivalence' links it intimately with the definition of 'novel trait' in a way that leads to a logical impasse" (Royal Society, 2001:181). More significantly with respect to the broader issues around a regulatory approach based on the concept of substantial equivalence:

The Panel finds the use of "substantial equivalence" as a decision threshold tool to exempt GM agricultural products from rigorous scientific assessments to be scientifically unjustifiable and inconsistent with precautionary regulation of the technology (Royal Society of Canada, 2001: ix).

In response to the Royal Society report the Government of Canada proposed an action plan that included a commitment to ongoing assessment of progress according to the Royal Society recommendations and in conjunction with advice from the CBAC, specifically referencing their upcoming 2002 final report (CBAC, 2002). However, by 2004, the CBAC issued an advisory memorandum warning that, “The lack of a comprehensive regulatory system for products of biotechnology is impeding the development of niche industries in Canada and consequently the potential for consumer and economic benefits” (CBAC, 2004: np). The memorandum stated that despite reviews by the Royal Society and the CBAC “there is little evidence of government action to implement recommended improvements or to extend the system to other products.” Rather, it noted that despite five separate regulatory review and development processes, “[n]ot one of these efforts has delivered even draft regulations” according to original timelines: “[I]n fact, there seems to be a practice of simply extending the target dates to some never quite attainable date in the future” (Ibid).

Consequently, despite a wealth of documents and communication, regulatory reform in Canada does not appear to be a priority. Similarly, relatively little federal legislative activity on biotechnology has occurred in the United States. Overall, both governments’ strategies for the technology seem to indicate a strong concern with facilitating development, and with preventing regulatory hurdles from impeding this development. For example, the lack of independent data collection concerning crops to be assessed relies on the manufacturer to be forthright about safety limitations of the products they wish to commercialize. If nothing worse, this can lead to insufficient data

and testing. More significantly, it belies a close relationship between industry and regulators.

Both Canadian and American biotechnology regulation demonstrates a lack of separation between government as promoter and government as regulator, and evidence of the keen interest in developing the industry can be found on both sides of the border. In Canada, 'success' was early on associated with development of the industry:

The dramatic growth in biotechnology activity in Canada—from a small core of health care companies, to a community of more than 500 firms employing more than 25 000 Canadians, underscores the success of the National Biotechnology Strategy over the past 15 years (Government of Canada, Industry Canada, 1998: 4-5).

The 1998 renewed Canadian Biotechnology Strategy asserts the Government of Canada's consistent "support for biotechnology as a priority" (Government of Canada, 1998:4). Indeed, its ten key themes emphasize measures to enhance Canadian competitiveness, such as through sectoral support, expanding research and development, and accelerating the application and commercialization of new technologies. Efforts have been made to dispel the impression of a conflict of interest. For example, Agriculture Canada was initially "lead developer, promoter and regulator" of agricultural biotechnology until its regulatory function was transferred to the CFIA (Bjorkquist, 1999:25). However criticisms of the Canadian government's contradictory role as industry facilitator and regulator have continued unabated. This perceived conflict of interest came to a head over the issue of Monsanto's application to introduce Roundup Ready wheat in Canada in 2002. This issue will be discussed in greater depth in Chapter 3, however the relevant fact here is that the Canadian government assessed Monsanto's application against a backdrop of intense opposition from a wide variety of interests. At

this time, it was revealed that not only was the Canadian government final arbiter of Monsanto's application, but that it also had a role in developing the technology (providing funds, experimental fields, and government scientists to facilitate development); further, it even stood to profit from a royalty of up to 5% of Monsanto sales once the wheat was approved (CBC Television, 2003).

In the United States, the promotional stance taken by the government is even more explicit than in Canada, and due to the international influence the country wields it has even greater significance globally. For example, the 1986 *Coordinated Framework* subscribed to the goals of the Organization for Economic Co-Operation and Development report on recombinant DNA applications, of which the United States was a major contributing member. The report's seven general recommendations emphasize pro-development goals such as information sharing, harmonization, protecting intellectual property, and balancing "adequate review and control..." with "avoiding undue burdens." In sum: "any approach to implementing guidelines should not impede future developments in rDNA technology. International harmonization should recognize this need" (US Federal Register, OSTP, 1986: 23308). The U.S. is similarly active from a pro-development stance on other international agreements affecting biotechnology. For example, despite polls that show the vast majority of Americans are in favour of labelling of genetically engineered foods, the United States is actively campaigning at the U.N. Codex Alimentarius commission in opposition to mandatory labelling (Environmental News Service (ENS), 2006: "U.S. Seeks").

In addition to the above critiques, there are also more practical signs of regulatory failure in the two countries. In Canada, illustrations of regulatory weakness are most

evident regarding the proprietary aspects of the technology. In this case, regulation is not about regulating the risks of the technology but about establishing liability. The lack of laws governing involuntary presence of the patented GM material came to a dramatic head in the Schmeiser case, and continued on in the Saskatchewan Organic Directorate supported Hoffman case, as we shall see in Chapters 3 and 4. While not yet about involuntary presence, lawsuits around patent infringement through seed saving are mushrooming in the United States. Suffice it to say here that a number of issues remain unresolved with respect to liability and infringement, and the growing number of lawsuits in the United States and Canada are indicative of the need for legislation, yet regulators on both sides of the border appear reluctant to address the issues. While the courts will come to some determination in any given case, the decision will be based on legal issues specific to the claim in question, and not on the broader social issues which comprehensive legislation could be hoped to consider. What the prevalence of lawsuits would seem to indicate is a lack of government regulation with respect to the distribution of power that is to be assigned between farmers and biotechnology companies as a result of the new technology.

While Canada provides legal examples of regulatory weakness, the United States provides more physical evidence. A number of such incidents have highlighted serious flaws in the American regulatory framework (see for example, Bratspies, 2002, 2003; Mandel, 2004). As the United States has almost 9 times the hectares of transgenic crops under production as Canada, it is not surprising that it would have more physical incidents of regulatory failure. Given that the regulatory frameworks of the U.S. and

Canada are themselves substantially equivalent, there is no reason to believe that these failures are not continent wide.

The most spectacular illustration of the weakness of the American regulatory framework for biotechnology was the Starlink Corn debacle. Starlink Corn was approved for production for animal feed and industrial uses in 1998, but not for human consumption due to lingering questions about its allergenicity. Regulatory approval was conditional on a number of special procedures designed to keep it out of the human food supply—such as mandatory segregation, buffer zones, and grower education—which there was a widespread failure to follow (Mandel, 2004). In 2000, traces of the unapproved corn were found in tacos and other corn products, significantly, not by regulators but by an environmental coalition. Starlink was regulatory failure writ large: “one company, with one GM crop, managed to contaminate food for millions of households and brought an international commodities market to a standstill” (Bratspies, 2003: 593).

Starlink vastly increased public pressure on U.S. regulatory bodies to ensure the safety of biotechnology regulation. Subsequently, the EPA committed not to issue any further split approvals. Similarly, while unable to provide written documentation to this effect, Canadian officials likewise follow a policy of no split approvals (CFIA, Personal Communication, 2006). Starlink showed the dangerous regulatory gaps that can result from the piecemeal approach to regulation common to both the United States and Canada. Moreover, Starlink highlighted significant gaps with respect to the establishment of liability over the novel technology. Hamilton (2005) notes that seed companies had initially attempted to “allocate costs and liability to the “offending” farmers, many of

whom had never seen the restrictive terms of the product approval,” and that if an Iowa attorney general’s office hadn’t stepped in, “the whole episode may have evolved quite differently.” (2005:48). Given attempts to escape liability in the face of such failure, liability for more uncertain issues would be even more difficult to ascertain. Hamilton argues that the approach of biotechnology companies is to shift this responsibility to the producers through the technology transfer agreement: “This is done by placing language in the technology agreements to make producers responsible for post harvest ‘channelling’” (2005: 48-9), essentially, making them responsible for directing their grain to approved uses and markets.

Despite a wealth of safety assurances since that time, regulatory weakness in the framework persists. In 2005, the Swiss company Syngenta inadvertently mixed its approved Bt11 corn with the similar but unapproved Bt10 corn, resulting in 37,000 acres of the unapproved corn planted in the United States, a portion of which was exported to the European Union (Wright, 2005). In 2002, two incidents of improperly contained pharmaceuticals occurred, leading to the destruction of significant amounts of potentially contaminated crop (Mandel, 2004).

In 2002, APHIS created the Biotechnology Regulatory Service (BRS). Addressing regulatory weakness would appear to be the BRS’ function. As stated on the BRS website, its purpose is to place “increased emphasis on our regulatory responsibilities,” although subsequent web pages report the familiar mixed purpose of regulation and development: “to focus on the USDA’s key role in regulating and facilitating biotechnology” (USDA, APHIS, “Welcome to”; Ibid, “Biotechnology”). Perhaps it is for this reason that BRS puts a strong emphasis on public communication

about regulatory strength, while nonetheless drastically failing in its regulatory functioning. For example, according to the BRS: there are “serious penalties” for failure to adhere to BRS regulations, permit conditions, and requirements; that, depending on the crop involved, “a site may be inspected at least 5 times” to ensure compliance; and that APHIS field tests find 98% compliance with regulations (USDA, APHIS, “Compliance and Enforcement”). To the contrary, a 2005 audit by the USDA Office of the Inspector General raised serious concerns that “the Department’s efforts to regulate those crops have not kept pace” (United States Department of Agriculture (USDA), Office of Inspector General (OIG), 2005:i). The 2005 audit was not the first however:

Although APHIS agreed to improve its tracking of inspection reports following an Office of Inspector General (OIG) audit more than 10 years ago, the agency continued to lack an effective, comprehensive management information system to account for all inspections and their outcomes (USDA, OIG, 2005: iii)

More specifically, the OIG audit report illustrates a lax, uncoordinated and downright ineffective system. In some instances, a lack of necessary regulation and guidance was at issue. For example, notification protocols were not reviewed and were often only provided verbally; reporting of final dispensation of pharmaceutical and industrial harvests was not required, such that “two large harvests of GM pharmaceutical crops remained in storage at the field test sites for over a year without APHIS knowledge” (ii); and an applicant planted “regulated edible GM crops in an open field, where they were accessible to the public” (7) and could be eaten by passers-by. Most significant of all, APHIS regularly lacked basic information about the location of field tests, as it “does not consistently collect precise location information” (14). Even when APHIS knew test site locations, there was a lack of coordination between units

responsible for management and those for inspection, such that “BRS has no assurance that the highest risk field sites are inspected” (iii). Other lapses are more difficult to ascribe to simple incompetence, considering the development push. For example, permit sites were not inspected with the frequency APHIS reported and the agency “understated to the public the percentage of inspected sites with compliance infractions” (7). Further, the OIG “found 11 violations that were not recorded in BRS’ compliance infractions database at the time of our audit, even though they were reported to BRS or could have been identified from information BRS already had. APHIS took administrative action on only 1 of those 11 violations” (USDA, OIG, 2005: iii).

It would appear that in the dual pressures to regulate and facilitate the development of the biotechnology industry, the push to facilitate industry development is significantly stronger in both Canada and the United States. While there is a far larger industry and markedly greater evidence of this regulatory failure in the United States, there is considerable support for the contention that these regulatory schemes are similar and are equally flawed in Canada.

The European Union: A Precautionary Approach

The European Union (EU) only took on its current shape as a single market economic union in 1992. Biotechnology regulation in the EU has proved doubly challenging not only because it is a new technology but also because regulation requires consensus from its member states. Of course, the challenge is ongoing and is exacerbated by the EU’s expanding membership.

In 1990, the EU adopted Directive 90/220/EC for the assessment and approval of GM organisms (Pew, 2005: 9). Subsequently, in the early 1990's the European Union approved a number of GM products for commercial use, including crops. In 1997 Regulation 258/97/EC was passed, requiring the labelling of foods containing GMOs, excepting foods that were derived from GMOs but did not contain GMOs (Ibid). However, biotechnology regulation in the European Union is affected by a greater cultural sensitivity towards food and concerns have been greatly exacerbated by specific food safety fears, such as the BSE outbreak in the mid 1990s. Perhaps due to these greater sensitivities, it proved difficult to obtain member state consensus about the highly controversial technology. Starting in 1997 and continuing to 2000, a number of member states invoked the "safeguard clause"¹ to ban crops from their countries that had already gained EU approval. In 1998, a number of these member states vowed to "block approval of GM crops unless existing labelling and safety regulations were further tightened" (Pew: 10). Consequently, member state resistance resulted in a de facto moratorium where no new approvals were granted, "while the EU was working to develop new EU-wide legislation more acceptable to the member states" (Ibid).

In 2003, while regulatory amendments were ongoing in the EU, the United States, Canada and Argentina—the top three biotechnology crop producers globally—launched a challenge through the WTO against the EU's de facto moratorium. They argued that the moratorium violated free trade agreements, as it constituted an unfair trade barrier. Further, they believed that the challenge was "necessary to discourage other countries,

¹ The safeguard clause allows a member state to "provisionally restrict or prohibit the use or sale of an approved GMO if there is "new or additional information... or scientific knowledge" that gives it "detailed grounds" that the GMO "constitutes a risk to human health or the environment"" (Article 23 of the EU Directive 2001/18/EEC, as cited in Pew, 2005:16)

especially those in the developing world, from using the EU regulatory approach as the basis for their own regulations” (Pew: 12). Between 1998 and 2004, when the de facto moratorium was lifted, the EU did, in fact, produce a number of relevant legislative amendments and new initiatives. The general theme of this new GMO legislation, in contrast to the North American model, was a pronounced emphasis on detailed information gathering, risk assessment, and tracking and monitoring procedures. Also, in antithesis of the North American model, GMOs are not regulated under a compilation of existing statutes, but according to legislation specifically crafted for the purpose.

Authorization for experimental release of GMOs is a national decision, based on EU risk assessment procedures. A nation-state of the EU may grant authorization based on an evaluation of environmental and health risks outlined in the application and based on conditions laid down in Directive 2001/18/EC of the European Union. Unlike APHIS’ notification system, which lacked even basic information on the site location of such high risk crops as pharmaceuticals, the EU application package requests detailed information not only on siting but on data relevant to assessing potential impact on the “receiving environment,” such as proximity to humans, proximity to drinking water supplies, nearby flora, fauna, livestock and migratory species, and potential future land developments, among others. The application must also include detailed information on monitoring plans, procedures for controlling spread, waste treatment and emergency response in case of unexpected spread (Official Journal of the European Communities, 2001, Annex III A: III).

While field trials are a national decision, the authorization to market GMOs must include all nations, as under the common market of the EU commercialization of a GMO

in one nation would imply authorization in all. The application for authorization is presented to an initial member state, which produces an assessment report based on the risk assessments of the field trials and further assessments based on information specific to marketing the product, such as intended use, storage and handling, and identifiers for post marketing control and inspection (Ibid: Annex IV). If the member state's assessment is favourable, the application is referred to the European Commission. If there are no objections from other member states or the European Commission, the GMO may be marketed (Europa, 2005:7).

New regulations put in place in 2003 (No 1829/2003) allow for even greater centralization of authority. Manufacturers can choose whether to apply for authorization under a 2-part assessment, including Directive 2001/18/EC and the new Regulation 1829/2003, which specifies new criteria for GMO food and feed. Alternately, the new regulation 1829/2003 allows a manufacturer to file a single application for authorization for all uses of a GMO (both environmental release and use in food and feed). This application option streamlines the process according to a "one door, one key" principle (Europa, 2005, "Questions": 10). Under 1829/2003 an application is assessed by a single risk assessment conducted by the European Food Safety Authority and a single risk management process involving Commission and member states in a regulatory committee procedure (Ibid: 10). The authority is an independent source for scientific advice and technical support, endowed with legal personality (Europa, 2005, "Transboundary"). Unlike the Canadian advisory commission (CBAC), the European authority's detailed tasks appear to be strictly limited to providing and advancing science knowledge, without broader policy concerns. For example, its mandate includes: providing scientific

opinions, developing uniform risk assessment methods, commissioning scientific studies, identifying and characterizing emerging risks, collecting and analyzing food safety data, compiling an inventory of European level data collection systems (Ibid). With respect to American accusations, it would appear that the European model has a much greater potential for science based regulations than the apparent 'don't look, don't tell' American approach.

The EU GMO authorization process provides a number of significant contrasts to North America. In direct reference, the EU notes that the "one door, one key" approach ensures "experiences such as with Starlink maize in the US... are avoided because GMOs likely to be used as food and feed can only be authorized for both uses" (Europa, 2005, "Questions": 10). Further differences with respect to regulations on traceability and labelling, and with respect to co-existence and liability issues mark an even greater policy divergence.

In 2003, the EU passed directive 1830/2003 which put into place traceability and labelling requirements for all member states of the EU. These were put into effect in 2004. Labelling requirements specified that pre-packaged products contain labels stating that the product contains genetically modified organisms and non-prepackaged products be displayed in association with such labelling. The traceability legislation requires that from the first stage of placement on the market (including in bulk) and all subsequent states written records must be kept that the product contains GMOs and providing the unique identifiers of those GMOs. Further, these records must be kept for five years from transaction date (Official Journal of the European Union, 2003: Article 4:4). Exemption thresholds for the labelling and traceability requirements were put in place to allow for

trace amounts of “adventitious or technically unavoidable” GMOs (Ibid, Article 4:7). The new regulations reduced this threshold to 0.9 percent (from its previous 1.0 percent) and extended its application from those products that tested above 0.9 percent GM to include all products derived from ingredients that were above 0.9 percent GM (Gene Watch UK, nd). This allows for the inclusion of products, such as vegetable oil, which are so refined and processed that GM material is no longer detectable, to be included in the labelling requirements if they were produced from GM ingredients.

While labelling is about consumer choice, traceability requirements provide the ability for future monitoring as well as a contingency plan—unavailable in the North American regulatory model—in the event that a GM product turns out not to be as safe as its conventional counterpart. Regulation 1830/2003 states that:

Traceability requirements for GMOs should facilitate both the withdrawal of products where unforeseen adverse effects on human health, animal health or the environment, including ecosystems, are established, and the targeting of monitoring to examine potential effects on, in particular, the environment (Ibid, para. Official Journal of the European Union, 2003:2).

The EU traceability and labelling requirements thus offer a significantly more stringent regulatory environment than in North America.

As demonstrated by the lawsuits between technology developers and farmers arising in Canada and the United States, co-existence and liability are areas of significant regulatory lapse in the North American block. Again, the EU has attempted to directly address the issue. In 2003, the Commission decided that member states could develop their own measures regarding co-existence strategies. The Commission produced guidelines for the development of such measures based on the principle that “farmers should be able to choose the production type they prefer, without forcing them to change

patterns already established in the area,” and that in general, “farmers who introduce the new production type should bear the responsibility of implementing the actions necessary to limit admixture” (Europa, 2005, “Questions”: 17).

Consequently, a number of EU states are working on co-existence legislation. Co-existence legislation can not only include such elements as rules for separation distances, buffer strips, monitoring and requirements to inform neighbours of GM crops, but also can dictate who bears the financial burden in case such procedures are insufficient to contain the spread of genetically engineered material. For example, German co-existence legislation puts in place a “polluter pays” principle, such that GM farmers would be liable for contamination to a non-GM farmer’s field. This liability could be joint liability of bordering GM farmers, where individual liability is not possible to determine (Reuters, 2005). Denmark has put in place a compensation scheme whereby compensation will be paid to conventional or organic farmers who suffer economic loss due to contamination by GM material in their crops. The compensation will be funded by a tax on GM producers, based on hectares of land cultivated (Europa, 2005: “Commission”). In the Netherlands, the Dutch Agriculture Ministry has urged agricultural stakeholders to construct a voluntary agreement on co-habitation, which it considers preferable to creating a special law (Mudeva, 2004). Pro biotechnology groups are motivated to expedite such a process, as GM crops have not yet been commercialized in the region. These groups have created an agreement, including the set-up of a special compensation fund in cases of contamination, which is now subject to approval (Ibid).

Some critics argue that such tough liability laws act to prevent the adoption of the technology and provide a loophole for nations seeking to block GM cultivation, as

farmers faced with the prospect of liability over the crops would be unlikely to risk adoption. While there is no evidence to support or refute this contention the generation of such legislation avoids the huge regulatory grey area evident in North America.

Subsequent to the new labelling and traceability requirements, the EU ended its de facto moratorium with the first GM approval since 1998, Syngenta's GM sweetcorn. Since 2004, at least five new GM products have been approved. Interestingly, the ending of the de facto moratorium occurred prior to the WTO ruling, which was provisionally issued against the EU in February 2006. However, a homogenous approach to biotechnology regulation in Europe is still not assured. Despite the new legislation, the unpopularity of GMOs with the European public is prompting some nations to continue their resistance. A number of countries continued their bans on approved GMO crops using the "safeguard clause." Subsequently the Commission called on these nations to lift their bans, "however, the Commission recommendation to force the lifting of the national bans was rejected by a qualified majority of the Council, leaving the national bans in place" (Pew, 2005: 16). Member state-EU tussles over GMO approvals remain ongoing.

As of 2006, the current corpus of EU biotechnology regulation has some marked differences from the North American model. It emphasizes data gathering, tracking and long term monitoring. In an almost antithetical way from North America, the emphasis is on visibility in decision-making and long-term assessment, and public consultation. While labelling of consumer products is currently limiting market opportunities for GMO products, the clarity and single desk authorization process may provide some corporate benefit. The contrast with North America is not coincidental. A 2002 European Commission strategy paper for biotechnology in Europe stated that the technology was

developing so rapidly that Europe's policy choice is "not whether, but how to deal with the challenges posed" (Commission of the European Communities, 2002: 4).

Consequently, it emphasized the need to make these choices before they were imposed:

Europe is currently at a crossroads: we need to actively develop responsible policies in a forward looking and global perspective, or we will be confronted by policies shaped by others, in Europe and globally (Ibid).

While it may be the case that the United States' drive to promote biotechnology, in conjunction with international laws, are applying some pressure on the European Union to accept the technology, it is also the case that the European Union as a whole is setting clear terms on which this acceptance is conditional. Even so, approvals have been slow, and there are still member states whose acceptance has yet to come.

Resistance and Inevitability in the Contours of the Third Food Regime

Global Politics, Local Resistance

Biotechnology plays a key part in American and Canadian economic development plans: the current image is one of American ascendancy as a biotech super power with Canada running tag-along development. Together, these two nations are set to dominate as a North American block, with respect to a global agriculture driven by corporate biotechnology. On the other hand, the European Union provides a countervailing tendency. While it also supports its biotechnology industry development, it emphasizes a much more precautionary form to this development. Developing countries are a third large block, both with respect to their position as a market for the technologies themselves, and as a market for the agricultural surplus produced with these technologies

in developed countries. Thus they are another important component of the 3rd food regime and are an increasing component in US-EU biotechnology power relations.

A main objective must be to ensure that the EU maintains competitiveness vis-à-vis major industrialised countries such as the US and Japan. Moreover, whatever policies Europe will decide regarding life sciences and biotechnology, they will have important international impacts, in particular for developing countries. The interests of these countries must also be taken into account. We must integrate the international dimension into all relevant policies, and we need to develop an international agenda, based on our fundamental values and long-term objectives, to actively promote balanced and responsible policies globally, in particular towards the developing world (Commission of the European Communities, 2002: 25).

Not to overstate the importance of the European Union's biotechnology industry, "the US biotechnology industry started earlier, produces more than three times the revenues of the European industry, employs many more people (162,000 against 61,000), is much more strongly capitalized and in particular has many more products in the pipeline" (Ibid: 9). The US remains the undisputed world power in biotechnology. However, neither can the EU's antithetical stance to American style biotechnology be discounted, as it retains influence on the global stage. Some, like Bernauer (2005) argue that this influence is an important factor in the United State's WTO challenge of the EU, as this influence could otherwise affect broader geopolitical relations around biotechnology:

Both the US and the EU have, in recent years, been negotiating free-trade agreements with developing countries. Those agreements, some of which also cover non-tariff barriers to trade, such as environmental and consumer risk regulation, may have the effect of locking in either the US or the EU model of agri-biotech regulation in large parts of the developing world. (Bernauer, 2005: 24).

Consequently, the U.S. has some motivation to challenge the EU in order to deter developing countries from “emulating the EU’s agri-biotech regulation,” and potentially compromise the United State’s market access for its new biotechnology products (Ibid.).

While the most obvious contours of the American dominated corporate biotechnology food regime appear set, there are still significant factors that could upset the gelling of the regime as it currently appears to be unfolding. Three issues appear highly significant for this potential: the first is the development of international agreements, and (equally significantly) the power that nations attribute to them; the second is the impact of shifting national priorities resulting from domestic pressures, such as legal changes or significant sub-national (or sub-union, in the case of the EU) resistance; lastly, is the impact of the costs and benefits of the technology itself, as the technology is still sufficiently new that dramatic shifts in its development could shift global opinion-- in either direction. Notwithstanding the latter’s importance, the discussion here will focus on the first two.

As we saw in Chapter 1, food regime scholars such as McMichael (1992) argue that under international trade agreements such as GATT “national sovereignty would be subordinated to an abstract principle of membership in the state system that sanctions corporate rights of free trade and investment access” (354). The constraints on national autonomy suggested are two-fold, resulting both from international agreements and from the internationalization of capital itself. State subordination due to the power of internationalized capital does not yet seem to have been a factor in biotechnology regulation. As biotechnology is increasingly integrated into the larger food-sourcing project, however, nation-states will likely become more vulnerable to capital’s dictates.

With respect to international agreements, there are already indications of their constraining nature on states. Further, as the United States is often a central power in the development of these agreements, they are most likely to act as a means of consolidating American power. To the extent that biotechnology fulfills its promise in this unfolding agricultural order, agreements recognizing intellectual property rights of these biotechnologies will be central. The WTO's TRIPS agreement is therefore a key feature of the corporate biotechnology regime.

Vandana Shiva argues that the U.S. aimed to make intellectual property "its primary asset for economic growth" (Shiva, 2001: 19), and that a global patent system was central to this aim. The adoption of Trade Related Intellectual Property Rights (TRIPS) under GATT imposed just such a system, and secured US advantage over developing countries with respect to patents on life. As noted, TRIPS require countries to adopt a patent or sui generis system of plant variety protection, such as UPOV. However, UPOV is heavily weighted in favour of protecting corporate rights over the social policy goals that a nation may have. Consequently, Shiva argues that TRIPS represents an act of 're-colonization' of the South by the North (Shiva, 2001). However, the homogenizing effect of TRIPS is not yet certain. For example, some countries are resisting the US version of plant variety protection. Further, the ambiguity with respect to how the TRIPS agreement reconciles with the Convention for Biological Diversity [CBD] has led to some heated debate with respect to which has precedence (Shiva, 2001:103). Some scholars argue that the CBD and the Cartagena Protocol "have become staging grounds for resistance to WTO rules and to the market-based management of genetic resources that the WTO supports" (McAfee, 2003:175-6). These battles are waged in the WTO

agreements and in the associated agreements. For example, as noted, the US is working to impose its perspective on voluntary (rather than mandatory) labelling at the Codex Alimentarius, and is challenging EU labelling requirements as unlawful at the WTO (Davidson College, 2004). Amending these laws could significantly weaken EU regulations.

Without doubt, the most highly significant aspect of the coming food regime will be the shape and force of international agreements. However, the practical reality of these international agreements is still unfolding. If the US were to be successful in their challenge at the WTO, and, of course, dependent on the EU's response to this success, the ruling could definitely lend support to the constraining nature of international agreements. An EU policy response in favour of US style biotechnology and against the wishes of its citizens would seem to support food regime concerns. However, whether the EU would adjust its policies in response to a US win remains to be seen. There are significant indications that the WTO ruling "is likely to have more political resonance than actual impact on European food and agriculture sectors" (Minder, 2006). Similarly, Bernauer argues that it "is very unlikely that the EU would back down and change its regulations in line with US requests" (2005:16), and more likely an EU loss would result in a series of punitive measures and countermeasures. The EU has its own domestic pressures and is unlikely to be willing to bow to what it sees as American bullying. Tellingly, the European Commission was recently cited as stating that the WTO report would not force changes to the EU's regulations. Rather the European Commission emphasized that, "Only products recognized as safe will be allowed and the WTO report will not influence the decision-making process in the EU" (cited in Minder, 2006).

Notwithstanding the potential for limitations due to international laws (assuming they are respected), the three regions discussed here have demonstrated a great amount of national regulatory autonomy. International laws could change this, if the motivation to abide by them was sufficient. If the perspective of food regime scholars was taken to the extreme, so could future decisions by an internationalized biotechnology industry, no longer dependent on state support. For the time being, however, biotechnology *is* a national or economic union driven enterprise. Consequently, whatever happens within these political entities to affect their priorities can affect the shape of the evolving regime.

Domestic priorities can change from political pressure from below the nation or economic union. These pressures are most evident in the European Union, with its trouble getting member state compliance over GMOs. Despite the fact that the EU has put in place regulatory changes and declared them sufficient to restart the approval process for GMOs, it has yet to get all member states—some of whom are receiving strong anti-GMO pressures from their citizens-- to observe the EU legislation. A number of nations, such as Austria, remain vehemently opposed to GMOs in their territory, putting an EU-wide GM policy in jeopardy. This lack of unity weakens the EU's position with respect to the US.

Such bottom-up pressure is not unique to the EU, however, but is also evident in the United States, and Canada, to a lesser extent. A study of legislative activity on agricultural biotechnology by the Pew Initiative on Food and Biotechnology found that while “the regulation of agricultural biotechnology was not a top priority for Congressional legislators,” the states “have emerged as the key battlegrounds of issues raised by agricultural biotechnologies” (Pew, 2003: np). Between 2000 and 2001, 158

pieces of legislation were introduced at the state-level. While many of the bills and resolutions dealt with preventing anti-crop destruction (28%), a number dealt with issues such as the regulation of GM crops (12%), liability and agricultural contracts (18%) and the labelling of GM foods (16%). Of course, the majority of these initiatives did not pass, and of the legislation that did pass a full 67% dealt with anti-crop destruction. However, such activity was still highly significant, was broad based (initiatives were from 39 states) and is indicative of bottom-up pressures facing the nation. For example, an initiative in Oregon (which ultimately did not pass) proposed labelling of GM food, much in the manner of the EU, and Maine proposed an outright ban on GMOs in the state. In Canada, an initiative has been put forward to make Prince Edward Island GMO free. In all three regions discussed here, there have been numerous petitions for GMO free zones. For example, on March 2, 2004, Mendocino County in California became the first country in the US to ban growing GM crops and animals.

Such local declarations carry a potent political force if sufficiently cumulative. However, the forces of opposition are not to be underestimated. A new challenge has been placed on the use of such local forms of resistance, as there is a concentrated effort by industry and its proponents to get pre-emptive state legislation prohibiting local governments from taking such positions. A number of such laws have already been passed. In North Dakota, for example, bill SB2277, passed on March 16, 2005, reads:

A political subdivision, including a home rule city or county, may not adopt or continue in effect any ordinance, resolution, initiative, or home rule charter regarding the registration, labeling, distribution, sale, handling, use, application, transportation, or disposal of seed. This section does not apply to city zoning ordinances (environmentalcommons, 2006).

Opposition to GMOs can take many forms, of course, and such laws do not necessarily spell the end of political resistance. Consequently, while the contours of a US-led corporate biotechnology food regime appear set, it is necessary to remember that the food regime, like globalization itself, is a contested phenomenon. In the words of Philip McMichael: “the trajectory of the corporate food regime is conditioned by its resistances” (McMichael, 2004: np). These resistances are increasingly occurring through the legal forum. National intentions can be affected by higher court rulings on issues significant to the developing industry. For example, higher court rulings on issues such as the patentability of life, ownership of self-reproducing inventions, infringement from involuntary presence of patented material, liability for contamination of involuntary presence of patented material, and monopoly breaking decisions around biotechnology companies, all could have a major impact on the way in which a technology develops in a certain nation. Rulings on such issues can make a region a more or less favourable location for the biotechnology industry, and consequently could affect political strategies for economic development. Further, such court rulings can act as focal points for broader resistance strategies, by providing a means to have such issues debated in the broader public.

Conclusion

In conclusion we have seen that the North American regulatory regime for biotechnology is characterized by regulatory gaps, poor compliance, and other indications of weakness. There is strong support for the position that the regulatory weakness in the United States and Canada is not the result of passive regulatory oversight, but rather an active program to facilitate the biotechnology industry’s development. Rebecca Bratspies

argues with respect to the weakness of biotechnology regulation in the United States that, “the central culprit is a laissez-faire regulatory philosophy” (2003:631). The ‘weaknesses’ produced by this philosophy have been just the right thing for the development of an American biotechnology empire.

Agricultural production itself is no longer a driving force in industrialized economies; however, the input and processing sectors around agriculture provide vast opportunities for business to “farm the farmer.” As noted, together the United States and Canada account for 65% of the global production of transgenic crops, making North America the world leader in agricultural biotechnology production. While the global area of biotechnology crop adoption is still increasing in both developed and developing countries, this crop area is now increasing at a much greater rate in developing countries. Between 1996 and 2005, the global area of biotech crops grown by developing countries increased every year (James, 2005a). By 2005, however, the growth of biotech crop area from the preceding year in developing countries (23% increase from 2004 to 2005) far exceeded that of the growth in industrial countries (5% increase) (Ibid). Consequently, a technology such as genetic modification, that can transform agriculture on a global scale, can provide massive economic benefits for its producers; notably, North America. In this way, the biotechnology revolution is reminiscent of the program of industrialization of developing world agriculture that followed the green revolution of the 1960’s (Otero and Pechlaner, forthcoming).

Following on the trends of the first and second food regimes, global agriculture continues its pattern of increasing integration. Turning food into a compilation of globally sourced components is key for furthering this integration, and the future of

biotechnology suggests the ultimate conclusion of this process is quite near. Based on global trends, it is not too early to claim that biotechnology is central to the next world food order. Corporations are central to biotechnology, and all evidence to date shows the new world food order will be an American led corporate biotechnology food regime. What is left to determine is what impact this new regime will have on national autonomy, as raised by those who advocate the food regime and globalization perspectives, and whether any alternatives remain possible.

With respect to national autonomy, this research has provided a direct contrast to the picture that many globalizationists paint of corporate rule presiding over cowering and powerless nation-states. This regulatory overview has revealed that the unfolding of the international corporate biotechnology regime (driven from North America) is largely a state supported enterprise. Both the United States and Canada show profound regulatory weakness, but in both regions there is equally good evidence that this weakness is more the result of state predisposition than a lack of national autonomy. The evidence indicates that the regulatory capacity of these nation-states is anything but declining at the current time. Rather, the 'corporate era' of agriculture is an actively facilitated state project, as far as North American agricultural biotechnologies are concerned. This conclusion is in keeping with the food regime perspective, which sees the institutionalization of corporate rights through international agreements such as the WTO as a "state-initiated project" (McMichael, 2004: np). Similarly to Urmetzer's findings, the key motivator here appears to be ideology not inability: in this case, a strong state ideology of support for biotechnology development.

These findings need to be strongly qualified with an awareness of the relative strength of these nation-states in comparison with that of developing countries, who are more likely to be rendered pawns in such a political enterprise. The evidence of this is already emerging, for example in the US and EU positioning around the potential rejection of US food aid shipments of GM grain to Africa. For its part, the EU (when considered as a unit) shows a strong tendency to continued regulatory intervention, and, while there are national differences, as a whole the EU demonstrates a continued strength with respect to EU specific priorities. Despite the United States' primacy in the industry, its continued pressure tactics, and its ultimate WTO challenge (along with Canada and Argentina), the EU has persisted in adopting a more precautionary course with respect to biotechnology regulation. This course has national variation within the EU, of course, however it is clear that the corporate biotechnology regime promoted by the United States and institutionalized in international laws is not inevitable. Countries, such as Canada, could have significant regulatory leeway if they so chose, or if the domestic pressures were sufficient to prompt such autonomy.

CHAPTER 3

BIOTECHNOLOGY IN THE PRAIRIES: THE RISE OF CANOLA AND THE FALL OF WHEAT

We are in favour of the fact that they are bringing in new biochem. products to market. ... So if biotechnology can increase productivity, increase our net returns for farmers, we are in favour of it. We are in favour of anything that would increase our net profitability. (SK#21, Saskatchewan Canola Growers Assoc.)

It could affect us. Our neighbour just owns it and it blows over to us the way Percy claims it happened to him, which I strongly believe that's what happened—yeah, organics could be a thing of the past. Definitely. (SK#12, Organic producer).

I think if farmers made more money, you know, in the end, I think they wouldn't have to turn to some of these things. It really becomes an economic issue, really. Strictly a survival issue. (SK#20, Producer/Seed dealer)

Introduction

Bordered by Manitoba on the east and Alberta on the west, Saskatchewan is at the heart of Canada's prairie region. The province occupies 161 million acres and has a population of almost 1 million (Government of Saskatchewan, "About"). The urban centres and the majority of Saskatchewan's population live in the prairie southern half of the province. To the north is the Canadian Shield, characterized by inaccessible rock and forested wilderness. In addition to its distinctive geography, climate and weather play a key role in Saskatchewan's characteristics. Saskatchewan winters are long, cold and dry, while summers are short, hot and dry. Saskatchewan receives an extremely large amount of sunshine each year, gaining the designation of Canada's sunniest province, and some

areas of the province even rival locales such as Rome in terms of hours of sunshine. Nonetheless, the short summers mean a relatively short growing season, with 60-100 annual frost-free days (International Society for Horticultural Science, "Canada").

Within the province itself, there are significant regional differences. The far north is severe and non-agricultural. The growing season increases as you go south, and the southern half of the province ranges from moderate to semi-arid conditions, such as in the southwest. Even within a given region there is great seasonal variation. For example, historical temperatures for Regina, in the southern third of the province, have ranged from -50 degrees Celsius to well above 0 in January, and from well below 0 to 35 degrees Celsius in July (International Society for Horticultural Science, "Canada"). Obviously, such variation makes weather a key factor in agricultural production, and makes drought and frost tolerance in crops traits of high value.

As of the 2001 Census of Agriculture, Saskatchewan has 50,598 farms, covering 64.9 million acres (Saskatchewan Agriculture, Food and Rural Revitalization [SAFRR], 2002a). The number of farms in the province have declined (11.2% from the previous census in 1996), which is consistent with an overall national decline in farm numbers (Statistics Canada, 2001). Nonetheless, farmland only declined 1.1%, and it still covers over 40% of Saskatchewan, and a vastly greater percentage of the more inhabitable southern half. In 2001, the average size Saskatchewan farm was 1,283 acres (SAFRR, 2002a). However, this average incorporates a large number of hobby farms. In the reality of commercial agricultural production in Saskatchewan, 2-3,000 acres is more the commercial norm, and 5,000 acres is not uncharacteristically large.² Despite agriculture

² Personal communication with SAFRR employee. Telephone communication. 2006.

declining in significance while the service sector increases, agriculture nonetheless remains very important to the province's economy, generating about 2 billion dollars annually (Statistics Canada, 2001) and employing 10% of its workforce (Government of Saskatchewan, Bureau of Statistics, 2004). At the same time, biotechnology is another significant part of the province's economic plan. The provincial centre of the bio-economy is Innovation Place—one of the province's two research parks—located at the University of Saskatchewan in Saskatoon. The Innovation Place research park is responsible for 7,900 jobs and contributed \$184 million to the economy of Saskatoon, and \$262 million to the economy of Saskatchewan in 2004 (Government of Saskatchewan, 2005). It focuses on agriculture, information technology and the life sciences. Approximately 35 companies are specifically engaged in agricultural biotechnology research and development in the Saskatoon park. This accounts for about 30% of the nation's activity in this area, and according to the National Research Council of Canada, it is "recognized as one of the largest clusters of its kind in the world" (NRCC, 2005). It is here that the world's first genetically engineered commercial canola variety was developed (Ibid).

In sum, both agriculture itself and agricultural biotechnology are very significant to the provincial economy. At the same time, Saskatchewan is a key locale for Canada's burgeoning organic agriculture industry. It has the largest acreage of organic production in the nation, making up 33% of all organic agriculture production. By 2003 there were 1049 certified organic producers in Saskatchewan—over 2% of Saskatchewan's farmers—and this number is growing, with another 25 farms in transition to certified organic status (University of Saskatchewan, 2004). As we shall see, while relatively

small in numbers, Saskatchewan's organic producers are nonetheless quite vocal on their issues. Biotechnology is an issue not only because the philosophy of organic production is antithetical to the type of agricultural production that genetically engineered canola represents, but because genetically engineered organisms are prohibited in organic production. Further, Saskatchewan has also been the stage of two highly publicized lawsuits over genetic technologies that have formed the hub of some significant anti-biotech resistance. The impact of biotechnology on agriculture is particularly interesting given this apparently polarized context.

Saskatchewan farmers grow mainly grains, oilseeds, and specialty crops. Wheat, of various types, remains a highly important crop, although wheat production in the province has dropped significantly (over 55% between 1996 and 2001 (SAFRR, 2002b)) as low wheat prices have motivated some producers to switch more towards livestock and forage crops. In addition to wheat, Saskatchewan producers grow a variety of coarse grains, such as barley, oats and rye; oilseeds, such as canola and flax, pulse crops, such as lentils and peas, and mustard and canary seed amongst others. The top five field crops in Saskatchewan are: Spring wheat; barley; alfalfa and alfalfa mixtures; canola; and Durum wheat. To date, transgenics have only really been under commercial production in one crop in Saskatchewan—canola—although a very small area of transgenic corn is growing, and attempts have been made to introduce other transgenic crops in the past, such as flax and wheat.

Canola is an important crop to Saskatchewan. In 2001 it was produced on 33.4% of farms (Canadian Statistics, "Selected Oilseeds"). Production patterns do differ by region, and many variations exist; however, a classical rotation pattern for a

Saskatchewan farmer would be to grow an oilseed, then a cereal, a legume, and a different cereal or canola again, growing canola every 3rd or 4th year. Because canola has been higher priced in the past, some growers try shorter rotations, some even growing canola every 2nd year.

There are currently two kinds of genetically engineered canola on the market in Saskatchewan, Monsanto's Roundup Ready canola (resistant to its herbicide Roundup) and Bayer CropScience's Liberty Link canola (resistant to Liberty herbicide). Market share statistics are difficult to obtain, but knowledgeable sources estimate that 92% of the canola grown in Saskatchewan is herbicide tolerant of some sort. Of that, approximately 45% of canola is Roundup Ready, 30-32% is Liberty Link, and 15% is Clearfield canola (SK#28, Saskatchewan Canola Development Commission). The Clearfield canola, by BASF, is a herbicide tolerant canola that is produced through a process called mutagenesis, and is not genetically engineered.

Liberty Link canola, currently owned by Bayer CropScience, was the first genetically engineered herbicide tolerant canola to be introduced. The first Liberty resistant canola plants were open pollinated varieties, and were introduced in 1995 (Bayer CropScience, 2006). Monsanto first introduced Roundup Ready canola, also an open pollinated variety, in 1996. Whether due to Liberty Link's poorer yields, as has been suggested, or due to producers' greater familiarity with the Roundup chemical, Monsanto's Roundup Ready canola soon captured the bulk of the herbicide tolerant canola market. In 1997, the Liberty tolerant trait was introduced into a class of hybrid canolas, called InVigor, which markedly improved yields. Currently Liberty Link

canola's market share is reportedly on the increase. At the same time, Monsanto is progressively shifting its Roundup Resistant trait to hybrid varieties.

In order to investigate to what extent agricultural biotechnology is reorganizing agricultural production in Saskatchewan, I conducted 37 interviews with 40 stakeholders, primarily during two visits to Saskatchewan (one in March and one in July of 2005). Two interviews were also conducted in British Columbia in November of 2004, and one was conducted by telephone in October 2005. Given my focus on the changes brought by the legal aspects of the technology, I conducted a number of interviews with litigants directly involved in the Schmeiser and Hoffman lawsuits, as well as with organic producers (given their attempt to certify as a class), conventional and GM producers, and stakeholder organizations in agricultural production. While producers who grew canola were of particular interest, wheat growers also had a vested interest in genetic engineering, given the attempted introduction of Roundup Ready wheat in the early 2000's. This chapter draws primarily on the data from 34 of these interviews; 17 with producers (7 organic, 8 GM and 2 conventional), 14 with representatives of agricultural organizations and other stakeholders (including government), many of which were agricultural producers themselves, and 3 with knowledgeable informants. There is obvious overlap in many of these categories—for example, many organization representatives are also producers themselves. The remaining interviews are related more specifically to the Schmeiser and Hoffman court cases, and feature more prominently in Chapter 4. A complete list of interviewees can be found in Appendix B.

The interview data reveal that the adoption of genetically engineered canola in Saskatchewan is due to its benefit to agricultural producers. There has been no indication

that producers have adopted the technology as a defensive manoeuvre against infringement litigation. While the economic benefits are not unambiguous, producers clearly gain sufficiently either in economics or in production benefits to justify the cost of using the technology. Low commodity prices and consequent poor returns increase the importance of any yield benefit a technology can provide. However, Saskatchewan producers remain sensitive to their vulnerability to the market. Further, while resistance to the technology is low in local environmental groups, it has found other avenues: resistance is evident from organic farmers, it is evidenced in the 2 lawsuits to be considered here, and it has arisen dramatically in relation to specific technological applications (e.g. Roundup Ready wheat). These resistances clearly inform the context of biotechnology development in Saskatchewan.

Who Wants to Grow Genetically Engineered Herbicide Tolerant Canola?

With 92% of production, herbicide tolerant canola is clearly the preferred approach for canola production in Saskatchewan, and within that, the genetically engineered varieties—with Roundup Ready and Liberty Link varieties together making up about 75% of production—are the most desirable. Much of the remaining 8% or so that is not herbicide tolerant canola is canola selected for a specific purpose outside of what is offered in GM varieties. For example, there are two types of canola—Argentine canola (*Brassica napus*) and Polish canola (*Brassica rapa*)—but only *Brassica napus* is genetically engineered. *Brassica rapa* is lower yielding, but requires a shorter time to maturity. Therefore it is favoured in the northern regions where the growing season is typically shorter, and the risk of frost before maturity is much greater. Private industry

pulled out of genetically engineering rapa and only conventional breeding is done on this type of canola. Therefore a great deal of the remaining conventional canola is rapa grown in the northern regions. Further, a number of specialty canolas, produced on contract for specific purposes, such as high oleic acid canola, are still conventional, although increasingly they are also being offered in herbicide tolerant varieties.

Opinions about genetically engineered canola in Saskatchewan can be mixed, depending on who you ask, however there is a fair amount of consensus about the technology amongst its users: whichever system they use, herbicide tolerant canola has provided a number of agronomic benefits and has aided their production of a higher value crop that has previously been one of the more difficult to grow. Some other benefits noted were: reductions in necessary tillage; increased flexibility in chemical application; reduced work time; and apparent benefits to direct seeding and conservation practices. Nonetheless, the technology is not without its detractors, most notably organic farmers, and these will also be discussed in turn.

For those who use and appreciate genetically engineered herbicide tolerant canola, the benefits have been firmly planted in improved weed management. Canola is one of the more difficult crops to grow with respect to controlling weeds, as it is more easily out-competed by weeds than other crops. At the same time, there are many weed species that are closely related to canola, so unlike some other crops, there was no good herbicide that could selectively treat weed problems in canola without damaging the crop itself. For this reason, prior to herbicide tolerant varieties, canola could not be grown at all on land where there was significant weed pressure. The Roundup Ready [RR] and Liberty Link [LL] systems allow for in-season weed control, and farmers can spray

herbicide over the top of the already growing canola plants, drastically reducing weed pressure as an agronomic factor. The benefits of this in canola production are obvious. Most notably, genetically engineered herbicide tolerance has allowed canola to be grown where previously it had otherwise been too difficult:

One of the reasons I haven't grown canola over the years is weed control problems, and that's been solved by these new technologies. Well, with the chemicals we can use now we can get a lot better weed control in the crop. It's a lot simpler. (SK#14, Producer)

We plant canola now where we would never think of planting it because of... it all comes down to weed management. There are farmers now who plant canola on just the roughest, dirtiest fields—dirty meaning lots of weeds—that would never have thought of planting it before. (SK#38, Producer)

Not only can genetically engineered canola now be grown where it couldn't before, but the resulting canola is “cleaner” or freer of weeds, due to the post-emergence application of herbicide. This benefits the farmer by increasing his yields—as less weeds means less competition for water and nutrients—and by increasing the value of his crop, which now has less dockage, or weed seeds, mixed in with it. A high percent of dockage can reduce the value of a crop significantly.

[W]hen we had the open pollinated varieties, we had problems with weeds that we couldn't kill out there, in the crop, they just grew uncontrolled out there and then you had more dockage. Whereas with these new varieties, these altered gene varieties, you can grow a cleaner crop. That's how it affected my farm. (SK#29, GM Producer)

Herbicide tolerant canola has also coincided with new perspectives on moisture retention. While leaving land to summer fallow had been the traditional philosophy of moisture preservation in Saskatchewan, the current agronomic philosophy is that this leaves soil vulnerable to erosion and the use of continuous cropping is advocated.

Herbicide tolerant canola leaves fields clean of weeds, and facilitates direct seeding onto the previous year's crop stubble. The reduction in summer fallow provides farmers with an opportunity for increased income, as they can keep more land in production each year.

The technology has also provided a management benefit to those who farm large acres or those who have other constraints, such as working off farm. One way it does so is by widening the chemical application time, given that the genetically engineered canolas allow producers to spray after the plant has already emerged. As a crop development specialist characterizes it:

So somebody that is farming on the weekends, being able to spray Roundup or Liberty, and the crop is safe at any stage, that is pretty attractive. (SK#2, Academic-Crop Development)

Another way genetic technologies provide management flexibility is by reducing the amount of cultivation—and associated work time—through advantages like direct seeding. One young farmer describes this below:

For us, in a sense, we were running out of time. My dad works out like me. We were both working. For us we just found we would have to be working the fields in the fall, preparing them for seeding, trying to get the weeds out—we just found we were limited with time, and the more land we took on the less time we had for prepping our fields, and in a way we just thought this would be a way in which it would make our lives a bit easier. (SK#38, Producer)

Therefore, in addition to its weed control benefits, a number of producers found that GM technologies provided some significant management benefits. However, the technology, particularly the RR technology, is not without management drawbacks as well. In particular, one drawback of the technology results from the widespread use of Roundup as a general herbicide prior to the introduction of RR canola. Roundup had become the mainstay of farmers for spring burn-off and for other weed management

related jobs. Roundup Ready canola therefore added a management complication, as volunteer canola from a prior crop becomes a weed for any non-canola succeeding crop—one that cannot be managed by the usual treatment of a glyphosate herbicide. One producer explains this management issue:

[S]ometimes you don't just have volunteer canola the following year... you might have canola show up in your field two years down the road, three years. A canola seed can stay in the ground for some time. So say three years down the road, you go out to spray your field in spring, burn it off with Roundup, and you see all the canola laying there. Right? And you want to sow flax on there. Well, you can't put 2-4-D in your tank to kill the canola because it's a residual, it'll kill your flax when it comes up. So that's a definite drawback, you really have to watch the following years when you try to kill your canola off, what you are seeding on. ...[Y]ou have to think about what you are doing more, you know. Plan your fields better, I guess. (SK#26)

For most producers, this added management was well worth the benefits brought by the RR technology. For others, using Liberty Link canola had yield advantages as well as avoiding any of the management issues of the doubled up use of glyphosate-based herbicides. For a small minority, the irritation extended beyond their individual practice. As one producer complained, Monsanto's claims that their RR canola would not spread was "bullshit" and the spread of RR canola was a great nuisance because 2-4-D had to be used in the yard instead of Roundup when the canola volunteered.

Given the huge significance that the risk factors of environmental biotechnology place in international debates, it seems prudent to consider the opinions of those who work with the technology themselves. Yet, despite the fervour that swirls around these issues outside of the agricultural sector, there are few strong opinions about the health, safety, or environmental risk of the technology at the farm level, although opinions certainly exist. As one producer explained it to me, while there is a debate about the

technology, and while many producers hold opinions on either side of that debate, the rest of them just work out whether the technology will make things better for their farms, and base their decision on that. Even more pointedly, one producer quite succinctly characterized how farmers' overwhelming concern is with their bottom line:

I think they [the health, safety and environmental risks] are significant, but so far I don't believe that the concern in a mass way is preventing the primary producer from producing them. I think the pressures, the economic pressures, are so great on the farm that they're willing to accept those risks. (SK#11, GM Producer)

While expressions over broader environmental and health implications such as the above can occasionally be found, they are rare outside of those involved in organic production. This is not surprising given the concerted effort of industry leaders to promote the 'safety of biotechnology' message that, if compromised, could hurt consumer demand. More directly relevant on the farm level, chemical use, cross pollinations, and resistance to chemicals (the superweed issue) are environmental issues that would overlap with production issues. However, again, these issues did not appear to warrant a great deal of consideration by those involved in production, and there did not seem to be any hugely significant reorganization of production around these issues.

One topic—the environmental benefits of using Roundup over other chemicals—occasionally warranted comment:

What I used to use as far as insecticides, fungicides, and herbicides... what I used to use and how lethal it was, compared to today, second to none. (SK#4, Canola Council of Canada)

This type of comment was heard most often from institutional organizations, but occasionally by farmers as well. On the other hand, what farmers readily discussed but industry and many organization leaders didn't was the increased need to add chemicals to

Roundup in order to manage RR canola volunteers. These chemical additions not only counter the environmental benefits of using Roundup for the herbicide choice, but also add an additional cost to the overall chemical bill. The issue was particularly emphasized with respect to the attempted introduction of RR wheat, which would have resulted in two important crops that required additional chemicals in order to control them. In any case, the impacts of chemical reduction or chemical additions have not had any significant impact for the majority at this time. For example:

We were concerned about how to control the Roundup Ready canola. It hasn't turned out to be too big of a problem. It has been fairly easy to control. ... Chemicals that you use in wheat generally wipe out the canola pretty easily. (SK#3, Seed Dealer/Producer)

Nonetheless some producers expressed irritation at canola that could not be killed with Roundup volunteering in their yards and between their trees. In the event of this occurring, farmers must respond outside of the use of their traditional tool of Roundup, sometimes even removing the plants by hand. However, the problem does not seem to be overly significant for the majority.

The most significant of the environmental issues for Saskatchewan producers is the issue of weeds developing resistance to glyphosate; and to date, the issue has predominantly remained in the realm of a potential concern. Outside of the debate over Roundup Ready wheat, where the issue was given a fair amount of play, and despite extensive coverage by environmentalists,³ the issue appears to currently be of low concern to the majority of producers. Canola is only one of a variety of crops grown in a farmers' rotation, although the higher price and the improved weed control have

³ The discovery in Canada of a canola that had become resistant to three different herbicides was given a great deal of coverage by environmental organizations (see, for example: Beyond Pesticides, 2001, "Genetically").

increased the acres of canola grown. As yet, there is little evidence of resistance. Further, in the event of resistance, the fact that farmers can switch to another oilseed crop, change to another herbicide resistant canola, or increase their cereal or specialty crop acres may limit the concern they have over its development. For example, one farmer I spoke to explained that while resistance was not yet an issue, he was motivated to use Liberty Link canola so that he could still use Roundup for burn-off while reducing the chance of resistance to the chemical developing on his farm.

But Does It Help Make a Buck?

In sum, the physical aspects of genetically engineered herbicide resistant canola appear to have been predominantly beneficial, although there are certainly those who disagree with aspects of the technology. It is possible the technology has been slightly too beneficial, as a number of respondents ruefully noted that the vast increase in canola acreage in Saskatchewan has been followed by a reduction in the value of the crop. However, others argue that the price of canola oil is set by the price of soybean oil from the US and other markets, and that canola volume has no impact on this price. While it is not possible to consider economic returns free of the issue of commodity price, estimates can be made about the relative economic benefits of the technology compared with conventional canola. And with respect to whether the technology has provided an economic benefit to growers, the conclusion is far more ambiguous than for its physical attributes.

This economic ambiguity could have something to do with a producer's previous practices. For example, for those who previously could not grow canola, the genetically modified varieties have provided them with a new and economically beneficial cropping

option; this may contrast with those who were already growing the crop and only changed inputs. In any case, a number of growers emphasized that the technology had unambiguously provided them with an economic benefit as a result of gains from weed control. At the same time, a significant number of other growers were appreciative about the technology's weed control benefits but remained ambiguous about its economic ones:

It's been convenient for us on the farm, that's for sure. It's allowed us to grow canola crops that have a lot fewer weeds in them. Yeah, weed control has gotten a lot easier. And I was going to say cheaper, but I'm not sure of that. You've got your technology fee of \$15/acre and another \$5-10 of chemicals. So overall I'm not sure it's cheaper but it's more effective. (SK#3, Seed Dealer/GM Producer)

Similarly:

Over the... since 1999 I'd say I was farther ahead [economically] with growing altered gene variety canola instead of open pollinated. Some years it's been close, there really hasn't been a lot of difference, but I would say since 1999 it's probably been a benefit to me. (SK#29, GM Producer)

By all accounts, the cost of the Roundup Ready and the Liberty Link herbicide systems were fairly similar. Roundup Ready canola was sold with one of the cheapest herbicides, Roundup, which had gone off patent and therefore faced competition from generic chemicals. However, Roundup Ready technology was only sold with a \$15 per acre Technology Use Agreement [TUA]. As one grower explained it to me, Monsanto's seed plus the TUA together cost about \$35-40/acre with an added \$5-6 for chemical application. The cost of Bayer CropScience's Liberty Link canola's seed was similar to Monsanto's but had no accompanying technology fee. However, it's Liberty chemical was still under patent and was priced sufficiently high that the LL and RR technological packages ended up being on par with each other.

Producers of both kinds of genetic technologies often noted the increased cost of seed. When asked whether he felt the technology had any drawbacks, a Liberty Link grower states it:

Probably the initial drawback would be—and one that you notice the quickest—is the increased cost of seed. That would be the only drawback that I can think of. (SK#29)

While overall the costs of the technology were considered high, for many biotechnology wasn't specifically singled out, but was considered just one of a number of high input costs a farmer was unable to balance against low commodity returns. The voice of the farmer from Saskatchewan is clear: inputs are rising, commodity prices are low and farmers are finding it harder and harder to survive. The end result is farmers pushed closer to the financial edge:

Your seed costs and of course your sprays are going up every year. It's getting to be a bigger risk all the time. A guy used to be able to absorb one or two failures, now one failure can damn near sink you. Because everybody is maxed out on their operating loans, and their credits, and that kind of stuff. (SK#25, GM Producer)

One drawback that was specific to the increased cost of transgenics is that it is an up front cost, due before the crop—and any potential yield benefits—has been harvested. While the added input cost might provide a net economic benefit when the harvest is good, it increases the risk when drought, frost or other failures affect the productivity of the crop. Further, while sentiments about the worth of the higher cost of the genetically engineered canolas were mixed, rising prices were noticed by both producers and stakeholders. As characterized by an agricultural consultant:

...you know growers increasingly are saying, 'Gosh, there's something out of whack when canola seed costs continue to go up and up.' You know, when a pound of canola seed is worth more than a bushel of canola

that you harvest there's something wrong. Fifty pounds to a bushel.
(SK#22)

The rising prices were often accompanied with a sentiment that producers couldn't do anything about them. The concerns over the rising price of canola seed were such that producer organizations were beginning to discuss how to address the issue. For example, the Saskatchewan Canola Development Commission [SCDC], a grower organization funded by a check-off,⁴ was increasingly considering the possibility of entering into canola breeding in order to provide some means to address rising seed costs:

And we are evaluating should we get involved in breeding programs to provide competition for industry. ... So that's the evaluation process we are in. To try and figure out what is the best way to provide reasonable priced seed to growers. So it's an issue. And it's one of the major issues we have in the organization right now. (SK#28 SCDC)

While producing conventional canola may have significant drawbacks, as will be discussed, canola is only one potential crop in a typical Saskatchewan farmer's rotations. Therefore, those who find the cost, or the risk, too high could choose to produce other crops. This can have a dual cost reduction, firstly because another crop would not have the premium charged on GM seed, and secondly because farmers can resave seed for non-patented non-GM crops. For example, the producer below explains how he strategizes with his crop choices:

I probably seed less [acres of canola] in the last couple of years, because of the expense, yeah.... Like last year I put in 250 acres of mustard, because I had my own mustard seed here, and it worked just fine, and of course that's conventional as well. So instead of canola, I might put in more flax in or something, flax is cheaper to seed too. (SK#26, GM Producer)

⁴ The canola check-off is a per-tonne fee deducted at the point of sale. The SCDC check-off deduction is mandatory, but funds are refundable upon request.

Of course, the net benefit of this type of strategizing will depend to a great extent on the price of alternative commodities, as canola has traditionally being one of the higher priced crops. Given the vast acreage seeded to canola each year, clearly a majority of producers are still finding it worthwhile to plant the crop despite any ambiguity in its economic benefit. The obvious question is: why?

The answer to the above question is readily apparent with a few conversations with farmers. Unlike in Mississippi, which we will see presently, the introduction of biotechnology has not had a make or break impact on the viability of the crop it has been genetically engineered into. However, Saskatchewan farmers are market dependent, and do not have the extensive agricultural subsidies that can ease the financial burden of farmers in the United States. In addition, they cannot pass any financial imbalances onto consumers, as they must take the price that the market sets for their commodity. Consequently, the number one concern for farmers squeezed between high input costs and low commodity prices is yields, and herbicide tolerant canola has allowed farmers to increase yields by decreasing weed competition and dockage, farming previously fallow fields, and by helping producers to farm more acres with the same amount of labour and equipment. Alternately, the GM varieties allow farmers to farm the same amount of acres with less effort, thus allowing them to supplement their incomes in other ways. Unfortunately, the increased canola yields producers gained through the use of biotechnology were not so much characterized by benefit, as by necessity. For example, the two GM growers below discuss how their yields have increased, without any improvement to their incomes:

When I first started farming in 1978 I grew open pollinated varieties and my costs were .25/lb, and I sold that canola for \$6 a bushel. That was back

in 1978. Whereas now my costs are \$6/lb and I'm still getting \$6 a bushel. My yields has gone up, like before my yield was maybe 30-35 bushels an acre with conventional open pollinated varieties, whereas I have gone up to maybe 150 bushels an acre with Liberty Link canola, but still with the prices the way they are now.... Basically what we are doing with altered gene varieties is we are working on yield, we are not working on price, and that is why guys are growing it. (SK#29)

You just keep getting bigger yields all the time, sell more, but you still get the same as you did 40 years ago. (SK#25)

It would appear that farming requires getting an edge of yields and staying ahead with that edge. While technology may not allow you to gain a better income (although for some, this is certainly the case) it will allow you to stay in the game. Those who don't adopt, fall behind. In this sense, for many the technology is not about economic benefit, but about avoiding economic disadvantage—a technological treadmill scenario familiar to many industries. There were those who noted that such technologically induced gains were temporary, as soon prices would drop in response to increased yields. However, there was always the hope that new technology would arrive on the scene and take them the next step to profitability.

In actual fact, there seemed to be a great deal of either hope or optimism in Saskatchewan that biotechnological developments in canola would provide producers with new marketing opportunities, and provide them with a global edge. Simply marketed as a vegetable oil, canola suffers some disadvantages against the very cheaply produced soybean oil, particularly given transportation cost differences and increasing competition from locations such as Brazil. As it was explained to me, 'there is only so much you can do with efficiency.' However, a number of specialty types of canola are grown, and these are marketed for a premium given their special uses. High erucic acid canola (produced

for industrial uses) is one such type, and high oleic canola (a healthier, more stable oil for health conscious consumers, such as in the Japanese market) is another. There is a great deal of interest in expanding these specialty oil markets, and biotechnology is seen as a key tool for creating these new applications. Therefore, in addition to providing potential yield increases, biotechnology is touted as the harbinger of niche marketing opportunities, with canola seen to be particularly suitable for engineering with specialty traits. This hope for the future of genetically engineered canola is not only held by industry and stakeholder organizations, but can also be found within the farming community. For example, one GM producer provided his rationale as to why he believes Saskatchewan needs to pursue agricultural biotechnology:

The trends are costs will continue to escalate. Market prices won't keep pace with it, not likely, and that squeeze will continue. The margin between your costs of inputs to what you get in the market place is going to continue to narrow. There are a few options being tried, one involves the biotech industry, and that is to engineer a type of crop that can be grown in an area where you haven't got foreign competition or competition in another region. ...somehow biotechnology take us into an arena that will allow us to produce in this region, and for a few years have an opportunity because you are not coming up against competition with that particular crop in a foreign country. (SK#11)

Who's in Control?

Monsanto's Technology Use Agreement

The costs and benefits of using genetically engineered crops are not restricted to their agronomic and economic impacts, however. A significant question raised by agricultural biotechnology concerns the issue of control: will the use of the technology reduce a producer's control over his or her agricultural production? A significant target

for those who have these concerns has been Monsanto's Technology Use Agreement [TUA].

For producers, it appeared that the ethics of the cost of Monsanto's Technology Use Agreement were nearly as irritating as the cost itself. Many felt that, given the justification for the TUA was the need for research and development dollars, the money had long since been recouped. The following is a fairly typical perspective:

Yeah, [the TUA] bothered me right from the beginning. I didn't believe in that \$15. Then after a while, OK, well they have to have it. But that was years ago. They don't need that no more. That's all been paid a million times over. If that's what they were using it for, their research, they haven't done any more, so quit it. (SK#25, Producer)

Given the proximity in cost of the RR and LL systems when you calculate the cost of their total technology package, the irritation with Monsanto's TUA went somewhat deeper than strictly with respect to its cost. While economically and agronomically the two technologies have a great deal of similarities, negative expressions are largely reserved for Monsanto. The TUA and its conditions of use are where one of the more significant differences between the technologies emerges. As noted in the introduction, Bayer fairly early on switched to hybrid production of its GM canola. With the production limitations of second generation seeds from hybrids, and with the price they set for their technology's patented chemical, Bayer was relatively assured of capturing a return on their investment without any further contract provisions. Monsanto, on the other hand, could not extract such returns from its off-patent herbicide, Roundup. Further, Monsanto's GM herbicide resistant trait was instilled in open pollinated varieties, and therefore there was no physical disincentive to saving and reusing the seed the following year. Consequently, the company resorted to the use of the TUA, which in

addition to its \$15/acre fee had a number of provisions that a grower had to follow in order to be allowed to use the seed.

As a number of stakeholders characterized it, producers object to Monsanto's TUA because psychologically they cannot see any benefit to what they are paying for. For example, representatives from the Saskatchewan Wheat Pool [SWP] and the Canola Council of Canada [CCC] characterize it thus:

You always hear complaints, I mean, nobody likes to pay something for a piece of paper, right? I mean, you'd like to see that in your pocket instead, right? But it's the format chosen by Monsanto to capture profit and the return on their investment. (SK#17, SWP)

The biggest thing that I have seen with TUAs is that—and I'll speak from a farmer's perspective here—I don't like to be controlled by anybody. If Monsanto wants to control me, they can kiss my butt. And yes I did sign it, but in my heart I don't like to be controlled in that fashion. ... The idea of paying for technology you are going to use is not a bad idea, but Bayer CropScience does it, and they don't charge you TUAs, they charge you every time you use the product. (SK#4, CCC)

However, as was only alluded to in the latter statement, it is not strictly the 'piece of paper' that offends farmers, but what is written on it as well. Monsanto's grower contracts have a number of provisions—such as prohibitions on seed saving, the obligation to sell the end product to a Monsanto approved processor, and the right of Monsanto to inspect a grower's fields for three years—that a producer must contractually accept in order to purchase the technology. These provisions can elicit some strong responses:

I don't like Monsanto, I feel they are heavy handed. They want to control the product from the time it goes in the ground to the time it goes into the consumer's mouth, and you're just a pawn, you know, their servant really. I don't use Monsanto products. I don't really care for their attitude. (SK#19, Conventional Producer)

Another producer reacted thus:

...when you sign the agreement, you know, you pretty well sign all your privacy away, they can come onto your land and check your farm three years from now, and check your bins and do all those things, and when that first came out it really rubbed me the wrong way. I walked out of the first meeting I went to. I just said there's no way I would sign up for this sort of—I don't know if invasion of privacy is the right word—but eventually I caved in. I got mad the first meeting and told them so, and told them what I thought. There's quite a few guys that when it first came out were rubbed the wrong way by that. It's not just about the \$15 per acre, it's about what that \$15 represented.... (SK#14, GM Producer)

As this producer described it further, he eventually saw the benefits of the technology demonstrated by other producers and ultimately decided to accept Monsanto's conditions, which in practice, he did not consider as fearsome as they initially appeared to him on paper.

Ultimately, the majority of producers do not appear to feel the company has abused its contract agreement, or that it is in any way nefariously out to get them. Most simply concluded that if they didn't want to sign the contract, they could just not use the technology. The issue of liability around the contract will be discussed further with respect to the Schmeiser lawsuit. However, with respect to the question of expropriationism, the restrictions on seed saving need further consideration. While accepting restrictions on seed saving with the use of biotech crops is assessed as a worthwhile trade-off for the average farmer at the current time, in the context of rising costs, and the prospect of an increasing number of commodities marketed under this system, such restrictions become highly significant to questions of expropriationism.

The Rise of Biotech and the End of Farm Saved Seed?

Prior to the introduction of biotechnology, the cost of canola seed was relatively inexpensive. In addition, seed saving required seed to be treated for use the following year, and this made up the bulk of the cost of seed saving. For the majority of farmers, this was considered too much hassle for the low savings that would be involved. Consequently, there wasn't a great deal of saving and reusing of canola seed prior to the introduction of GM technologies given the low economic benefit of doing so. Although seed saving did not appear to be routinely practiced in canola production, it was certainly practiced by a few. For these, the use of patented genetic technologies represents a full shift from previous farm practices, as the following exemplifies:

When I was growing conventional seed prior to 1999, I saved seed and got it cleaned and treated. I probably did that for maybe half a dozen years. But since I've been growing altered gene varieties like Liberty Link I've never kept a seed or cleaned it or anything like that. I've been buying certified seed every year. (SK#29, GM Producer)

While RR canola users are prevented from seed saving by contract, Liberty Link canola users are prevented by the disadvantage of yield loss resulting from using hybrid technologies. In either case, even amongst those who had saved seed in the past, most expressed no strong negative feelings about the practical restrictions on seed saving. At its simplest; the trade-off was a deal they were willing to take.

More hypothetically speaking, many producers nonetheless believed that seed saving was an important right to maintain. The issue of farmers' right to save seed had even more salience amongst the better informed in the community, as the Federal government had funded a Seed Sector Review [SSR] to consider the revisions to seed regulations. Currently the Plant Breeder's Rights Act [PBRA] restricts producers from

selling certified seed, but provides a 'farmer's exemption' that allows producers to retain seed for their own use. A serious concern over the SSR was that it would result in efforts to revoke this farmer's exemption, and require producers to purchase certified seed anew every year. In the eyes of many, the farmer's right to save seed was under significant threat. With respect to canola, those farm saved seed practices that did exist before the introduction of biotechnology had already been reduced to negligible amounts after its introduction. However, in crops such as wheat, which is considered more stable in retaining its characteristics, and where only about 5% to 20% of seed is purchased anew each year (depending on who you ask), farm saved seed plays a much larger role, and such restrictions could have a significant impact.

As stated, however, producers found the loss of seed saving in return for the technological benefits of GM canola was a worthwhile trade-off. Further, at the same time as there was support for farm saved seed, there was also an acknowledgement of the importance of new technology to the Saskatchewan farmer, and that if its producers did not gain a sufficient return on their investment, the technological advances would no longer be forthcoming. The balance of this perspective is particularly well noted by those in the contradictory position of seed dealers and farmer, as the following demonstrates:

... even as a seed grower, I'm in favour of farm saved seed, you know. We've got a real dilemma in our seed industry, you know, because farmers aren't making a lot of money, so they're really in a cost-price squeeze. ... So if farmers are in a tight squeeze they don't buy certified seed. They will back up to the bin, or the portable cleaner will come in to clean it, or they will clean it themselves, and put it back into the ground again. You know, so then you see... like the patents... they want to protect what they developed. I mean, it costs a lot of money to keep people around to do those things, and I don't blame that, but are they really making more and more money all the time; do they have to make as much money as they are? (SK#20, Seed Dealer/GM Producer)

You know, all of us farmers would like to save our own seed, but if the companies that develop the varieties can't see their way to a profit then they are likely to pull out their investment, and maybe not give us improved varieties as we go along. So it's kind of a dilemma there. (SK#3, Seed Dealer/GM Producer)

While regular seed saving may not have been an important part of canola production, the practice does provide flexibility in farming production during times of need. For example, farm saved seed provides farmers with another economic strategy when faced with low funds, as in the year following a bad crop. Alternately another economic strategy is to alternate farm saved seed with certified seed, intermittently purchasing certified seed in order to upgrade to better varieties. The importance of such flexibility has been given particular poignancy in Saskatchewan in the last few years, where drought and frost have had significant economic impacts. Most recently, in August of 2005, Saskatchewan suffered a killing frost that caused approximately a billion dollars in loss. These environmental curves have compromised the economic viability of many Saskatchewan farmers. Evidence of the trouble can be seen in auction sales and loan application declines, and the indicators are not good:

You know there are places in Saskatchewan where a third to a half of farmers that are going to the bank to arrange their operating loans this year get turned down. (SK#2 Academic- Crop Development)

In addition to these bad years, the economics of buying seed has also changed. While historically canola seed was cheap and the motivation for saving it was low, with GM technologies the cost of seed is now almost triple what it was before their introduction. Therefore, the economic incentive for saving seed has greatly increased. While Roundup Ready seed cannot be saved by contract, saving Liberty Link seed (while also patented) has only been prohibited in practice through the yield reduction that comes

from growing a second generation of a hybrid. Unlike corn, however, where this yield reduction fully prohibits a viable second-generation crop, the yield losses from saved hybrid canola are far from that dramatic. In tough times, absorbing the loss may be the best economic strategy for a producer, and in the last few years there was increasing evidence of this strategy emerging.

...in Saskatchewan we had 2 years of drought, 1 year of a bad crop, and another year was a mediocre crop, and economic conditions—a lot of farmers were saying hey, I can't afford to do all this stuff. I can't afford to take the risk. And a lot of farmers were [saving hybrid seed]. (SK#28, Saskatchewan Canola Development Commission [SCDC])

...with people pushed for resources and with seed costs going up, which is a big issue that I think is going to get more and more important, there have been people who are holding back and reusing hybrid seed. (SK#22, Agricultural Consultant/Media)

While hard statistics are not possible to obtain, numerous stakeholders estimated that by 2005 the amount of farm saved hybrid seed was already on the increase. A respondent from the Saskatchewan Wheat Pool estimated a recent change of 10-15% in the amount of purchased certified seed:

...in canola it's been as much as 95% purchased every year. I mean, now it's fallen 10-15% lower than that, because of the high seed prices and some of those growers not seeing benefit for those purchases, and they are trying to look at alternatives, in other words, keeping some of their own. (SK#17, SWP)

Given the rise in saved hybrid seed, in 2004 the SCDC initiated research into what kind of yield loss farmers could expect with the use of second-generation hybrid canola, in order to help producers assess their best economic strategy. While data was still being collected that year, it appears clear that hybridisation in canola is only a barrier to seed saving as long as farmers are sufficiently economic stable. In the current

economic scenario, many farmers felt pressured to reuse hybrid seed despite the yield reduction. Unfortunately for producers, Bayer addressed this increased seed saving by following Monsanto's lead. As of January 1, 2005, Bayer put new labels on their seed bags outlining 'conditions of sale' for their seed. While they did not include contracts with some of the extra provisions of Monsanto's TUA, their seed bag labels explicitly affirm their patent and their right to prohibit the saving of their seeds, which "shall be used only for planting of a single commercial crop" (copy with author).

In addition to the loss of a significant economic strategy, the prohibition on seed saving has had some unexpected impacts. In 2005, for example, Manitoba experienced extremely heavy flooding, such that fields were too wet for many farmers to seed their land. In consequence, many farmers only had volunteer crops from the previous year, including crops of genetically modified canola.. While in the past, a volunteer crop would be better than no crop at all, patents on GM technologies prohibited growers from the use of the second generation canola. The incident offered a significant glimpse into unexpected losses that farmers can face when compelled to accept restrictions on seed saving in order to access the GM technologies. Monsanto affirmed its TUA in response to the disaster, however Bayer CropScience made a specific regional exemption for the unusual environmental conditions, allowing producers to cultivate the crop where they could not plant another.⁵ A less well publicized and widespread problem in the future may not result in the same exemption.

⁵ The Manitoba website notes Monsanto asserts the conditions of its TUA, but that a grower considering keeping a stand of volunteer canola should contact Monsanto. It has been reported to me that Monsanto's concession was to allow producers to keep the stand, with the purchase of the \$15/acre TUA. This choice is difficult if the crop is only a partially successful crop. (<http://www.gov.mb.ca/agriculture/news/wet/volunteercanola.html>)

While part of a larger trend, it is clear that the restrictions on farm saved seed that biotechnology enforces are likely to significantly disadvantage producers over the long term. Replicated into other important crops—Roundup Ready wheat being a case in point—it is very likely that patented technologies will seriously reduce farmer's economic strategies in the long run.

The Alternatives

While producers have calculated that at the current time the benefits of biotechnology outweigh the drawbacks, trends in rising seed costs and the above discussion indicate that this might not always be the case. A further measure of control, then, would be whether there are viable alternatives for producers in the event that the balance were to tip away from genetically engineered canola in the cost-benefit analysis.

Strictly with respect to availability, conventional seeds are still available, most notably in a few specialty varieties sold under contract and in the shorter germination period Brassica rapa, but small amounts of open pollinated Brassica napa are apparently still available. A representative of the Canola Council of Canada firmly asserts the availability of conventional varieties:

You still have options. You don't have to buy their seed. You can buy other commercially available seed. ... They are available to you. You aren't restricted. That's a media hype, in my mind. (SK#4)

Somewhat less adamantly, one producer responds: "Yeah, it's still there" (SK#29, Producer). The response seems to sum up both the availability and the enthusiasm most growers have over any conventional canola that has no compensatory premium attached

to it, as do the specialty canolas.⁶ While technically available, there is no doubt in most producers minds that the genetically modified varieties of canola are superior, not strictly because of their weed control benefits, but because varietal development in yields and other traits have gone hand in hand with the investment into herbicide tolerance. While conventional varieties are available, they are not considered on par with the new herbicide tolerant ones. As frankly laid out to me by this and other growers, what little public varieties are available don't measure up in yield, so using them is a big disadvantage:

As far as not growing any conventional varieties, I guess it would depend on... it all boils down to yield in the end, and what you are getting for your money. (SK#29, GM Producer)

Similarly:

No, everything I've experienced is [conventional production is] a disadvantage because it doesn't yield as well. And you need every bushel in order to keep going. So that's the main reason why guys are changing, is yields. (SK#25, GM Producer)

Farmers seek out the varieties with the best yields, and as the development of new canola varieties has been taken over by the private industry, industry's emphasis has gone into the production of genetically engineered canola. While only herbicide tolerance has been genetically engineered, the packaging of this trait with other varietal improvements, such as disease resistance or improved yields, has made the GM seed package superior to conventional ones. The strict availability of conventional canola notwithstanding, opinions on the atrophy of public breeding in canola and the resulting decline in competitiveness of conventional seed are fairly commonly held:

⁶A number of specialty canolas are still conventional varieties. Producers secure a premium for growing specialty canolas as they are produced under particular conditions on contract for specific markets.

...some of the conventional varieties competed pretty well, but as time moves forward and nobody does any work on them, they have lower yields, they have less disease resistance, and you've still got, you know, the weed control problems in them.... (SK#22, Agricultural Consultant/Media)

In sum, herbicide tolerant canolas are improved in multiple ways, not just weed control, whereas the development of conventional canolas has fallen by the wayside. In the event that farmers should at some time want a return to conventional varieties, they would not be able to garner the yields that have become the norm for making a return. The disincentive to reject genetically engineered canola therefore becomes greater as time goes on.

Why has canola development become dominated by private industry only? According to some, the cost of getting regulatory approval is so high that only major companies can go through the cost of varietal registration, and this accounts for the decline in public breeding. According to others, the idea of 'biotechnology' took on such a life of its own that it overtook all other breeding, in a glorified case of the tail wagging the dog:

[Biotechnology] has kind of taken over from traditional plant breeding, and it is actually now the focus from which plant breeding is managed. Instead of a tool, the tool is running plant breeding, instead of the breeding tool being looked at as just a tool, and if it is economically wise to use it or not. (SK#17, Saskatchewan Wheat Pool)

No doubt there are a combination of factors. Further, the decline of public breeding would seem consistent with a general trend towards government cutbacks of traditional services in agriculture. For example, in 2005, the area agronomists were discontinued, and with it went hands on consultation and personal assistance to producers. Now government assistance to agricultural producers is only provided through

telephone service to the province's Agricultural Knowledge Centre. Whatever the cause, it is clear that while in the past there had been extensive government research into varietal development through breeding, now the government's focus is firmly on biotechnology, and in taking a supportive role to industry rather than commercializing varieties itself. Of course, the level of public breeding versus private depends to a large extent on the crop at issue. While canola has gone to the private industry, public breeding still occurs in crops like wheat and barley, and grower organizations are active in other commodities, like pulses.

Whether the progressive exiting of public breeding from varietal development is a retrenchment or a redefinition of purpose strongly depends on your position in agriculture. Some, like Ag-West Bio Inc. consider it the evolutionary climax of plant breeding:

So if you look at all the major crops that are grown on the prairies they are all at a different stage of evolution. So if you take the wheat industry as an example, almost all of the varieties on the market in the wheat industry come from public breeding programs. Why? Because private breeding companies are not engaged with wheat breeding to a large extent. ... And why aren't they involved? Because they haven't found a value capture mechanism that would give them a comparative advantage in the market place. So in that sense the wheat industry, I would say, is less developed because the public purse has to pay for the development of varieties and it is not in the private sector where it should be, in my view, because in the private sector you are more likely to get newer things happening faster, and that will eventually be of more benefit to the producer as long as there is choice and competition in a free market system. Now if you look at canola, as compared to wheat, it is at a completely different stage of its evolution, because private companies have figured out how to make money out of canola, and they've done it by putting these specialized traits in, by increasing yields, by moving to hybrid systems, by changing the oil quality.... (SK#27A, Ag-West Bio Inc.)

Under this new orientation of public research, public organizations like the Plant Breeding Institute, Agriculture and AgriFood Canada, the Saskatoon Research Centre, and the like, do the background work on desirable traits in canola that the private industry picks up and then finishes the work of commercialising. The drawback of this is that when industry does not find a trait to be suitably profitable, that trait is not developed, no matter how beneficial it might be for farmers. This process is therefore described somewhat differently by the SCDC than the evolutionary terms used by Ag-West Bio Inc:

At present what is happening is PBI, Plant Breeding Institute, Natural Research Council, the Federal Government, Agriculture and AgriFood Canada, Saskatoon Research Centre, which is the major centre for canola, ... the University of Saskatchewan here has the Prairie Genome Project, which includes a bunch of different agencies, all these have developed traits that have potential to provide benefit. But the only way you get that trait into the market place [is this]: most of those people now are developing germplasm or identifying genes and marker genes, so they'll come up saying here's the germplasm, we've identified this gene, here is how you find it, this is how you transfer it, and it has drought tolerance. Then they give it to the company or they put it on the market saying, what would a company give us for this trait? Then the company comes in and says, well, I don't know, I'd have to get 50% return, if I have to put it in our varieties, there's all the development work plus there's all the regulations, I have to cover all those costs, I don't think it's worthwhile—where does it go? It might be a benefit to our growers, but we can't get it through the process. Now [canola's] the only crop where that's happening in. Ag Canada still has major breeding programs in wheat and barley. Pulse crops, is mainly the university, and Ag Canada has some but it's more the University has public funding in pulse crops. ... Mustard is all Ag Canada. Flax is the University of Saskatchewan. Plus some other universities... Manitoba. Canola is actually the only one that has been taken mainly over by the seed companies. (SK#28, SCDC)

The retrenchment of the public breeding programs is therefore a significant concern to grower groups, who are increasingly dependent on the decisions of private industry. While public breeding is maintained for the benefit of producers, private

industry selects traits for commercialisation based on profitability, which may or may not coincide with what is best for producers. In some cases, traits that would greatly benefit producers have already been identified, but lack the industry will to bring them to commercialisation. As a result, important trait developments, such as drought tolerance (given the economic losses caused by drought) are at risk of not warranting industry commercialisation:

And that starts to be a concern for growers to say we have all these traits that we know are there. These are realistic traits, they are already identified genes for drought tolerance—and you can imagine what kind of impact some kind of drought tolerance could have on canola in Saskatchewan. (SK#28, SCDC)

Further, particular sectors, regions or groups may get left out as private industry steers the course of plant breeding towards that designated to be the most profitable. For example, when it appeared that the returns on Brassica rapa (the northern appropriate canola) would not be sufficiently significant, industry put all its efforts into Brassica napus and pulled out of rapa breeding. Without public breeding those northern varieties would languish. Ultimately, the Saskatchewan Canola Development Commission, and the Alberta Canola Producers, in conjunction with Agriculture Canada, took over the rapa breeding program. These problems with trait development and the rising cost of seed are in part why the SCDC is considering the major investment of entering into canola breeding more broadly.

Opposition: Greens, Lawsuits and Wheat

Clearly those farmers who use Monsanto and Bayer's genetically engineered canola find it to be of some benefit, and without many crippling drawbacks. This does not

mean it is complaint free, of course, and Monsanto's TUA was particularly singled out as an irritant. However, for the most part, farmers appreciated the technology, and while a few had strong feelings about Monsanto, even some of those did not feel sufficiently negative to switch to Bayer's product on the basis of this feeling.

Nonetheless, opposition to the biotech industry has occurred. In fact, opposition has been sufficient in the province that it has left many of those who promote the industry wary and beleaguered, and sometimes even testy. Ag-West Bio Inc, for example, a non profit organization created to facilitate and promote the bio-economy in the province, responded to a scheduled interview with interviewees that required every question's terms be defined to the point where asking any question at all became difficult. Even those seemingly benign queries that survived this process prompted off-topic (but 'on-message') packaged responses; this despite conditions of pre-publication screening of any quotes.⁷ Perhaps explaining the rigorous demands of the interview process, one of the interviewees closed the interview thus:

There's a lot of recycled arguments and misinformation that exists in the whole spectrum, and some really vested interests and activists, and it's a very politically, socially sensitive and active area. (SK#27B, Ag-West Bio Inc)

While this was the most extreme case of interview sensitivity I experienced in the province, it was certainly not the only one. Nobody with an interest in the well-being of the industry appeared confident that I was not an environmentalist in academic's clothing, ready to run to the media with whatever conceded drawback to the technology I could wrestle into a damaging quote. These were testy times indeed. And yet, excluding

⁷ It is interesting to note that of the few organizations that requested a right of refusal and editing of prospective quotes, all were from Saskatchewan.

organic farming organizations, there was really no anti-biotech activity from any local environmental organization. Perhaps with such an economically beleaguered agricultural community, further challenging the livelihoods of those involved would not be beneficial to the long-term survival of any such organization. In any case, the only public anti-biotechnology sentiments from a public organization came from the organic industry. In the context of this apparent environmental free ride, it begs the question how had the province's biotechnology industry and promoters become so testy? What was the threat to their industry, if indeed there was one?

In the national context, environmental organizations, such as Greenpeace, the Council of Canadians, and Friends of the Earth, have taken biotechnology on as an environmental issue. While these types of organizations already have an impact on their own merit, they further their effectiveness by working with and publicizing local issues, such as the recent attempt to declare Prince Edward Island a GMO free zone. In Saskatchewan, the Schmeiser and the Hoffman (Saskatchewan Organic Directorate) lawsuits, and the attempted introduction of Roundup Ready wheat became high profile issues that garnered much publicity and widespread debate. Their consequent notoriety appears to have raised a significant amount of support, and stolen a fair bit of the wind from the Saskatchewan bio-economy's sails. I will discuss each of these issues in turn, beginning with Roundup Ready wheat.

The Schmeiser and Hoffman cases will be considered for two purposes. First, they will be considered for what they can reveal about how the legal framework is contributing to a reorganization of agriculture. Reorganization could occur through such processes as the direct impact of the proprietary technology on users (as we saw with

respect to seed saving), through the indirect impact of genetic contamination of non-users, or through a more general impact on the agricultural community more broadly (such as through technology adoption as a liability avoidance strategy). Second, while the cases themselves are acts of opposition, they will be considered for how they have contributed to wider opposition to the changes brought by the technology, if at all. The full legal details and significance of the cases will be discussed further in Chapter 4, however, enough details are provided about each case here to give sufficient context to the analysis.

Take Our Wheat!

In early 2000, Monsanto initiated the long process of gaining regulatory acceptance to commercialise its RR wheat in both Canada and the United States. Unfortunately, Monsanto neglected one of the golden rules of business: provide a product that your customers want. Opposition bubbled on both sides of the border, as various stakeholders raised concerns about the potential loss of markets. Post-Starlink, concerns about lost markets were paramount.

Leaving aside for a moment the issue of whether Canadian growers could sell RR wheat, the majority of farmers were not keen on the product for strictly agronomic issues. Unlike canola, wheat is not as vulnerable to weed pressure, and there are also fairly good and reasonably priced chemical control options available for weeds in wheat. Consequently, even the most benevolent of responses to RR wheat were usually fairly disinterested in the product:

...there are enough chemicals out there for wheat now to keep a nice clean field, I don't know why you'd want a field of Roundup Ready wheat. (SK#26, Producer)

Wheat is also a lower value crop, and increased input costs—as with the introduction of a TUA—would push the margins of return very low, even if this TUA fee was reduced below that of canola, as suggested. Seed saving is also very prevalent in wheat, in fact, farm saved seed accounts for the vast majority of acres. Therefore, restrictions on seed saving would represent another very significant cost increase for wheat producers. Depending on the cost of the TUA, the total cost of the input package for RR wheat would be far greater than the inputs for conventional wheat—without the agronomic benefits associated with herbicide tolerant canola. Based on economics alone, interest in RR wheat was already lukewarm. In conjunction with the existence of RR canola, serious agronomic issues were raised by the extensive use of Roundup.

As noted, glyphosate, the chemical in Roundup, plays a significant role in modern farming practices as a chemical treatment to “burn” the fields in the spring, prior to planting. In the practice of crop rotations, volunteers from the previous years crop become weeds in the next year's crop. While the management of volunteer RR canola does complicate farm management somewhat, the complications are manageable through an additional chemical additive to the glyphosate applications, and the benefits of RR canola have thus far outweighed the drawbacks for the majority of farmers. The addition of RR wheat to the crop rotation would create another weed immune to standard weed control methods. This would complicate management even further (as wheat volunteers in canola would be resistant to Roundup and vice versa), require further chemical additions, increase costs again, and also increase the chance of developing resistance to a

chemical highly prized by the modern farmer. The contradiction inherent in releasing RR wheat as a new tool is characterized by a representative of the Saskatchewan Wheat Pool:

Why do you want to incorporate another tool that loses you other tools on your farm? Roundup is already used so much already, by incorporating its use as was proposed on wheat, it would mean that you lose its effect and benefits on other crops on your farm. So Roundup Ready canola wouldn't be a good thing anymore, and Roundup Ready burn-off of crops and stuff, because now these all become new weeds in your crops. So how many places do you want this technology? One destroys and cannibalizes another. (SK#17, SWP)

Such concerns were voiced by many in response to the proposed crop:

I mean this spraying Roundup in the spring for burn-off, then you are going to spray Roundup in-crop spraying, then you are going to spray Roundup in-season, then you are going to spray Roundup next fall for burn-off—you are going to create a monster here. ... You are going to create some weeds you are not going to get rid of, and then they'll be breeding with other weeds—oh the hell you'll come up with pretty soon. (SK#25, GM Producer)

Most people here don't till their land before they seed it to kill weeds, they spray it with Roundup either just before they seed it or just after they seed it. So do you want to use even more Roundup and maybe hasten the possibility of glyphosate resistant weeds? Because if we didn't have glyphosate as a tool it would really change how we farm. (SK#22, Agricultural Consultant/Media)

In strictly agronomic terms then, there was already very little interest in Roundup Ready wheat. In the minds of many growers, it was useless at best, and agronomically detrimental at worst. This was not the end of objections to it, however. Had genetically engineered wheat not had any issues with respect to its international marketability, the product could be commercialized without serious detriment to non-adopters, outside of the risk of glyphosate resistance. Market rejection was a hugely significant issue, however. As a number of producers noted, considering the poor price that wheat was already fetching, what was the need for a high cost technology to increase production for

a product that would decrease demand for their crop? The general sentiment was that wheat was already produced in sufficient amounts to saturate demand and keep prices low, there was no reason to compromise their product growing something that offended their customers.

Given the impossibility of segregating RR wheat from non-RR wheat in the current wheat marketing system, even a boycott of the use of RR wheat by an overwhelming majority of farmers would still not be sufficient for preserving international markets. As long as even a few producers undertook growing the RR variety, the mixing of wheat meant shipments would be contaminated and the probability of market rejection was extremely high. Certainly, one factor in the viability of segregation is the question of tolerance levels, as many countries still lack these, and even within the European Union there are disagreements. Nonetheless, segregation is generally considered unviable, and even limited RR wheat adoption in the country would mean all Canadian wheat would be considered GM.

This marketing issue was not theoretical to wheat farmers, many of whom were also canola growers and had been keenly aware of the exclusion of their canola from European markets. However, while the loss of the European market had been a small and calculated loss by the canola industry, the Canadian Wheat Board [CWB] had surveyed its customers and concluded that over 80% of its customer base would refuse Canada's wheat if it were genetically engineered. Further, while the RR wheat initiative was planned for a number of countries, Canada was further ahead in the process, therefore it would be first in line for these market repercussions (SK#24, CWB). This was not a loss that the Canadian wheat industry thought it should bear:

From a safety perspective I don't think there's any concern. But from the perception of our customers that don't want to see that kind of contamination we have to be ultra conservative, because you know, the Wheat Board is telling us what to handle, what to buy, and what to deliver, and to what customer, and if the customer doesn't want that in there, then that forms our opinion. ... You have to meet customer demand, period. (SK#17, Saskatchewan Wheat Pool [SWP])

Producers and producer organizations were reasonably concerned that the introduction of the product would cause major economic devastation. Monsanto's drive to introduce the crop appeared to be unfazed by these concerns, however, which they continued to downplay. Nonetheless, the opposition to RR wheat on the basis of market considerations grew, and strong sentiments regarding the detriment it could cause the Canadian wheat industry were widely publicized. Unlike many agricultural issues, this opposition to RR wheat was widespread and uncharacteristically united. Canadian Wheat Board lobbying was supported by a large coalition of agricultural interests such as the Canadian Federation of Agriculture [CFA], the Saskatchewan Association of Rural Municipalities [SARM], the National Farmer's Union [NFU], the Agricultural Producers Association of Saskatchewan [APAS], wheat organizations from Alberta, and Ontario, and many others. Advertisements were published in the names of key agricultural organizations publicly asking Monsanto to withdraw its application, and stating that Monsanto's continued refusal could devastate Canadian farmers. Organic producers, concerned about GM contamination, filed an injunction against the introduction of RR wheat in conjunction with their class action lawsuit over GM canola contamination. Concerns that Monsanto would proceed despite the opposition were such that the CWB ultimately formed an alliance with environmental organizations, such as Greenpeace and the Council of Canadians, in an effort to further strengthen their lobby effort (Wells and

Penfound, 2003). Some considered this to be an unholy alliance, however temporary, given the environmental organizations were against the technology outright, and the agricultural organizations were only against the technology pending market acceptance. However, the alliance itself is testament to the vulnerability these agricultural organizations felt in the face of Monsanto's disregard for their economic well-being.

Farmers and farm organizations expressed frustration at the nonchalance with which their needs could be rendered irrelevant by a company's motivation to maximize its profits. In the face of the overwhelming opposition, Monsanto finally withdrew its application for registration in 2004. However, not before serious damage had been done to the faith that it would conduct itself in the best interest of its customers. The sentiment expressed by many agricultural organizations was that with respect to RR wheat, Monsanto was nothing short of a bully, willing to force its agenda to the detriment of all others:

The industry feeling is that the Roundup Ready wheat issue was handled very poorly by Monsanto, because it was basically, just, "Here's the wheat, take it!" Just shove it down people's throats basically, is what they were doing. (SK#18A, SARM)

They were wrong in not consulting more and not working more with us. They should have done that. They tried to heavy hand it through pretty good there for a couple of years. We had to get quite a pretty good lobby strength together. (SK#30A, APAS)

The repercussions of the Roundup Ready wheat fiasco were significant. From the industry side, Monsanto doubtlessly lost considerable investment dollars. Perhaps even more significant for the long-term, its image took yet another beating, as there was little doubt for the majority for whose benefit the push to promote the wheat was intended. As the representative from SARM further reflected:

I think they lost some business over it. I think there was some bad will over it. (SK#18A, SARM)

This 'bad will' was not only expressed by organizations. While the majority of farmers appear constrained to primarily financial considerations in making production decisions, where there was leeway, a few expressions of this resentment found physical manifestation:

In fact, I don't buy any Monsanto stuff anymore. Roundup Ready canola is the only thing I've bought from Monsanto for years because of the Roundup Ready wheat. ... They just kept pushing it. They didn't give a damn what anybody said, just as long as it lined their pockets is all they cared about. I haven't bought a gallon of Roundup in years. (SK#25, GM Producer)

There's always other products available. I just avoid Monsanto's products that's all. ... The GM wheat issue definitely has a bearing on it. (SK#19, Conventional Producer)

Even more significantly, the attempted introduction of a product so unwanted by producers highlighted producers' vulnerability to the profit strategies of companies such as Monsanto. Producer organizations that perceived RR wheat to be a very large threat to producer livelihoods found they did not have any mechanism to protect themselves.

It is important to note that RR wheat was not the first GM crop to fall to lobby efforts. In 2001, a genetically engineered flax seed developed by the Crop Development Centre at the University of Saskatchewan fell under similar marketing concerns. The European market, which was the destination of 60% of Canadian flax, was opposed to GM flax. With flax farmers fearing for the marketability of their product, organizations such as the Flax Council of Canada and the Saskatchewan Flax Development Commission pushed for deregistration (Warick, 2001). While not yet commercialized, the GM flax already had federal approval and was in the process of being multiplied up

(stocks increased) by contracted farmers in preparation of commercialisation. Instead, as a result of the lobby effort, the existing crops were destroyed and the crop was deregistered. In response to the resistance to the product, and its ensuing deregistration, the Crop Development Centre Director, Rick Holm, responded that: "It would have been irresponsible of us to fight to keep it on the market, and face the possibility of our farmers losing an export opportunity" (Ibid). Clearly, Monsanto did not hold this same perspective.

Given the overwhelming opposition, Monsanto would have been foolhardy to persist in its attempt to commercialise RR wheat, possibly even forcing the government's hand with long term regulatory implications. However, the imbalance of power that many became aware of in the altercation led a number of organizations to lobby for regulatory changes. In essence, these organizations wanted to see market considerations become a factor in regulatory approval. While RR wheat was stopped, producers remained vulnerable to similar unwanted introductions in the future, and producer organizations such as the Canadian Wheat Board wanted a more tangible means of protecting themselves than lobby strength and public support:

...when we did our first survey 80% of our customers said if you have genetically modified wheat, they won't buy it from Canada. However, the genetically modified wheat had the possibility of going through all our system, and getting regulatory approval from the government, because if it had met environmental safety, feed safety, and food safety.... We wanted consumer acceptance to be an issue when it came to regulatory approval for new varieties. (SK#24, CWB).

As more formally stated on their website: "[t]o ensure that the interests of farmers and customers are fully considered, the CWB's position is that a cost-benefit analysis should be conducted as part of the regulatory process" (CWB, 2005). The statement

includes a number of conditions that need to be met for regulatory approval, including “widespread market acceptance” and “a positive cost-benefit throughout the wheat value chain with particular emphasis on farmer income” (Ibid).

While the Canadian Wheat Board’s position is limited to wheat and barely, other organizations, such as the Saskatchewan Association of Rural Municipalities, are not similarly restricted. According to SARM:

We were proposing a regulatory solution, whereas some organizations and the chemical companies were saying it should be voluntary. It should be incumbent on the company to decide whether or not it is in the best interests. Whereas we said, well, that’s all very nice, but we don’t have enough faith in commercial interests to feel comfortable with that, so we look at having an additional step that considers market impact in the registration process because all the other factors in the registration process look at non-market factors. (SK#18A, SARM)

As noted by SARM, the biotechnology industry is directly opposed to any form of regulatory solution, as the industry position is that the system is already overly burdensome. Accordingly, Ag-West Bio Inc.’s position is that the regulatory system “sometimes deals with emotion and politics rather than science, and there is a vocal minority that wants to move it in that direction,” whereas they want to make sure that the “regulatory system remains science based and just looks after science based regulatory analyses.” (SK#27A Ag-West Bio Inc). In response to questions about the problems of the RR wheat issue, Ag-West Bio Inc emphasized that market acceptance should be kept out of the regulatory system, where decisions on introductions should be made on the basis of scientific parameters only: “[RR wheat] is a market acceptance issue, and so the industry has to deal with that. And I think in Canada the industry has demonstrated that they can deal with it effectively.” (SK#27A Ag-West Bio Inc).

Obviously, those concerned about their livelihoods and dependent on garnering sufficient lobby pressure to preserve it do not feel that the monumental effort required to stop Monsanto's RR wheat was a reliable means of dealing with such issues, and they continue to strive for more input in regulatory approval. Despite the obvious power and control issues manifested in the RR wheat issue, the issue was not the harbinger of an anti-biotech sentiment amongst producer organizations that it might have been. Objections remained firmly market based: "If consumers supported it, we would support it" (SK#24, CWB). If anything, attitudes remained steadfastly pro-biotechnology as the majority of these organizations were very careful to couch their opposition in the specifics of the case, and not to taint the technology itself. The sense that no one wanted to compromise the promise of biotechnology for the future of agriculture in Saskatchewan was palpable.

Give Us Back Our Genes: Patents on Life, Monsanto's Genes and Schmeiser's Canola

The Schmeiser case started in 1998 and the first trial revolved around whether Percy Schmeiser, a canola grower in Saskatchewan, had infringed on Monsanto's patent by using its RR technology without contract. Mr. Schmeiser alleged to the contrary that Monsanto's genetic material contaminated his crop, and that he faced a serious loss of property rights on account of Monsanto's claim. The case went all the way to the Supreme Court, where the broader issue of the patentability of life came under question. In addition to defending against Monsanto's patent infringement lawsuit, Schmeiser launched an international public relations campaign against the company and against biotechnology more broadly that is still ongoing. He alleges that self-propagating

patented technology violates farmer's rights, as the technology establishes itself on private land and then is subjected to industry's ownership claims, that Monsanto's investigative team—Robertson Investigation—is intimidating farmers into accepting unfair settlements to avoid costly infringement litigation, and that the issue of gene flow has turned farmer against farmer and resulted in a culture of fear on the prairies. Schmeiser has rocketed the issue of patents on self-reproducing seeds into the public forum, and highlighted the potentially devastating power shift that such patents can produce.

While the Schmeiser case appears to sum up a whole package of changes visited on the prairies, it remains to document their practical effect. An obvious question would be to what extent producers are even aware of these changes. Given that when the genetic technologies were first introduced Monsanto required producers to attend a meeting informing them of all facets of the new technology, most producers should have been well aware of restrictions on seed saving and the main aspects of Monsanto's contracts. Using hybrid technologies, Bayer had no such contracts. For those who weren't fully versed in the issues of proprietary rights on seeds, the ensuing years of media coverage around the Schmeiser and Hoffman case fully vetted them. In sum, there appears no shortage of awareness of the proprietary aspects of agricultural biotechnologies and patent infringement, more specifically. Further, there would appear to be few in Saskatchewan who are not thoroughly aware of the Schmeiser case, and fewer still who do not have an opinion on the matter, sometimes a strong opinion. Even retrieving court documents in Saskatoon got me an earful from a clerk about 'that man.' Leaving aside those who endorse more organic or sustainable type agricultures, these opinions often fell

outside of Mr. Schmeiser's favour, although the more thoughtful would expand on the difficult ethical issues raised in the lawsuit. For those who held negative opinions, Mr. Schmeiser was sometimes reported to be someone who likes to be in the thick of things, to the point of creating the thick to be in the thick of.

Uhm, his neighbours and some of the people in his area are not surprised that he got in trouble. And, you know, they say he's always done those sorts of things, and always poked the hot stick in somebody's eye, and unfortunately he poked it in Monsanto's eye, and they didn't take it lightly! (SK#14, GM Producer)

However, while some had plausible explanations of how they arrived at this information, Saskatchewan doesn't appear small enough for so many to have formed personal opinions of the man. Indeed, many of the reports sounded overly similar. Likewise, details of the case were often cited uniformly incorrectly when used as the basis of conclusions against Mr. Schmeiser. For example, the lawsuit involves supported allegations that—whether he originally obtained them by natural processes or not—Schmeiser saved seeds that he knew contained the GM technology, and then reseeded them the following year, hence producing a full GM crop. Nonetheless, I was repeatedly told that Schmeiser's story of contamination was implausible because there was no way the GM seeds could have blown into his fields in such 'nice straight rows,' neglecting this point of reseeding from one year to the next. Similarly, while it is in fact the norm for legal arguments to shift as they move through levels of court, and despite the fact that Schmeiser did not change his claims on the basic facts of the case (whereas Monsanto did drop their allegations of brown bagging), it was with some indignation that Schmeiser was reported to have continually changed his story from denying factual guilt (as would be appropriate at the trial level) to trying to challenge the validity of the patent itself (as

would be an appropriate question for the Supreme Court, which does not retry facts). The consistency of responses raised some speculation as to the extent of the media campaign surrounding the case.

Despite these qualifications, opinions about the legitimacy of the case among GM producers and related stakeholders were fairly consistent. The following are a few typical samples:

As far as I'm concerned the whole thing is a farce. ...there's no way that that amount of seed would blow and contaminate onto his ground and contaminate all his canola acres. It's just not going to happen. (SK#29, GM Producer)

...people around here are a little bit skeptical: they wonder how it came to pass that the Roundup Ready canola came to grow in nice straight rows in hundreds of acres, like it didn't seem to be a random thing, it seemed to be more of a deliberate use of Monsanto's seed. (SK#3, Seed Dealer/GM Producer)

If I had a whole field coming up RR canola, somebody seeded it, it didn't all blow there. (SK#25, GM Producer)

There are, of course, significant reasons why Mr. Schmeiser would not be considered a hero amongst canola growers in the region. For one, while his case garnered significant interest amongst farmers, Schmeiser's rise as an anti-GM spokesperson over the long duration of the case (and continued in the small claims court action) tempered the support many felt, as will be discussed further. However, while a number of people expressed either skepticism or exasperation with Schmeiser, this perspective was by no means unanimous. Those who were more inclined to be supportive were less concerned with the practicalities of infringement and more concerned with the issues behind the case. Further, and not surprisingly, a large contingency of this support could be found in the organic sector, as exemplified by the following two producers:

The ruling that Percy Schmeiser was responsible for what had blown onto his land—it's just totally bizarre in my opinion. (SK#15, Organic Producer/Retailer)

Schmeiser was growing whatever he was growing in a regular style commodity and then was genetically—was contaminated with a genetic canola so it wasn't his fault. Like he has no control on it and until it's proven and established and all the flags, if you like, are taken out of the problems, it shouldn't be that it's forced on somebody else or shouldn't be... it shouldn't be a problem for me. Just because my neighbours are doing something, it shouldn't be my fault or it shouldn't affect me. It shouldn't have a bearing on what I do. (SK#13, Organic Producer)

The more sympathetic treatment of Schmeiser by organic farmers is telling in that organic producers have little to lose from the negative press that Schmeiser has generated and significantly more to win by the ironing out of the liability issue, as will be discussed. Nonetheless, it was not strictly organic producers who felt some support for the issues behind Schmeiser's claim. For example, one conventional producer, who had mainly grown wheat, hay and crops other than canola in the previous years, expressed his feelings about the matter this way:

But if it was up to me, I would have still found him not guilty. Even if he was guilty, I would have still found him not guilty! ...if you are going to mess around with this stuff, and spread it around in people's fields, it's your problem. It's the company's problem. If they insist on a patent right to the use of all of this stuff, then they are also required to ensure that none of it contaminates into the neighbour's fields. ... I have no doubt that there was some of this GM stuff that accidentally fell into Schmeiser's field. I'm quite sure that that probably did happen. Maybe not to the extent that he was claiming, but nonetheless, the fact that it was there in however minor quantities absolved him from—you know if there was 1% there from a neighbour's field and he added another 99, well I can forgive him for that. (SK# 33, Conventional Producer)

As the above indicates, there are some farmers for whom the issue of liability around self-reproducing 'inventions' was more important than the practicalities of the case itself, although they clearly remain in the minority. It is also important to note that

even those farmers who were less supportive of Schmeiser, for the most part did not deny the plausibility of genetic contamination, the possibility of which was readily acknowledged:

...to me yeah he could have gotten some contamination from a truck going down the road or whatever. There's combines going down the road at harvest time, who knows, grain elevators, everything's kind of dripping and dribbling all over the place. There's a little seed all over the country. (SK#14, GM Producer)

The objection was to the extent of contamination, which was alleged to be over 95% pure by Monsanto, and which the trial judge found to stand up as fact. Given this (albeit disputed by Schmeiser) percentage, many felt that there was no doubt about deliberate infringement, and very few expressed any concern over the possibility of farmers being sued for infringing through contamination. For example, the preceding producer also emphasized the difference between a full crop of RR canola and a crop that had somehow become partially contaminated:

...I'm sure if they found a little Roundup Ready on the edge of my field, but found that the rest of the crop was a conventional... then I'm sure if they wanted to take me to court then the judge would laugh them out of the door. (SK#14, GM Producer)

Even for those who were aware of the legal grey area around contamination that remained after the Supreme Court left undetermined what percentage of GM material constituted infringement, the general sentiment appeared to be that Monsanto would be foolish to pursue anyone who really suffered contamination alone, and that the company would only take legal action against those who deliberately infringed. While the occasional producer entertained the possibility of a bias against Schmeiser, the majority

felt the legal framework was likely not a problem for farmers. The following provide an example of the apparent trust in the system:

But it would be hard—it is too bad, if you did get accused and you weren't actually using it, because the seed is blowing around all over the place. It may be hard to prove in some cases, although if you have a crop that is 99% Roundup Ready, it is hard to argue that I guess. (SK#3, Seed Dealer/GM Producer)

I think [companies] treat farmers fairly. Farmers abide by—when they buy the seed and they pay for it up front—when they abide by the rules, then there's just no way to get into a jam. (SK#29, GM Producer)

This trust notwithstanding, a very significant aspect of the legal framework is that those producers who have been accused of infringement are faced with a choice of proceeding through expensive litigation in their defence, or of paying a significant fee and signing a settlement agreement with Monsanto. A key feature of the settlement option is that it is accompanied by a non-disclosure agreement. Consequently, if producers were having a problem in this manner they could not share it with their neighbours or the larger community. However, producer organizations, which could field such concerns even if only anonymously, were similarly unconcerned over the practical interaction between farmers and biotech companies under the umbrella of these legal agreements. According to the Saskatchewan Canola Development Commission, signed confidentiality agreements or not, you would hear about it if farmers were being bullied:

If it was a legitimate problem there would be lots of farmers raising hell. Farmers are not the kind to not do that. (SK#28, SCDC)

The SCDC was not the only organization to think the issue of farmer liability was not significant. Some of these organizations, like the Saskatchewan Canola Growers Association [SCGA] are directly responsive to their members, through conventions and

such. While acknowledging potential issues, they still found no indication of a practical need for organizational involvement in the issues around Schmeiser's case:

But if the shift changes where more people are starting to disagree or they feel one of these companies are getting heavy handed with them, then it could swing in the other direction, and as an organization we'd have to look at it more. But until that point, where our membership is generally happy with the situation, then it's not a problem for us. (SK#21, SCGA)

Similarly, the Saskatchewan Association of Rural Municipalities stated:

I think that's a unique case. I think that the Schmeiser case was a unique case and we've only seen that one case with that particular problem. If we had one case one year, and the next year we had two cases, and then we had five cases, then I think it would be something we'd put up our antennae and say 'ok, why is this happening and what's going on out there?' (SK#18A, SARM)

In reality, the issue behind the Schmeiser case may have resolved itself in canola with the rapid speed of adoption. With the very small percentage of canola that is conventional—and the vast majority of that regionally specific, in the north—there are very few conventional canola producers left who could be contaminated. Nonetheless, the importance of the issues raised by Schmeiser's case are not diminished by current adoption statistics, as with each new GM introduction the issue will arise again; particularly in any crops that do not enjoy the same speed of adoption as GM canola.

Based on these interviews it doesn't appear that the threat of liability has scared any producers into adopting the technology as an evasive manoeuvre, or that any associated liability issues have seriously hindered producers—outside of restrictions arising from compliance with the TUA and patent rights. Of course, the actual long term impact and the currently perceived impact can be two very different things, and the issues have certainly been sufficiently aired that one might expect a more empathetic treatment

of someone who was willing to pursue them through years of litigation. I will return to this point after addressing Saskatchewan's second distinguished biotechnology related lawsuit.

Take Back Your GMOs: Genetic Contamination in the Organic Industry

Another source of resistance to the new biotechnologies has been from organic producers. Organic production is a growing agricultural niche and Saskatchewan makes up a large portion of the growth in Canada. As noted earlier, by 2003 organic producers made up 2% of all of Saskatchewan's producers, and their numbers continue to grow. Certification for organic production includes such requirements as a prohibition on the use of synthetic chemical inputs, including the use of buffer zones from non-certified crops and a requirement for the land to have been free of these inputs for several years before certification is granted. Genetically engineered organisms are considered a synthetic input, and are banned in organic production. In return for the high maintenance required for production without synthetic inputs and the additional requirements of buffer zones, record keeping and auditing systems, organic producers receive a premium for their product. Given the usually smaller acreage farmed and the greater effort involved, including the years of farming chemical free prior to gaining certification, a loss of organic status and associated premium would be a devastating economic blow to an organic producer.

Organic crops in Saskatchewan are mainly produced for export, the principal markets being the United States, Japan and Europe, and therefore these crops must also meet the organic standards of those markets. Organic standards relating to the use of GMOs were slowly put in place in various countries following its commercialisation.

While the GMO contamination thresholds—where they have been put in place—and the dates of their implementation have been disputed in the courts, the fact that GM contamination is currently a threat to organic certification is not. The Saskatchewan Organic Directorate [SOD] claims that since the introduction and widespread proliferation of genetically engineered canola throughout the countryside, it has become impossible to both obtain GMO free seeds and to produce GMO free canola. Hence, they claim that the production of organic canola is no longer possible in Saskatchewan and as a result they have lost an important market and an important crop for their rotations. Were canola to be the only crop to be removed from organic production, the industry might not have been spurred into action. However, with the attempted introduction of RR wheat, organic farmers were beginning to see the writing on the wall for the fate of their industry.

The Hoffman case, while not as well publicized as the Schmeiser case, is the first example of a group of producers going on the legal offensive against a biotechnology company. The case (most commonly known as the SOD case) was initiated when the organic farmers, faced with the prospect of the commercialisation of RR wheat, applied for class action status over the contamination of their organic canola industry, and filed an injunction against the release of the wheat. Hoffman and Beaudoin were the representative plaintiffs for the class action certification action. The wheat portion of their case was retracted when Monsanto withdrew its application for registration, however the SOD proceeded in its class action application over the issue of GM canola. The details of the case, which is still ongoing, will be discussed further in Chapter 4, but

at its heart is the concern of organic producers to continue to produce organically, and to continue receiving a premium for their product.

Unlike in the Schmeiser case, the concerns of the farmers in the SOD class action suit can be easily found replicated in the organic community at large. At its simplest, the complaint of organic farmers is about the loss of canola as an organic crop. While the organic canola industry was still in its infancy when GM canola was introduced, relatively clear examples of its impact are nonetheless available. For example, one organic producer states:

...you know, there's no organic canola around here. It's basically impossible to grow it because there's too much contaminated land.
(SK#8a, Organic Producer)

Similarly, another organic producer that also operates an organic sprout business selling to the health food industry explains how within the first few years of GM canola's introduction their business lost about 75% of their canola market:

...canola is really actually a nice sprout, but it's just like one of those things that got labelled. I mean there is non-GM canola out there, right, but canola has got such a bad reputation in consumer's mind... (SK#15, Organic Producer/Retailer)

In this case the impact had less to do with contamination per se and more to do with simple consumer rejection due to fears of contamination, however the effects are no less real. Markets, such as in Quebec and Europe, were unwilling to buy canola products, and where canola used to be an important crop on their farm, they were forced to remove it due to the lack of markets.

From outside of the organic community, the response to the concerns of organic producers is at times empathetic, at times self-righteous. Producers that I interviewed,

many of which weren't very familiar with the specific details of the case, were more inclined to the former (empathizing with any impact on a grower's income). Producer organization representatives and other stakeholders were far more inclined to the latter. From this second group there was a fair amount of clucking over the organic industry for setting a standard that could not be met, and therefore putting themselves in direct opposition to the rest of the (GM based) canola industry:

I think they've drawn the line in the sand far too pure. There was room for organic and GMO to coexist and go their merry way. (SK#22, Agricultural Consultant/Media)

Personally I don't understand why [organics have] gotten themselves in that box. Because they are essentially guaranteeing that there is no GMO present in their product. Zero. They don't make that guarantee for pesticide residues. (SK#2, Academic- Crop Development)

For those who hold this perspective, resolution lies in simply creating a GMO tolerance limit in organic certification that is viable for organic producers to meet, such as designating certified organic production as having no more than 1% GMO content, for example. By not doing this, organic producers are seen to be unnecessarily pitting themselves in opposition to GM canola producers, although some are more willing to acknowledge that it might not be the organic producers themselves that are setting the standards, but that market demand is a factor. A number of non-organic producers and stakeholders argued that there really was no organic canola industry to speak of in Saskatchewan in any case, and that whatever industry there was would not be sustainable anyway, given the weed challenges of canola production. Some argued further that the weeds spreading from organic farms represented a contamination in itself, and that the argument could go both ways over who is contaminating whom. However, at the heart of

most of the anti-organic sentiment seemed to be a simple principle of self-defence. The organic producer's lawsuit offers a direct challenge to the makers of a technology that the majority of canola growers value and wish to see maintained, and even developed further.

The logic supporting this self-protection can be easily found:

Someone smarter than myself certainly would have to say, what do you want us to do? ... Can you tell everyone that produces 10-12 million acres [to stop] because there's a few hundred acres out there that want to be organically grown? ... These people that talk this way, I'm afraid it's a small group, which certainly has a right to grow, by all means, and has an issue of contamination. I'm not saying that can't happen, and won't happen, and isn't happening; I'm sure it is. However, to restrict how the whole industry, that you have to bend because of my little group, you're not going to have that. That's not going to happen. I'm sorry. (SK#4, CCC)

Similarly, a representative from another agricultural organization who wanted his personal opinion to remain anonymous, and not associated with his organization, characterized it thus:

I think that's sort of a failure on their part, to expect a zero tolerance, and expect us to sacrifice basically a billion dollar industry on them, I think at their peak, when they were growing canola, was less than a million dollars, net return to them. I think sometimes the majority has to rule the situation, when we are adding that much value to our industry, to build a billion dollar industry.... (Personal opinion, anonymous)

However, from an organic farmer's perspective the problem—"the markets weren't there" (SK#15, Organic Producer/Retailer)—may not be so simply solved by the introduction of achievable tolerance levels as implied by many on the GM side, if such tolerance levels could indeed be agreed upon in various markets. Further, the concern of organic producers was far greater than the issue of GM canola. Ironically enough, a concern they held in common with many GM canola growers—the intended introduction

of RR wheat—was an even greater call to action for organic farmers. The following provide good examples of the concern:

If they brought GMO wheat in, we could be in really serious trouble because wheat is more along the lines of grass and can cross-pollinate and some other things like that and then we could lose...” (SK#8a) “...everything.” (SK#8b, Organic Producer)

I think wheat would—like if wheat—if they came up with a Roundup-Ready one—whatever—and it was getting into the organic stuff and they couldn’t keep it out, I think that would really hurt a lot of the organic people.... (SK#23, Organic Producer)

While the introduction of GM canola arose while the organic canola industry was still developing—thus representing a small actual but large potential impact—the introduction of GM wheat would affect a large number of organic farmers already growing organic wheat. Significantly, a number of these organic producers felt that the introduction of GM wheat could spell the end for them and other organic farmers. It would, as one organic producer clearly stated it, “knock us out of the organic business” (SK#12). As another stated:

GMO wheat would be really hard because it would take away one of the most—the main organic crops. Once everything is contaminated with that—losing organic canola was a big loss. Losing organic wheat—I’m not sure the farmers could hang on. (SK#8a)

While the retraction of Monsanto’s application for RR wheat brought many a sense of relief, it was by no means a permanent or even long lasting end to their concerns. Genetically engineered alfalfa was the next crop on Monsanto’s slate for release. Alfalfa is again considered highly important to crop rotations, especially for organic production, because it is a nitrogen-fixing crop. Therefore the removal of alfalfa from organic farming would mean the loss of an important soil-improving tool and of organic alfalfa

hay as a feed for certified organic livestock production. Once again, organic producers were faced with the loss of a significant tool for their livelihood.

In response to what he would do if GM alfalfa was released, one producer responded:

Pray. I don't know to be honest with you because we need alfalfa to feed our animals, you know, on our crop so if there's GMO alfalfa across the road, that's when a guy is going to have to step in and say to the neighbour Joe like 'Don't be planting that out there.' I don't know. I'm not sure. (SK#7A)

In essence, the creeping loss of organic crops to genetic engineering is causing organic producers significant economic concern. Similarly, the sprout dealer discussed above stated that the release of GM alfalfa could represent a loss of 30% of the volume of their sprouts. As she explained to me, it is not that alfalfa could not be replaced by another crop, but culminating the trend would spell the demise of their business:

I mean other legumes can be used. But part of it is, if alfalfa is introduced and then it's another crop and another crop.... (SK#15).

In this way, the lawsuit holds an important function as representative of the concerns of organic farmers. As was evidenced with respect to wheat, industry has trouble acknowledging producer resistance without an enormous lobby effort. While there was a good strong local opposition to RR wheat, maintaining this constancy of resistance is very difficult to achieve. Even limited to the organic community, the difficulty of raising a resistance lobby to GM alfalfa was noted in interviews. There were some that saw this as part of Monsanto's strategy:

And that's what I'm kind of thinking—is they're just keeping on developing other crops hoping that someday they will just sneak through without people—like get more and more crops—that's their game plan or

whatever. Weasel low for now and go in there and get that one in and that one in and that one in. (SK#15, Organic Producer/Retailer)

However, a lawsuit where producers can have their concerns represented for them circumvents the need for constant organizing. Many organic producers were glad to contribute to the fund set up by the SOD to fund the lawsuit.

The SOD action has a dual purpose. On the one hand, it provides a means for organic farmers to fight for their cause without needing to maintain a constant and exhausting full-scale lobby effort. On the other hand, it is a means to legally challenge the 'ownership without responsibility' privilege that biotechnology companies appear to have captured with respect to patents on life. As one organic producer describes it:

I'm hoping that their responsibility for it—for their rights—will be reined in to the point where they will be responsible as well. They have all these rights but they're not living up to their responsibility on the other side of the coin, is my feel on it, and I think if they were held responsible for the damage they do, they might disappear real quick. (SK#8a)

For some, this is strictly a market concern, but for most organic producers the concerns around biotechnology incorporate a wide range of potentially devastating environmental repercussions. In either case, the drive to force legal liability for GM contamination aims to cut to the heart of industry by challenging its externalities, and attempting to make them part of the biotechnology equation. At the very least, such legal actions have the potential to create instability in biotechnology investments.

Opposition and its Opposition

As even the above discussions on RR wheat and the lawsuits have shown, there have clearly been moments of opposition to the industry, some lasting longer than others but all garnering a fair amount of publicity and support. What the effect of this opposition

has been on the industry is hard to quantify or even fully qualify, although it is certain that there has been an impact. With respect to RR wheat, the effect is a potential reduction of research and development into new applications for genetic technology. Certainly there are speculations that as a result of the altercation over the wheat Canada has lost some of its favourable status for technological development:

One negative thing that has happened because of the Roundup Ready wheat, and it will affect canola, is Canada has actually been a fairly I guess you can say hotbed of biotechnology in crop agriculture and development in new crops, and I don't know officially the numbers, but I have heard that research dollars that would be sent to Canada have decreased because of the Roundup Ready wheat issue, because they no longer look at Canada as a favourable place to develop these products because of the resistance fuelled, and that may have hurt the amount of research being done here. (SK#21, SCGA)

You can already see the implications of the uncertainties of commercial returns to the companies, and that is that they don't do as much as they used to. Five years ago I would talk to the companies and they would say they are working on ten different technologies in fifteen crops, now they are working on three technologies in two crops. (SK#16 Academic, Agricultural Economist)

Whether Canada has been penalized in research and development as a result of RR wheat is hard to ascertain, although it is certain that the industry cannot take the commercialisation of new GM products as a given. While the RR wheat issue exploded into a public relations nightmare for Monsanto, it was not the first genetically engineered product to be withdrawn in Saskatchewan, as the earlier withdrawal of genetically engineered flax attests.

With respect to the lawsuits, the impact again is difficult to ascertain. However it is certain that the publicity around the court cases and their associated negative environmental coverage of biotechnology has contributed to greater consumer sensitivity

to biotechnology in general. As one knowledgeable interviewee characterized it, when GM technologies were first being introduced, and industry was attempting to gain excitement over its product, consumers could 'give a rat's ass'. All this has now changed. While the negative attitude of Europeans, efforts of environmentalists, market risks, and other factors have had an impact, there is little doubt that the publicity generated around Saskatchewan's two court cases has also contributed to that change.

Outside of increased publicity, the greatest impact of the organic producer's lawsuit is still hypothetical, having not yet achieved class action certification. Further, Monsanto's application for RR wheat was withdrawn before the results of the organic producers' attempted injunction against its release could be seen. Unfortunately for organic producers, their canola lawsuit could not be amended to include RR alfalfa, and ultimately opposition was not sufficient to prevent its release. In 2005, RR alfalfa was approved by both the CFIA and Health Canada for release.

While equally impossible to quantify, the contribution of the Schmeiser case can be to some extent extrapolated from the negative treatment he sometimes receives in his own community. Although there is no doubt Schmeiser has support, it is also plain that the agricultural community more broadly has not been circling the wagons around him, despite the fact that he would appear to be championing the case of the little guy against the big companies. To some extent this may be the result of the trickle down effect of negative press from invested organizations. To some extent Schmeiser lost credibility when he pursued Monsanto in small claims court, alleging the company was liable for contaminating his wife's organic garden. However, there is an even more significant factor in the lashing Schmeiser appears to be taking. In his crusade against Monsanto,

Schmeiser has formed alliances with environmental organizations, and has internationally criticized not just the legal actions of Monsanto, but the health and safety of genetic engineering—and genetically modified canola—more broadly. In the context of a canola industry that is trying to compete on the basis of its being a health alternative to the other oils on the market, the association of their product with claims of the high risk of GMOs that Schmeiser has helped to publicize has not been received favourably by those concerned about its marketability. This includes its producers.

There is ample evidence of resentment over this issue. For example, concerns over the negative press around GM crops prompted members of the Humbolt and District Marketing Club to wryly suggest suing Schmeiser for the losses they had incurred (Star Phoenix, 2001). Similarly, a respondent from the Saskatchewan Canola Growers Association commented that while the case didn't warrant the attention it gained, it did manage to put a bad light on canola:

I don't think it has like reduced the price of my canola, but it has hurt the industry as a whole to some extent. (SK#21, SCGA)

This impact is not strictly limited to canola, but the negative press around GM crops has also affected the potential introduction of other crops:

If they could get market acceptance they could have Liberty Link peas tomorrow. (SK#28, SCDC)

Perhaps best summing up the drive to develop biotechnology in the context of this controversy and opposition are the responses of an academic in crop development when asked what he thought the social impact of the technology had been. He replied that while the social impact of the technology had the potential of being positive, the current reality of it was increased stress levels in many people. As already noted, the opposition is

sufficient that those who are supportive of the biotechnology industry are defensive of the technology and often appear wary of interviews about the technology. Any interviewer might potentially be attempting to find some admission of failure to publicize, and the response to this is marked. Essentially, just as clearly as there has been opposition to the industry, there is also significant counter-opposition. Given the volatility of public opinion, the end result of this battle is far from determined. A significant advantage on the side of industry supporters is the fact that growers are very conscious of their vulnerability to the global market, and keen to avoid disadvantaging themselves in that market. While more articulate on the point than many, the sentiment of the following producer has resonance with that of others:

If we choose not to grow a certain product because it's a health risk, maybe another country will, and say, you know, we're not concerned about it, and the same multinational company then can farm its resources to a different nation. You know, that's entirely possible. So, you know, I'm thinking we're going to work in this area. (SK#11, GM Producer)

In sum, just as surely as there is opposition to the technology that is having an effect on its development, there is also a significant force of opposition to the opposition.

Conclusion

There is no doubt that the introduction of genetically modified canola has assisted producers' ability to grow canola. While the two types of GM canola each have their own particular agronomic strengths and weaknesses, their physical properties have had a fair amount of commonality of impact. With respect to these physical aspects to date, GM canola has proven to be a useful tool. According to producers and stakeholders, the technology aids in the production of canola (to the point of providing a new cropping

option to those who previously could not grow it), reduces losses due to weeds, and provides a handful of ancillary benefits. The use of the technology can increase management issues and costs, but overall the physical aspects of the technology appear to have provided individual producers with more agronomic choices. Economically, the impact of the technology is more ambiguous. It can provide an economic benefit to some producers, particularly new adopters and when the returns for the commodity are high. On the other hand, due to the high input costs, this benefit can be lost when the harvest is poor or when canola prices are low. Further, there is a greater risk involved with these higher input costs especially in frost and drought susceptible Saskatchewan. What the technology does do unambiguously, is reduce the manual labour required to produce the crop, thereby providing producers more time to work off-farm or to expand the acres under production, following the economic strategy of volume production.

Of course, the use of agricultural biotechnology cannot be considered in strictly agronomic, or even economic, terms. Instead, it comes with a whole package of shifts in agricultural practices; some minor and some not, and some whose significance will not be revealed for many years. For the most part leaving aside environmental and health aspects, this dissertation is focused on the issue of control: is the introduction of biotechnology reorganizing agricultural production, and is any potential reorganization shifting control away from producers? A number of potential sites for such reorganization were considered: restrictions on seed saving, Monsanto's TUA, liability issues, the decline in public breeding and genetic contamination.

The Schmeiser case notwithstanding, the issue of liability for inadvertent infringement did not appear to be a significant concern in Saskatchewan: there were no

indication that producers felt legally intimidated or had adopted the technology due to this issue. The potential for genetic contamination was somewhat reduced by the relatively low level of seed saving (compared to wheat, for example) already practiced in canola production. None felt that regulatory intervention was required for contamination of conventional crops, although given the rapid adoption of GM canola, the window for contamination events such as described by Schmeiser was very limited. A similar introduction into another prolific crop that is not so readily adopted by producers could drastically increase the importance of this issue, and could provide better evidence of the evolving legal relationship between farmers and biotech companies over self-replicating patented technology.

Monsanto's TUA was an issue onto itself. A farmer who liked Monsanto's TUA could not be found, and many visibly bristled at being told how to conduct their affairs. The distinction between a strict cost consideration of Monsanto and Bayer's technologies and the added provisions associated with Monsanto's TUA was made by many interviewees. Nonetheless, there were some who accepted the TUA as a means to ensure technology developers received the return required to promote further research and development. In any case, the benefits of the technology usually outweighed any irritation growers felt.

This latter point is significant. Farmers in Saskatchewan are tied to the market for their success. Farmers pushed to very small margins are motivated to take on any technology that can provide a slight increase in their incomes. Surviving in the margin between low commodity prices and high input costs is the number one concern of farmers today. Many are not making it. Biotechnology plays a short term and a long-term role in

that survival strategy. In the short term, it can provide an incremental increase in yields, which when expanded over enough acres, can make the difference between debt and profit. In the long term, it could provide new markets that would not be subject to the same level of competition in the global arena that many of their other crops face. The market dependence of Saskatchewan producers results in some interesting contradictions with respect to biotechnology: on the one hand, producers consider the technology as a means of access to new market niches and for gaining a technological edge to volume production, on the other hand they want to avoid the loss of markets that might occur if they use technologies that upset their customers.

From a micro perspective, the use of biotechnology has agronomic and economic costs and benefits, and as long as a producer can opt out it can be simply another means to increase overall production choices. As we saw here, however, there are a number of factors that reduce the viability of opting out. Firstly, accepting the terms on which the technology is being offered has meant a loss of options for producers around seed saving. This restriction of seed saving represents a significant shift in the traditional rights of farmers, and denies them an important economic strategy. When commodity prices are high and harvests are good, the impact of this may not be overly apparent. When the opposite is the case, negative repercussions can arise. The Manitoba floods are one example. The abrupt end to the already seemingly desperate tactic of resaving Bayer's hybrid seeds is another. Given the rising cost of canola seed, and the decline in public varieties, such negative repercussions are likely to increase. Not to overstate the case, GM seeds are not the only kind that can be patented, although they certainly represent a definitive shift. Further, restrictions on seed saving are not the only nail in the

economically imperilled farmer's coffin: a reasonable assumption, however, is that the reduction of economic strategies only forces those who are already economically imperilled out of the industry that much quicker.

The availability of publicly bred conventional seeds could provide another production alternative to the restrictions associated with GM crops. Unfortunately, the loss of public breeding programs has significantly reduced, if not completely closed, the viability of using non-specialty, conventionally bred, *Brassica napus* canola. Key traits necessary to stay competitive have only been released in conjunction with the herbicide tolerant traits in the GM varieties. A tiny amount of conventional production that is not specialty still exists, however it is clear that the majority of producers interviewed felt that there was little commercially viable alternative to growing the GM varieties. As long as there are different crops to grow, alternatives still exist in that manner. As new genetically engineered crops are commercialized, however, a similar lack of public bred varieties in these crops would result in a significant lack of alternatives.

Conclusions about whether there is an expropriationist tendency as a result of the introduction of biotechnology into Saskatchewan agriculture is mixed, and is again perhaps best understood in terms of short term and long term perspectives. In the short term, biotechnology has definitely provided a tool that can assist farmers to stay in the game. In the longer-term perspective, there are equally definitive indications of a trend towards expropriationism. In addition, some unexpected control issues arose with respect to corporate introductions of unwanted genetically engineered crops. As biotechnology is introduced into more and more crops, as commercially viable non-GM alternatives of these crops decline, and as prices and contract restrictions increase without farmers

having recourse, the expropriationism trend will inevitably increase. It is important to note that many of these tendencies are already at play in agriculture more broadly, through the growing prevalence of production for contract and the declining public sector involvement in agriculture.

Of course, opposition to the industry, and to its expropriationist tendencies, may have an impact on the technology's future. The impact of this opposition is still unfolding. For example, while concerns over genetic contamination of conventional canola were not high, contamination of organic production was a serious concern to all those involved and is likely to be a continued source of opposition. Efforts to introduce market considerations into the technology approval requirements were another significant modifying factor, although the success of this also remains to be seen. Outside of the marketability issue, few outside of the organic industry are in favour of tightening the regulations around biotechnology; a number even felt that such a move would only decrease the participation of the public sector in plant breeding, one of the few areas where growers felt the government should have greater involvement. We will now turn to Chapter 4, for a more in depth consideration of the Hoffman and Schmeiser lawsuits and their legal implications.

CHAPTER 4

LEGAL OFFENSE AND DEFENSE ON THE CANADIAN PRAIRIES

This is just the small tip of the iceberg, they can patent anything they want, design and engineer anything they want, without responsibility. And even have a Technology Use Agreement, where they maintain control, and maintain the financial benefits of the ownership, [and] they don't have to take any of the responsibility for how the person they've licensed to use it handles it. So it seems to me that it's wrong. That's what we are trying to do; attach liability to them for what they own and what they've done. (SK#6, President, Saskatchewan Organic Directorate [SOD])

You know, it's their property when it comes to a farmer potentially having to pay, but it's the farmers' property when it comes to them having to potentially pay, and we don't think that they can take those inconsistent positions. (SK#1, Lawyer for SOD and Schmeiser)

You don't know how strong that patent really is until somebody violates it and it's upheld in a court of law. (Trish Jordan, spokesperson for Monsanto, as cited in Lyons, 2001)

Introduction

As we already saw quite clearly from the interview data in Saskatchewan, in addition to biotechnology's novelty as a technology, it has also introduced new ownership and control issues to be contended with at the farm level. Both Percy Schmeiser and the organic farmers have gone far to publicize the legal issues that accompany the introduction of the technology. Nonetheless, on a practical level, these issues remain theoretical for many producers, as technological decisions are often

necessarily limited to strictly economic cost-benefit assessments. However, as demonstrated by these lawsuits, the legal changes around biotechnology represents a bit of an iceberg phenomenon: while the shift to proprietary seeds looks reasonably navigable (don't save seeds), a large portion of the changes remain below the surface. This in no way reduces their impact, but only delays the awareness of these impacts. Therefore, in order to better assess the nature and direction of development of any reorganization resulting from agricultural biotechnology, it is necessary to look more fully at the legal changes that are evolving below the surface. This will be accomplished here through a more detailed assessment of two lawsuits in the province: commonly known as the Percy Schmeiser and the Saskatchewan Organic Directorate lawsuits

This chapter will begin with a look at Canada's intellectual property rights (IPR) protection for plants, both through legislation enacted under international obligations and through the evolution of Canadian case law. Next, it will provide a more detailed investigation of the case chronologies and the issues raised in the two groundbreaking court cases. What are the resolved and the unresolved legal issues around agricultural biotechnology in Canada? To what extent are the resolved legal issues effecting a social reorganization of agricultural production? Who gains and who loses in this reorganization, and in what ways? In what direction do the yet-to-be-resolved issues seem to be unfolding? Last, I will consider whether there is evidence of an emerging trend of capital accumulation through legal means, or "expropriationism," and to what extent there is evidence of resistance to this means of accumulation. I will close with some conclusions about the overall trend of expropriationism in agriculture.

The data for this chapter are made up of the court decisions and supplementary legal documents of the selected cases—such as court transcripts and affidavits—as well as interviews with litigants and their representatives, wherever possible. More detailed information on interviewees is available in Appendix B. Monsanto Canada preferred to speak through a single representative, their communications’ officer, Trish Jordan. For this reason the perspective of Monsanto’s legal representation was not available. Despite agreeing to respond to questions on condition they were submitted in print, Bayer CropScience was unable to respond within the available time.⁸ Further, although a lawyer for the company indicated a willingness to be interviewed, this was not permitted by the company. While the Schmeiser case concluded at the Supreme Court of Canada in 2004, the case initiated by the Saskatchewan Organic Directorate is still ongoing. With respect to the latter, therefore, we can only assess the expropriationist tendencies in the apparent direction of the legal decisions to the extent they have unfolded to date.

Intellectual Property Rights Protection

As noted in Chapter 2, the TRIPS agreement of the WTO imposed the need for member countries to subscribe to some form of intellectual property protection for plants, if they do not grant outright patent protection. Under Canadian patent protection, a patent can be obtained on a product or a process, and monopoly protection over that invention is provided for 20 years. In order to obtain a patent, the invention must have novelty, utility and ingenuity (Canadian Intellectual Property Office, “A Guide”). In exchange for this monopoly protection, the inventor is “expected to provide a full description of the invention so that all Canadians can benefit from this advance in technology and

⁸ From the original request contact, approximately 3 months of negotiation ensued.

knowledge” (Ibid). Simply stated, patents are for the promotion of innovation for the benefit of society. The question that remains is whether life forms can be considered patentable subject matter in Canada.

As noted in Chapter 2, the TRIPS agreement of the WTO seeks to impose some uniformity in intellectual property protection, and, if not full patent protection, member countries must have a sui generis system of intellectual property protection, such as that modelled by UPOV. Canada enacted plant breeder’s rights [PBR] legislation in 1990, and became a signatory to UPOV in 1991. Canada is party to the 1978 Act of the Convention. Plant protection under UPOV 1978 provides breeders with rights over the production for purposes of commercial marketing, the offering for sale, and the ultimate marketing of the variety (UPOV, 1978: Article 5). At the same time as providing this protection, it provides exemptions for the rights of researchers and for farmers to save seeds for their own use. While the Act only explicitly mentions the exemption for researchers, who are permitted to “[utilize] the variety as an initial source of variation for the purpose of creating other varieties or for the marketing of such varieties” (Ibid), the exemption for farmers—the “farmer’s privilege”—has been widely adopted. According to the International Union for the Conservation of Nature and Natural Resources [IUCN], “the limitation of Plant Breeders Rights to production for the purposes of commercial marketing etc, has been interpreted in practice as allowing farmers to replant and exchange farm-saved seed” (IUCN, “Article 9”). With respect to Canada, the Canadian Food Inspection Agency states “[f]armer’s privilege was allowed in the current PBR Act because support for the legislation from some farm organizations was conditional on allowing farmers to retain the right to save and use their own seed” (CFIA, “Proposed

Amendments”). Whatever its source, the provision for farmer’s privilege under the 1978 Act is undisputed in Canada.

In 2003 a number of industry groups⁹ under the auspices of the Canadian Government initiated an industry wide assessment of the Canadian seed sector, called the Seed Sector Review [SSR]. The purpose of the review was to assess and develop recommendations for regulatory change. One of the recommendations of the Review was to upgrade to UPOV 1991. In contrast to the 1978 version, the 1991 UPOV explicitly refers to these exemptions and makes them optional features to be adopted or excluded at the discretion of the signing country:

[Optional exception] Notwithstanding Article 14, 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 for planting, on their own holdings, the protected variety or a variety covered by Article 14(5)(a)(i) or Article 14(5)(a)(ii). (UPOV, 1991: Article 15(2))

While those in favour of UPOV 1991 argue that the optional provision does not mean that the right of farmers to save seed will be excluded, those opposed argue that opening the door to this possibility means that its actual occurrence will only be a matter of time. There is little doubt to those in favour of retaining farmers’ rights to save their seed that adopting UPOV 1991 will ultimately compromise if not outright remove this provision. The upgrade to UPOV 1991 is only one of the suggestions of the SSR. The overall thrust of the review is the ‘streamlining’ of regulations and the overall facilitation

⁹ These included the Canadian Seed Growers Association, the Canadian Seed Trade Association, the Canadian Seed Institute and the Grain Growers of Canada.

of opportunities for industry, many of which raise the objections of those in favour of farm saved seed.

Another source for erosion of farmers' right to save seed previously afforded under UPOV 1978 and the PBRA is occurring through the introduction of seeds available only by contract. In fact, some of the erosion of these rights appears to be facilitated by Agriculture and Agri-food Canada [AAFC]. Agriculture Canada applies for PBR protection on the seeds they develop, and then licenses them to seed companies for multiplication and distribution. While the PBR protection preserves a farmer's right to save his seeds, Beingessner (2004) states that this right is being made a "mockery" as the licensees then introduce contracts into the equation. Hard White Wheat, for example, a variety developed by AAFC and licensed to Quality Assured Seeds [QAS], can only be purchased from QAS under contract conditions that preclude seed saving. The argument for such a system is that it provides funds for research, and against it is that "forcing farmers to buy new seed each year benefits only those seed companies and growers that sell the seed" (Ibid).

This issue of farmer's rights to save seeds is not just playing out in government legislation, however, but, with respect to the patentability of life, it has become the subject of Court decisions. As we will see in Chapter 6, this question had an early start in the United States, with a trend supporting the patentability of life strongly set by the 1980 Chakrabarty case. In Canada, the transition to proprietary life forms has progressed more slowly. According to Roberts (1999), given the lower rates of investment into commercial biotechnology activity in Canada than in the United States, both the Canadian Intellectual Property Office and the Canadian courts "have faced much less

pressure than their American counterparts to accede to an expansive view of patentable subject matter” (30).

Patent protection for inventions is provided in Canada and other countries as a way to stimulate invention while benefiting the public good. Therefore, in exchange for bringing an invention to the public a patent holder is provided the right to exclude others from making, using or selling the invention for 20 years (Canadian Intellectual Property Office Website, 2006). For an invention to be patentable it must have ‘novelty, ingenuity and utility’ (Ibid). According to the Patent Act, the definition of invention is “any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter” (Government of Canada, *Patent Act*. R.S., 1985 c. P-4, s.2). This definition is modelled on US law (Vaver, 2004:157). As we shall soon see in Chapter 6, however, in contrast to the apparent enthusiastic expansion of the definition of ‘manufacture’ and ‘composition of matter’ evident in the American approach to patentability, particularly in the last two decades, the legislative history of Canada has evolved a somewhat more restrictive definition (Atkinson, 2005:13).

¹⁰The Canadian Patent Appeal Board decision regarding a patent application over a mixed yeast culture designed to purify pulp mill effluents in *Re Application of Abitibi Co* (hereafter “*Abitibi*”) represents the first Patent Appeal Board decision in favour of patenting life forms (Roberts, 1999: 31). The patent examiner originally rejected the claim on the basis that life forms are not patentable. The Appeal Board, however, noting that judicial bodies throughout the world have “gradually altered their interpretation of

¹⁰ The following two paragraphs are drawn from Roberts, 1999 and Atkinson, 2005.

statutory subject-matter to adapt it to new developments in technologies” concluded in favour of patenting life forms modified by human ingenuity: “on viewing the ferment of uncertainty that has been stirred up, we can no longer be satisfied that at law a patent for a microorganism or other life forms would not be held allowable by our own courts” (*Abitibi* at 88-89, as cited in Robert, 1999: 31). The Appeal Board indicated criteria for the future of such patenting, finding that lower life forms—such as yeast, moulds, fungi, bacteria and the like—that can be mass produced in a uniform manner should be patentable. While acknowledging that achieving uniformity would be difficult with respect to higher life forms, the Appeal Board did not rule out their patentability should they eventually meet these criteria: “But if it eventually becomes possible to achieve such a result, and the other requirements of patentability are met, we do not see why it should be treated differently” (Ibid).

Roberts notes that if the courts endorsed the approach outlined in *Abitibi*, it might have had significance akin to that of Chakrabarty in the United States (see Chapter 6). As it is, patenting life forms was substantially qualified in *Pioneer Hi-Bred v. Canada (Commissioner of Patents)* (hereafter “*Pioneer*”). *Pioneer* involved a variety of soybean produced by selective breeding, the patent claim for which was denied by the Commissioner of Patents on the basis that it was not an invention in the meaning of the Patent Act. The Federal Court of Appeal concurred, indicating that the legislature should adopt special legislation to provide some intellectual property protection for plant breeders, but that if Parliament had intended patents on plant varieties, it would have provided for this through the inclusion of applicable terminology—such as ‘variety’ or ‘strain’—in its definition of invention (Robertson, 1999:33). The approach provides a

significant contrast to that in *Abitibi*. The case was appealed to the Supreme Court of Canada, where the patent application was rejected, but on the basis of inadequate disclosure¹¹ rather than the issue of the patentability of higher life forms. However, in its obiter dictum reasoning, the Court distinguished between plants resulting from selective breeding and those from genetic engineering, with only the former relying on evolution and the laws of nature. Consequently, “it was more likely that genetically engineered plants would be patentable because they resulted more from human intervention and less from the laws of nature” (Atkinson, 2005: 14). The Plant Breeder’s Rights Act was passed soon after, in 1990. Based on these court cases, the Patent Office issued guidelines for patent examiners, differentiating lower life forms (“which are essentially unicellular in composition”) and higher life forms (“which are multi-cellular differentiated organisms (plants, seeds and animals)”), and stating that “[l]ower life forms which are new, useful and inventive are patentable,” whereas “[h]igher life forms are not” (The Canadian Manual of Patent Office Practice, as cited in Atkinson, 2005:15).

Whether life is patentable in Canada would seem to have finally found a form of resolution in the much-celebrated case of the ‘Harvard mouse’ or ‘oncomouse,’ a mouse genetically engineered to have a predisposition for cancer, useful for research purposes. The mouse had already been patented in the United States in 1988, but based on its status as a higher life form, the Commissioner of Patents in Canada considered it unpatentable subject matter. The denial of the Harvard mouse patent was appealed all the way to the Supreme Court of Canada in *Harvard College v. Canada (Commissioner of Patents)* (hereafter “*Harvard College*”). The Federal Court Trial Division, while allowing for

¹¹ Monopoly control is granted in part on condition of detailed instructions provided so that at the end of the monopoly term someone ‘skilled in the art’ could replicate the invention. The Supreme Court rejected the deposit of seed specimens as complying with this requirement (Roberts, 1999:34).

patents on the method for introducing the gene and for the preparation of the first generation of mice, rejected the mouse as unpatentable subject matter (Roberts, 1999:36). The case was appealed to the Federal Court of Appeals, which, resting its decision on an interpretation of the mouse as a 'composition of matter,' consistent with the precedent setting 1980 Chakrabarty decision in the United States (see Chapter 6 for further discussion), supported the patentability of the mouse (Vaver, 2004: 159). On appeal, the Supreme Court of Canada, in a 5-4 decision, once again rejected higher life forms as appropriate subject matter for patenting. The oncomouse was ultimately denied for patenting in Canada, and the higher court ruling would seem to have brought some closure to the issue of the patentability of higher life forms. As summarized by Atkinson:

The Court held that because Parliament chose an exhaustive definition of invention, they made an explicit decision to include some subject matter as patentable and exclude other subject matter as unpatentable. They argued that this exclusion applies to higher life forms (Atkinson, 2005: 15).

Atkinson finds two general historical approaches in Canada to the question of what is patentable subject matter. The first approach, Atkinson claims, was an erratic "mixing pot" approach, whereby "flavours from the three major patent criteria are combined until the subject matter tastes just right," that led to confusion as to the statutory definition of invention (Atkinson, 2005:10). In contrast to this mixing of the requirements of novelty, ingenuity and utility with the definition of invention, the second approach, which gained prominence in *Harvard College*, assesses whether or not an invention constitutes patentable subject matter, and, if so, independently assesses whether it has novelty, ingenuity and utility (Ibid: 10). In *Harvard College* it would seem the Supreme Court of Canada had provided much needed clarity with respect to determining the patentability of inventions, as well as providing a definitive answer to the

patentability of higher life forms: higher life forms were not considered patentable subject matter. Nonetheless, the issue of patentability would arise again in the Percy Schmeiser case, as we shall soon see.

Prairie Litigation

While technically possible, infringement lawsuits under the Plant Breeder's Rights Act in Canada have not been significant. According to a January 2004 issue of *Germination*, the seed industry finds PBRs difficult to enforce (cited in Kuyek, 2005: 34). The protection offered under utility patents would be considerably stronger. The legal requirements of utility patents would explicitly preclude seed saving by farmers even for personal use, in direct contradiction to the farmer's rights afforded by the plant breeder's rights. Nonetheless, post-*Harvard College*, the patentability of seeds was highly questionable. Patent infringement is not the only form of agricultural biotechnology related litigation, of course. Given Monsanto's Technology Use Agreement, even if patents on seeds were not upheld, farmers who legitimately purchased and then saved Monsanto's seeds would be in violation of Monsanto's contract, and open to legal suit.

Unlike in the American South, where there are a number of cases to draw on, lawsuits in Canada involving genetically engineered crops are more limited. According to those who downplay concerns over such new forms of litigation involving farmers, legal action is very limited. Monsanto claims that of the handful of cases it initiated in Canada, only the Schmeiser case has proceeded through the court system. Bayer was unavailable for comment. However, Kershen (2004) cites that as of 2003, Schmeiser was the only utility patent infringement case involving plants in Canada (2004: 576, f7). It is not just actual lawsuits that are at issue, however, as detractors claim that the great economic

imbalance between farmers and technology developers motivates farmers to accept unfair settlement agreements when faced with the threat of a lawsuit. In such cases, there is often no court record as settlement can occur before the case is filed. Given the non-disclosure agreement that accompanies such settlements, it is impossible to learn how many such cases there are, or how much it cost those farmers who settled. Consequently, further quantitative data is difficult to obtain. While the lawyer for Schmeiser and Hoffman states that he has been involved in “a handful” of cases, it is likely that some other lawyers in the area may also have had contact regarding similar preliminary consultation or involvement.

While such broader based information is difficult to come by, there is no shortage of information—or action—surrounding the two court cases that launched the agricultural biotechnology issue onto the Canadian consciousness. With the Schmeiser case and its associated issues (some as yet unresolved), suddenly varietal improvements in agricultural crops require a legal and ethical stance on property and ownership: should farmers’ right to save seed be abolished, and will innocent farmers risk liability for patent infringement due to involuntary acquisition of the technology developer’s genetic material? In the Hoffman case, unwanted genetic mixing has created a problem for organic farmers marketing their organic (GMO-free) product, raising questions of liability. While Schmeiser’s case is a defensive one, and the Hoffman case is offensive, the issues raised in both cases result from the new practice of granting patents on self-reproducing inventions. Schmeiser and Hoffman alternately put to trial issues such as the validity of patents on life, whether patents override Plant Breeder’s Rights, the right to farm organic, and liability for patent infringement or for damages arising from the

unwanted presence of genetically engineered material. At heart, these are all questions about the expropriation of farmers' existing rights. While biotechnology's detractors consider such genetic mixing "contamination," its developers prefer the considerably more benign "adventitious presence." Kershen (2004) suggests the more neutral term "inadvertent presence," although this term is restricted to innocent possession of the patented seed, such that "innocence" excludes farmers who knowingly allow volunteer crops to spread. This term appears in keeping with the Supreme Court's conclusion in the *Schmeiser* case. Given the preconceptions that are entailed in each of these definitions, such terms will be avoided here except in reference to the expression of particular viewpoints. Where unavoidable, the linguistically unsatisfying but less predetermined expression 'presence of genetically engineered material' will be used here.

Monsanto v. Schmeiser

The complex web of social and legal ramifications of patented genetically engineered seed forced the usually neglected sphere of food production into the public eye when Monsanto Canada Inc. (hereafter "Monsanto") launched suit against Saskatchewan canola farmer Percy Schmeiser for patent infringement in 1998. The case of *Monsanto Canada Inc. v. Schmeiser*¹² was a first not only with respect to its being the first patent infringement suit over genetically engineered crops in Canada, but also because Schmeiser alleged that any genetic technology in his crops constituted an unwanted presence. Schmeiser's response to Monsanto's lawsuit was neither passive nor strictly run from a position of self-defence. Rather, Schmeiser took on the company offensively, and vehemently fought the suit not only in the law courts, but in the courts of

¹² *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256.

public opinion, becoming an icon of resistance to the agricultural biotechnology companies; a “David” versus the biotech “Goliath.” The case progressed all the way to the Supreme Court of Canada, which rendered its final decision on May 21, 2004.

The basic facts of the Schmeiser case are relatively straightforward, although much occurs below the surface of these basic facts. Percy Schmeiser was a conventional canola farmer from Bruno, Saskatchewan. He was one of the roughly 20% of canola farmers in western Canada estimated at trial to practice seed saving.¹³ When Monsanto introduced its new genetically engineered RR canola in 1996, Schmeiser did not adopt it and continued his routine practice of saving and cleaning a portion of his canola seed for planting the following year. He believes this practice helped him select for his own strain of canola, which was more disease resistant: between 1993 and 1999 he had purchased no new canola seed.¹⁴

Schmeiser stated at trial that he subscribes to minimal chemical use and prefers chemicals that can be incorporated into the soil, rather than chemicals like Roundup, as he believes they reduce moisture loss. However, Roundup was a tool he used, as many other farmers did, to burn off his fields prior to planting and in order to keep the area in ditches and around power poles clear. In 1997, Schmeiser conducted such a routine spraying of ditches and power poles, however, unlike in the past, the volunteer canola in the area did not die with the weeds. Schmeiser decided to conduct a test, and sprayed approximately three acres worth of Roundup on a test strip of his canola crop, parallel to the power poles, only to find after several days that a large portion of the canola did not

¹³ Ibid. (Trial Proceedings, June 5, 2000 at 278).

¹⁴ *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 at para. 29.

die. He estimates about 60% of it. Despite this knowledge, Schmeiser stated that he continued his farming practice as usual, saving and cleaning the seed, and replanting it for the 1998 crop. Purportedly acting on a tip that Schmeiser was farming Roundup Ready canola without licence, and after some initial contact, Monsanto sued Schmeiser for patent infringement in 1998. According to Schmeiser, it hit him like a lightning bolt when he was served with Monsanto's claim that he had infringed their patent on their RR canola:

Well, I had no idea or nothing what was, you know, that I had been always using my own seed, I never bought any Monsanto seed and all of a sudden I'm getting a Statement of Claim that I was using their product.¹⁵

The details of *Monsanto Canada Inc. v. Schmeiser* (*Schmeiser*, hereafter) are more fulsome and contested than can be outlined here, though a few points bear mention. Monsanto, for example, originally accused Schmeiser of "brown bagging" their patented technology, a term that applies to the illegal sale of seed between farmers (hence, in unmarked bags), such as would be the case in sales of either certified or patented seed from one farmer to another. However, despite efforts to support this claim through interviews and other investigative means, the plaintiff dropped this allegation at trial. It is not insignificant that they further dropped their claim of infringement with respect to his 1997 crop, and proceeded on the basis of his 1998 crop alone. The plaintiff consequently alleged that Schmeiser had knowingly and deliberately segregated, saved, and ultimately propagated their patented RR canola in his 1998 crop. They point to the fact that, on the basis of their own tests, the percentage of RR canola from samples of Schmeiser's 1998

¹⁵ Ibid. (Trial Proceedings, June 5, 2000 at 870).

canola crop was 95-98% Roundup tolerant.¹⁶ In response, Schmeiser claims to have been a victim of unwanted contamination. He testified that after his spray test of Roundup, the approximately 60% of healthy canola that remained was thickest closest to the road, thinning as it progressed into the field, suggesting the GM material might have spread from the roadside. He vehemently denied Monsanto's conclusions regarding the percentage of genetically engineered canola in his crops, although supporting evidence is weak, and further raised significant objections about the sampling procedure: samples were collected by Monsanto without independent oversight; discrepancies arose around the location and transfer of these samples; and evidence for the presence of the patented gene was based on tests conducted by Monsanto's own staff.

As the Supreme Court of Canada accepts the facts of the case, the subject of the complaint can be traced to Schmeiser's field no. 1. In 1997, Schmeiser planted saved canola seed on this field. He sprayed a test patch of this crop with Roundup and found that 60% of it did not die. In the fall this patch was then harvested, separated and stored over the winter. Despite being notified by Monsanto that it had concerns he was growing their RR canola, he then treated and planted these seeds in 9 other fields in the fall of 1998.¹⁷ While these are the accepted facts of the case, the chronology of how Schmeiser might have acquired a full crop of RR canola, if one accepts that this is indeed the case, is a complex and disputed record of treated and untreated seeds sourced from different fields, deposited in different combinations in field granaries, recombined, and used to reseed different fields again. Nonetheless, the most salient detail relates to the field where

¹⁶ *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 at para 53.

¹⁷ Facts are as accepted by the Supreme Court of Canada: *Monsanto Canada Inc. v. Schmeiser* (2004), [2004], 1 S.C.R. 902 at para. 59-63, 2004 SCC 34.

Schmeiser conducted his spray test, resulting in an area with a high concentration of RR canola.

Schmeiser testified that he himself did not combine or swath the field where he had conducted the Roundup test as he had an injury at the time, and his neighbour and hired hand did it. This hand was provided with no special instructions, although Schmeiser noted that given the practicalities of navigating the farm equipment, he usually approached the field from a particular way. The first load of this canola was dumped into an extra truck parked in the field, as is the normal procedure when the primary truck doesn't return from the granary in time. When this secondary truck failed to start it was tarped and left in the field, and a few months later was moved to Schmeiser's storage Quonset in Bruno. Schmeiser claimed that when he wanted to seed the following year, the canola in this truck was the quickest to access, as it would not be hampered by the road bans that restrict the maximum load that can be hauled on municipal roads in springtime (to avoid road damage). Consequently, it was this canola that he brought to be cleaned and subsequently seeded his crop with in 1998. However such a chronology is viewed, in March of 1998 Monsanto sent Mr. Robinson, from Robinson Investigations to talk to Schmeiser about their suspicions regarding his canola. Schmeiser claims to have gotten angry at Mr. Robinson's statement that they had sampled his fields, and when Mr. Robinson left, Schmeiser forgot about the incident. Nonetheless, the fact of this interaction, if not the spray test itself, meant that Schmeiser was aware of the presence of Monsanto's RR canola in his fields.

While the original practical question of the court case concerned whether or not Percy Schmeiser deliberately infringed on Monsanto's patent for its Roundup Ready

technology, this practicality was almost immediately overshadowed by the case's broader significance with respect to the rights of farmers. While responding to the specifics of the claim against him, Schmeiser effectively put a number of the technology's unchallenged aspects on trial. Schmeiser argued that he had never deliberately planted, or caused to be planted, any seeds with the patented gene. Schmeiser claimed that given the 'unconfined release' of the patented gene into the environment, the plaintiffs had not controlled its spread, and have "thus lost or waived their right to exercise an exclusive patent over the gene."¹⁸ Further, he argued that Monsanto's patent was invalid and void because a life form that can spread by itself was not the proper subject matter for a patent. He also claimed that a finding of infringement would constitute granting a patent on a plant, and that this was not possible in Canada in light of the Plant Breeder's Rights Act. A further question was the scope of the patent: given that Schmeiser claimed not to have exploited the benefits of the technology by spraying Roundup on his crop (excepting his test strip), he claimed not to have "used" the invention, and thus not to have infringed the patent.

Federal Court Trial Judge McKay took a purposive approach to the claims of the patent, asserting that any interpretation should be "fair and reasonable to both the patentee and the public."¹⁹ With respect to the question of use, the Judge based his decision on the claims of the patent: while the invention's utility is found in its resistance to glyphosate, "none of the claims specifies this utility nor does it require the use of glyphosate, such as Roundup herbicide, for the invention to be claimed."²⁰ Further, with respect to the argument that the PBRA represented Parliament's intent that plants should

¹⁸ *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 at para. 12.

¹⁹ *Ibid.* at para. 23.

²⁰ *Ibid.* at para. 26.

be governed by legislation other than the Patent Act, the judge found nothing in the PBRA that “precludes an inventor from seeking registration under the Patent Act.”²¹ This decision in favour of patenting plants supported a prohibition on seed saving, which was otherwise considered permissible under the PBRA’s farmer’s exemption.

Further, while acknowledging that replication of the gene may occur in nature, Judge McKay found that this did not compromise the patent. While not all progeny of the RR plants will be Roundup tolerant, “those plants containing the gene can be subject to Monsanto’s claims as patent holder.”²² The implication of this is that the patent will stand on the Roundup tolerant gene through as many generations as are produced—within the time period of Monsanto’s patent rights. This is a far simpler dispensation of the debate over succeeding generations than we shall see in Chapter 6, with respect to such issues in Mississippi.

Lastly, the Judge considered the validity of the patent in the context of the Harvard College case regarding the patentability of the oncomouse. At the time of the Schmeiser trial decision, *Harvard College* had only reached the Federal Court of Appeals, which ruled that the Patent Act did not exclude a patent on an appropriate case regarding a non-human higher life form. Judge MacKay ruled that while Harvard Mouse was not directly applicable, as it related to a higher life form, it implicitly supported Monsanto’s patent (by supporting claims on the components, if not on the mouse itself). Further, he noted that in *Abitibi* the Patent Office supported that “certain life forms may

²¹ Ibid. at para. 80.

²² Ibid. at para. 83.

be patentable.”²³ This consideration of where plants stood in relation to higher life forms would come up again.

As noted, significant concerns were raised with respect to the evidence samples collected and with respect to the results of the tests. For example, as is usual in the course of their business, Humbolt Flour Mills took a sample of Schmeiser’s 1998 crop when he brought it in to be cleaned, however, they then provided this sample to Monsanto without Schmeiser’s knowledge or consent. The judge declined to rule on the propriety of the evidence collection and noted that Schmeiser had civil remedies to address such issues. Further, while acknowledging that the court needed to carefully weigh the evidence from the genetic tests, given the questions raised, there was insufficient cause to disregard it. Overall, despite the concerns, the judge reached the “tentative conclusion” based on the “balance of probabilities” that the plaintiff had infringed the patent.²⁴

In sum, Judge MacKay found no justification to rule against the validity of the patent, and on the balance of probabilities concerning the sampling and handling of evidence, found that the plaintiff was growing canola containing the plaintiff’s patented technology. With respect to the defendant’s defence that there was no intention to infringe the patent, the judge ruled that intention was immaterial: “it is well settled that infringement is any act which interferes with the full enjoyment of the monopoly rights of the patentee.”²⁵ While it was the case that the “invention has utility in resistance to glyphosate,” the judge emphasized that “none of the [patent] claims specifies this utility

²³ Ibid. at para 89.

²⁴ Ibid. at para 114.

²⁵ Ibid. at para 115.

nor does it require the use of glyphosate.”²⁶ Consequently, in the new context of inventions that can reproduce themselves, this trial court decision suggests that an ‘act of interference’ simply entails knowledgeable possession. Further, while no determination of the source of Schmeiser’s GM canola was determined at trial, the defence produced a number of possible points for contamination, including a neighbour whose tarp was loose as he hauled GM canola past Schmeiser’s fields, and another whose swaths blew into Schmeiser’s land. Five canola growers grew RR canola in Schmeiser’s area.²⁷ Nonetheless, the determination of the source of GM canola was deemed irrelevant. Judge MacKay ruled that the source of the Roundup Resistant canola was “really not significant for the resolution of the issue of infringement.”²⁸ While this determination was based on the fact that Schmeiser “knew or ought to have known” that his seeds were Roundup tolerant, it soon became one of the most notorious statements of the trial. Schmeiser himself credits this statement with garnering resistance to the changes that were occurring in agriculture:

Then after that [the trial] then alarm bells I think went off around the world in how farmers, and organic farmers, could lose their rights to their seeds and plants over night through contamination or pollution against their wishes, overnight, can no longer use their seeds or plants. And I think, if the judge wouldn’t have made that decision, or had worded it somehow else, it would never have become an international issue. That wording is what did it. (K#2, Schmeiser)

The Trial Judge’s ruling appeared to interpret events strictly from the perspective of patent law, with little leeway for the social particularities that surrounded patents on self-reproducing ‘inventions’. Even just a few years after its introduction, there could be

²⁶ *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 at para. 26.

²⁷ *Monsanto Canada Inc. v. Schmeiser* (2004), [2004], 1 S.C.R. 902 at para. 60, 2004 SCC 34.

²⁸ *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 at para. 119.

no denying the prolific nature of canola or the likelihood of volunteers. Consequently, the fact of farmers facing unexplained and unwanted presence of genetically engineered material was not in dispute. In point of fact, the trial Judge heard testimony from two Saskatchewan farmers regarding their experience with unwanted RR canola in their fields, despite the fact that neither farmer had previously grown the crop. Louis Gerwing, for example, testified that he had a volunteer RR canola problem in 1999:

On one quarter I had chemfallow, I had sprayed it twice with Roundup and these plants never died, they were growing along the highway and out into the field quite a ways [...] Well, most of it was along the highway and then there was several plants I would say a thousand feet down the field, just about a quarter mile some were out....²⁹

Similarly, Charles Boser testified about his experience when he attempted to chemfallow his field, also in 1999. He had a custom applicator spray the field twice to combat weeds, after which everything was “burned to a crisp... except for the canola.”³⁰ He indicated that well over 100 acres out of 160 had RR canola on it, “in a pattern that went completely across the whole quarter section, from east to west.”³¹ Testimony was heard in the trial that Monsanto had attended to a handful of similar complaints from farmers.

Monsanto did not deny the testimony of the two farmers. In fact, the cross-examination used the opportunity to demonstrate Monsanto’s willingness to removed unwanted RR canola that is reported to them, as they did in both of these cases, and thus their continued control over their invention. Monsanto’s conduct with respect to these two farmers, in conjunction with the Technology Use Agreement, was taken by the Judge

²⁹ Ibid. (Trial Proceedings, June 5, 2000 at 1118).

³⁰ Ibid. at 1108.

³¹ Ibid.

as evidence of the company's effort to control the spread of its invention, and thus supported his conclusion that there was no loss or waiver of Monsanto's exclusive rights to its invention. The Judge did not specifically address the issue of nature, or discuss the significance of increasing natural spread of the gene, if any. Thus the issue was left open whether any amount of natural spread could ever constitute a loss of control, as long as an explicit intention to control spread continues to be demonstrated by the company. What is unambiguous about the ruling, however, is Judge MacKay's determination of the proper purview of patent rights and property rights:

For the defendants it is urged Monsanto has no property interest in its gene, only intellectual property rights. While I acknowledge that the seed or plant containing the plaintiff's patented gene and cell may be owned in a legal sense by the farmer who has acquired the seed or plant, that "owner's" interest in the seed or plant is subject to the plaintiffs' patent rights, including the exclusive right to use or sell its gene or cell, and they alone may license others to use the invention.³²

Thus a farmer whose field contains seed or plants originating from seed spilled into them, or blown as seed, in swaths from a neighbour's land or even growing from germination by pollen carried into his field from elsewhere by insects, birds, or by the wind, may own the seed or plants on his land even if he did not set about to plant them. He does not, however, own the right to the use of the patented gene, or of the seed or plant containing the patented gene or cell.³³

Thus the findings of the trial judge render an explicit determination that patent rights over-ride the property rights of farmers. This leaves farmers liable for any presence of patented genetically engineered material in their crops, regardless of how it got there, and regardless of whether they exploited its benefits, as long as they were aware of its existence. While Judge MacKay determined that Schmeiser was liable because he "knew

³² *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 at para. 91.

³³ *Ibid.* at para. 92.

or ought to have known” that his crop was Roundup tolerant, he left unresolved the status of farmers who were not aware of this presence in their crops. In response to concerns that a finding of infringement would prevent farmers from saving their own seed due to concerns over contamination, the Judge dismissed these concerns on the basis that Schmeiser’s contamination was “not simply from occasional or limited contamination.”³⁴ The judge did not, however, note how such a scenario would play out except to note that Monsanto assisted with the removal of canola by those farmers who contacted the company. Further, he left undetermined what would be required to establish a claim of ignorance of contamination, and what the fate of farmers would be who were determined to be ignorant in this way.

The decision of the trial judge seemed to confirm the worst fears of biotechnology’s watchdogs. *Schmeiser* brought to light the non-technological changes that biotechnology brought to farming, by raising the prospect that ordinary farmers, conducting their farming operation in the same manner they always had, could find themselves liable for patent infringement. While the conditions of the TUA already raised the ire of some over the mandatory conditions that acceptance of the technology entailed, maintaining patent rights over the involuntary presence of genetically engineered material meant that something could be taken away from farmers even without their consent. Consequently, *Schmeiser* raised huge concerns that biotechnology represented a transfer of control over agriculture to corporate hands: expropriationism by act of nature.

Having had their patent affirmed, both plaintiffs, Monsanto Canada and Monsanto Company (US), sought different remedies for Schmeiser’s infringement, an approach the

³⁴ Ibid. at para. 125.

judge rejected: the former sought \$15,450.00 for the unpaid technology fee of \$15/acre applied to Schmeiser's 1998 crop; and the latter sought profits of \$105,000.00 based on Schmeiser's accounting of revenues and costs of production. In addition they sought exemplary damages. The Judge rejected the claim for dual remedies, exemplary damages, personal liability, and also rejected the conclusion that the \$105,000.00 represented Schmeiser's profits, when it provided no deduction for Schmeiser's labour. The Judge provided that the plaintiffs together could claim for profits, to be determined, or general damages in the amount of \$15,450.00. An accounting based on profits was ultimately selected and resulted in an award in the amount of \$19,832, plus pre-judgment interest, post-judgment interest and costs.³⁵ Further, an injunction was granted preventing Schmeiser from planting any seed retained from his 1997 or 1998 crop, or which he knew or ought to know was Roundup tolerant. Lastly, he was ordered to relinquish any stored plants or seeds from these years.

Given the radical shift in farmer's rights that Judge MacKay's decision signalled, and the existence of numerous environmental and civil society groups already involved in the issue of GMOs, *Schmeiser* was widely publicized. The case became a lightning rod for those opposed to patents on life, increasing corporate power, and the social, health and environmental risks of biotechnologies. Schmeiser launched a website for his cause and became a celebrated public speaker and anti-GMO activist. Schmeiser also appealed.

Schmeiser submitted 17 points for appeal, many of which replicated his claims in the Federal Court trial. Some of these issues related to the sampling and to the remedies, and the Appeal Court upheld the Trial Court with respect to these matters. Monsanto also

³⁵ *Monsanto Canada Inc. v. Schmeiser* (2002), [2003] 2 F.C.R. 165 (C.A.) at 172, 2002 FCA 309.

cross-appealed, predominantly on the issue of increasing the damages, but was denied on the basis that an accounting of profits was an equitable remedy, and the Trial Judge did not err in the award. With respect to substantive concerns, Schmeiser's defence focused on claims that at heart were aimed at defining the scope of patent rights for a self-reproducing invention that contrasts with the property rights of farmers: how broadly can such a patent be construed and what is the status of those who inadvertently come to possess the invention?

The defence argued that the patent was too broadly construed if it allowed for infringement where a RR canola plant was not sprayed with Roundup. The position taken was that this interpretation would be "unfair" to the public, "because if it stands Mr. Schmeiser could find himself liable for infringement simply by following his normal farming practices."³⁶ The Appeal Court again responded through a purposive construction of the patent, with an eye to whether there has been any interference with its "full enjoyment." Consequently, the Court found that the essence of the claim is the presence of the gene, and spraying Roundup was immaterial. Secondly, the defence argued that the source of the RR canola was not irrelevant, and that Schmeiser could not have infringed because he "took no steps to cause glyphosate resistant canola plants to grow on or adjacent to his property in 1997."³⁷ To burden his crop with a patent claim is "an unjustified intrusion on Mr. Schmeiser's property rights."³⁸ The Court found that as the infringement claim only related to the 1998 crop, and that the likely source of that was clearly determined to be the result of Schmeiser's saving seed he knew or ought to have known was RR, then the source of the original presence in 1997 was not relevant.

³⁶ Ibid. at 187.

³⁷ Ibid. at 190.

³⁸ Ibid.

The Court of Appeals responded to the remaining claims under three headings: conflict of rights; innocent infringer; and the effect of unconfined release.

With respect to the conflict of rights, the Court found that the issue is usually only relevant when establishing remedies, but that where there is a conflict between property and patent rights, “the jurisprudence presents a number of examples in which the rights of ownership of property are compromised to the extent required to protect the patent holder’s statutory monopoly.”³⁹ Thus, once again the rights of patent holders subvert the property rights of farmers. The Court acknowledged that accidental infringement can occur, however, and it found some merit to the defendant’s claim that support of the patent in *Schmeiser* could disadvantage any farmer who didn’t grow RR canola, and thus would be at risk of infringing Monsanto’s patent:

There is considerable force to the argument that it would be unfair to grant Monsanto a remedy for infringement where volunteer Roundup Ready Canola grows in a farmer’s field but its resistance to glyphosate remains unknown, or if that characteristic becomes apparent but the seeds of the volunteer plants are not retained for cultivation.⁴⁰

Consequently, while intention is generally considered immaterial to infringement, the Appeal Court found that it “seems... arguable that the patented Monsanto gene falls into a novel category.”⁴¹ On this basis the court found that “it is an open question” whether in circumstances where a farmer was either unaware of the patented gene, or was aware but did nothing to propagate or promote its presence, Monsanto could “obtain a remedy for infringement on the basis that the intention of the alleged infringer is

³⁹ Ibid. at 191.

⁴⁰ Ibid. at 193.

⁴¹ Ibid. at 194.

irrelevant.”⁴² The Court found that Schmeiser’s propagation of plants that he “knew or ought to have known” were Roundup tolerant set him apart from this category, and therefore the decision with respect to *Schmeiser* did not need to resolve whether intention would be irrelevant in a scenario where the infringer is unaware of the invention’s presence or, if aware, does nothing to cultivate it.

Lastly, was the question of whether the unconfined release of RR canola into the environment—and its subsequent spread—was tantamount to a waiver of the rights of the patent holder. The defence argued that it was “physically impossible” to prevent the spread of RR canola, and what steps Monsanto did take to prevent its spread were “curative rather than preventative.”⁴³ The Court upheld the findings of the Trial Court with respect to this issue. The Court found that even if the defence was correct on these points it would not amount to a waiver, but might “cause Monsanto some difficulty in defending its patent rights in certain situations.”⁴⁴

In sum, the Appeal Court dismissed the appeal, but more explicitly defined some of the limitations of its support for the findings of infringement, as it might apply to those the Court considers truly “innocent” infringers. For example, Schmeiser protested the injunction that prevented him from saving canola seeds that he knew or ought to have known were Roundup resistant. Given that the nature of canola meant “he can reasonably anticipate the constant presence of volunteer glyphosate resistant canola in his field at all times,”⁴⁵ he argued that the injunction consequently prevented him from his normal practice of seed saving and forced him to purchase new seeds every year. The Appeal

⁴² Ibid.

⁴³ Ibid. at 196.

⁴⁴ Ibid.

⁴⁵ Ibid. at 201.

Court did not accept this interpretation of the injunction, however. The injunction, the Court stated, did not refer to the “awareness of every Canadian farmer” about the possible presence of RR volunteers. Rather, the “requisite knowledge would not be established unless Mr. Schmeiser, because of the use of Roundup or some means of chemical testing, knows or is wilfully blind to the presence of glyphosate resistant canola plants.”⁴⁶ Consequently, as long as Schmeiser didn’t test the seed before he saved it, and conducted no other questionable actions, he would not be in violation of the injunction. Under this line of logic it seems likely that were this Court to preside over an innocent infringer case, possession without testing would also not constitute infringement. In any case, were this perspective on “innocence” to be maintained, it at least provided some clarity to the legal quagmire that granting patents on self-reproducing visually indistinguishable genetically engineered canola raised.

Considering the vast personal and financial expense of litigation, it would have been easy for Schmeiser to stop at this point. The decisions were not in his favour, and the judgement against him was just under \$20,000; relatively small considering the gamble that proceeding contained. Schmeiser did not stop, however, and his case was accepted for hearing at the Supreme Court of Canada.

The issues under consideration for the Supreme Court again primarily related to the scope and validity of the patent, and to what remedies Monsanto was entitled to if Schmeiser was found to have infringed. The applicability of the patent to plants, and the meaning of “use” were key elements of this decision. The Supreme Court returned a 5-4 split decision, upholding the patent, with the minority dissenting in part. Notably, the

⁴⁶ Ibid.

Supreme Court explicitly stated that their role was not to consider the “wisdom or social utility” of GMOs. Perhaps even more telling, they also stated that “the innocent discovery of farmers of “blow-by patented plants on their land or in their cultivated fields” was not under consideration. Rather, their decision was solely concerned with “the application of established principles of patent law to the essentially undisputed facts of this case.”⁴⁷

Once again, Schmeiser’s knowledge of the presence of the Roundup tolerant technology in his canola was a major factor.

The majority found Monsanto’s patent on the plant to be valid. Monsanto’s patent claims did not extend to the plant itself, but were for the genes and the modified cells that made up the plant. However, the majority found that “whether or not patent protection for the gene and the cell extends to activities involving the plant is not relevant to the patent’s validity.”⁴⁸ A purposive construction of the invention recognized that it would be practised in plants, and this was sufficient. This construction is further elucidated in the question of whether the defendant “used” the patent. The Majority determined that whether the patent was “used” depended on whether the defendant actively “deprived the inventor in whole or in part, directly or indirectly, of full enjoyment of the monopoly conferred by law”⁴⁹ This can occur through someone employing the invention to their advantage—even if they did not actually utilize its herbicide tolerance—such as through the stand-in utility of the invention. Along this logic, even though Schmeiser did not spray Roundup, he could have decided to do so in the future if he decided that was advantageous, or he could have sold the technology to other farmers. This construction of use depends solely on an assessment of ‘use’ from the perspective of what the patentee

⁴⁷ *Monsanto Canada Inc. v. Schmeiser* (2004), [2004], 1 S.C.R. 902 at 911, 2004 SCC 34.

⁴⁸ *Ibid.* at 903.

⁴⁹ *Ibid.* at 919.

would lose with respect to their patent rights. There is no equivalent incorporation of the gains or losses to the public in the concept. Such a narrow view of use that neglects to incorporate a concept of fairness became a point of contention for the minority.

Secondly, the court considered whether Schmeiser infringed the patent through using the plant, when it was the gene and cell that were patented. According to the majority, infringement occurs when the defendant makes use of a patented part, even if it is within something that is unpatentable, like a plant. The majority compared Monsanto's patent to that of patented Lego blocks used to make an unpatented structure. Under this conception, claiming that Schmeiser did not use the invention when he cultivated plants "flies in the face of century-old patent law, which holds that where a defendant's commercial or business activity involves a thing of which a patented part is a significant or important component, infringement is established."⁵⁰ According to the majority, infringement of Monsanto's patent does not rely on the "use of the gene or cell in isolation."⁵¹ As we shall see, the minority strongly disagreed with this interpretation of the claim.

While intention was irrelevant to a finding of infringement, the Court claimed the absence of intention "may be relevant to rebutting the presumption of use (and thus infringement) raised by possession."⁵² Therefore, possession constitutes infringement, but where the possessor makes no effort to gain advantage from the invention and "can show that the object is held without a view to advancing the defendant's interest" it may

⁵⁰ Ibid. at 931-2.

⁵¹ Ibid. at 932.

⁵² Ibid. at 904.

provide a defence.⁵³ With respect to the “innocent bystanders” question, therefore, the Court was clear that it did not consider Schmeiser to be one. Based on the uncontested facts, Schmeiser had planted saved and planted seeds—whatever their original source—that he knew or ought to have known were Roundup tolerant. He could have rebutted the presumption of use by trying to arrange for the technology’s removal, otherwise showing that the presence was accidental or unwelcome, or having a concentration in his fields consistent with “blow by” canola. In a scenario that smacks of active cultivation, the Court considered the presumption of use unrebutted:

Knowledge of infringement is never a necessary component of infringement. However, a defendant’s conduct on becoming aware of the presence of the patented invention may assist in rebutting the presumption of use arising from possession.⁵⁴

In this way the Court clearly expresses the difference with respect to their decision in Schmeiser’s case versus a decision that might be made in a case involving what they considered a truly innocent infringer. Nevertheless, there are no qualifications with respect to how the majority construed the issue of practical (if not legal) patents on plants or with respect to the question of whose rights prevail in any conflict between patent and ownership rights. With respect to the defendant’s claims that the “ancient common law rights of farmers to keep that which comes onto their land” were being violated, the Court’s response was straight-forward:

[T]he issue is not property rights, but patent protection. Ownership is no defense to a breach of the *Patent Act*.⁵⁵

⁵³ Ibid. at 925.

⁵⁴ Ibid. at 933.

⁵⁵ Ibid. at 937.

The minority, led by Justice Arbour, differed on a few points. Firstly, it found much greater significance to the fact that the Appeal Court's decision on *Schmeiser* came prior to the Supreme Court's final decision in *Harvard College*. *Harvard College* allowed claims for the process of producing a higher life form—as long as it required significant technical intervention by man—and for lower life forms, but excluded the patentability of higher life forms. Consequently, the minority in *Schmeiser* felt that the central issue was whether the Appeal Court's *Schmeiser* decision could stand in light of this change. The majority had dispensed with this question rather quickly with the contention that this case differed from *Harvard College* because the patent refused in that case was for a mammal, and that the Patent Commissioner had already allowed claims for plasmid and somatic cell culture.⁵⁶

The minority countered the majority's emphasis that the commercial interests of the patentee constitute the essential elements of the patent. Rather, Justice Arbour argued that there are further themes involved in a purposive construction of a patent, outside of preserving the patentee's monopoly rights. Firstly, patent claims should be fair and reasonably predictable for the public. Secondly, the scope of the patent is such that whatever is not explicitly claimed is considered disclaimed. Consequently, "an inventor cannot enlarge the scope of the grant of exclusive rights beyond that which has been specified."⁵⁷ This is a significant point, as the specifications of Monsanto's patent clearly do not claim the plant. From this perspective, all of Monsanto's claims are valid as long as they are not construed as extending to the plant. While the cell and the gene are patentable, Justice Arbour argued that "[i]n order to avoid the claim extending to the

⁵⁶ *Ibid.* at 916.

⁵⁷ *Ibid.* at 944.

whole plant, the plant cell claim cannot extend past the point where the genetically engineered cell begins to multiply and differentiate into plant tissues, at which point the claim would be for every cell in the plant, i.e. for the plant itself.”⁵⁸ Plants, according to *Harvard*, are unpatentable. Further, Arbour argued, “The public is entitled to rely on the reasonable expectation that unpatentable subject matter falls outside the scope of patent protection and its use does not constitute an infringement.”⁵⁹ This concern with fairness encompasses not only the public but also the hypothetical person ‘skilled in the art’ that is making and interpreting patent claims. According to the minority position, “ a person skilled in the art, upon filing of Monsanto’s patent, could not reasonably have expected that the exclusive rights for gene, cell, vector, and method claims extended exclusive rights over unpatentable plants and their offspring.”⁶⁰

As Monsanto’s patent claims could not be interpreted to extend patent protection over whole plants, the minority concluded that there could be no infringement. Simply stated, the minority found that reading the patent in the manner the majority did was in error:

[T]he test for determining “use” is not whether the alleged user has deprived the patentee of the commercial benefits flowing from his invention, but whether the alleged user has deprived the patentee of his monopoly over the use of the invention as construed in the claims. [...] In the result the lower courts erred not only in construing the claims to extend to plants and seeds, but also in construing “use” to include the use of subject-matter disclaimed by the patentee, namely the plant.⁶¹

Once Schmeiser’s case reached the Supreme Court, the opportunity was available for many of the organizations that were interested in the case to expand beyond their

⁵⁸ Ibid. at 949.

⁵⁹ Ibid. at 950.

⁶⁰ Ibid. at 945-6.

⁶¹ Ibid. at 906.

public canvassing role and apply for intervener status, which would afford their positions a formal hearing. Eleven groups were ultimately granted intervener status on the case. Four of those who were granted this status were supportive of Monsanto's right to patent seeds: the Canadian Canola Growers Association [CCGA], Ag-West Biotech Inc., the Canadian Seed Trade Association [CSTA] and BIOTECanada. The latter three of these are seed trade and biotechnology industry groups, and they are consistently concerned that if plant technology developers are unable to protect their intellectual property then it will negatively affect this technology development, to the detriment of the Canadian biotechnology industry and the seed sector. Interestingly, considering the question of litigation against innocent farmers that *Schmeiser* involves, the CCGA (an umbrella organization for provincial canola grower organizations) also intervened in support of patents on plants. The CCGA position is that it is not hugely common for canola producers to save their seed, that canola producers export a large portion of their product, and that any compromise to their producers' access to biotechnology products would affect their global competitiveness. Consequently, the CCGA argued that intellectual property protection was necessary to encourage research and development and maintain access to new developments. In order to advance their position, the CCGA took on the issue of the legitimacy of patenting directly, arguing that plant genes, cells and plants, are, in fact, the proper subject for patents as they are not higher life forms because they "are not sentient, do not express emotion and are mere 'compositions of matter.'"⁶² The concerns over the market disadvantage of losing the technology were, therefore, far greater than their concerns over the potential risk of legal liability:

⁶² *Monsanto Canada Inc. v. Schmeiser* (2004), [2004], 1 S.C.R. 902 at 911, 2004 SCC 34 (Factum of the Intervener, The Canadian Canola Growers Association [CCGA], December 2003 at para 20).

Farmers' privilege to save seed and potential innocent infringement of patents are manageable issues given current agronomic practices. No remedy would be awarded to a patent holder who sued an innocent bystander in a frivolous infringement claim. If this issue becomes a concern to the CCGA members, the CCGA will propose to Parliament that it amend the Patent Act to provide regulatory protection for farmers.⁶³

Intervening in support of many of the issues Schmeiser raised were seven organizations, six of these submitted jointly: the National Farmers Union, the Council of Canadians, the Sierra Club of Canada, the International Centre for Technology Assessment, the Research Foundation for Science, Technology and Ecology, and the Action Group on Erosion, Technology and Concentration. These groups were concerned with social elements that had not found a forum in government regulation or in the courts, such as the broader social effects of patents on life and restrictions on seed saving. They argued that the lower courts had failed to consider public interest in their findings:

An overly broad interpretation of patent claims may not only interfere with further innovation, a traditional concern of patent law, but also derogate from the existing rights of third parties and adversely affect the environment and biodiversity. This significantly complicates the task of finding the proper balance between public and private interests when patents concern living organisms which spread and interact with the environment.⁶⁴

Unfortunately for these groups, the majority of the Supreme Court was adamant in its intentions not to consider any issues outside of the Patent Act. Similar to the *Harvard College* decision, the Court determined that if these issues were to be given consideration, it was up to Parliament to do so:

⁶³ Ibid. (Notice of Motion, CCGA Proposed Intervener, September 2003 at para. 4(iv)).

⁶⁴ Ibid. (Factum of the Interveners, Council of Canadians; Action Group on Erosion, Technology and Concentration; Sierra Club of Canada; National Farmers Union; Research Foundation for Science, Technology and Ecology; and International Center for Technology Assessment [hereafter "Council of Canadians et al."], at para. 22).

Inventions in the field of agriculture may give rise to concerns not raised in other fields—moral concerns about whether it is right to manipulate genes in order to obtain better weed control or higher yields. It is open to Parliament to consider these concerns and amend the *Patent Act* should it find them persuasive.⁶⁵

Further:

Where Parliament has not seen fit to distinguish between inventions concerning plants and other inventions, neither should the courts.⁶⁶

While dismissing any concerns outside of strict patent considerations, the scope of the patent is certainly within that purview. It is on this point that the Attorney General of Ontario intervened, expressing concern that the Court “apply its usual approach of interpreting patents narrowly to gene and DNA sequence claims.”⁶⁷ The Attorney General’s specific concern was with respect to health care, and that the Schmeiser decision “not inadvertently restrict the ability of researchers and health care providers... to develop new tests and treatments for patients.”⁶⁸ This concern resonates with the minority’s position on how the scope of the patent should be determined. Nonetheless, the majority supported the much broader interpretation of the scope of the patent.

The only significant disagreement the Supreme Court had with the earlier Courts’ decisions was with respect to remedies. As noted, Monsanto had chosen to seek an accounting of profits and Schmeiser’s profits on his 1998 canola crop had been calculated at just under \$20,000. However, the Supreme Court ruled that the inventor is only entitled to the portion of the profit that can be attributed to the invention. Schmeiser had sold his RR canola for the same amount as he would have any canola crop, and, as he did not

⁶⁵ Ibid. at para. 93.

⁶⁶ Ibid. at para. 94.

⁶⁷ *Monsanto Canada Inc. v. Schmeiser* (2004), [2004], 1 S.C.R. 902 at 911, 2004 SCC 34 (Factum of the Intervenor, Attorney General of Ontario, December 16, 2003, at para. 5).

⁶⁸ Ibid. at para. 4.

spray Roundup, his yields cannot be said to have increased. Consequently, the invention could not be said to have contributed anything to his profits. The Court awarded Monsanto no remedies and declared that on the basis of the mixed results, both sides would have to pay their own costs. While the “innocent infringer” question in many ways remains to be resolved, the decision on remedies creates much greater certainty for anyone accused in this way. As long as no Roundup was sprayed, and the seed was marketed in the normal channels, Monsanto would get no accounting of profits. This would end the concerns of the innocent infringer if it were not for the fact that Monsanto could elect for a damages remedy, at \$15/acre plus any further damages that can be proven. In addition, while there seems only modest financial benefit for Monsanto to launch such litigation, there remains a strongly punitive aspect of engaging farmers in costly litigation. Consequently, Monsanto retains a strong motivation to sue in order to maintain control of its invention.

On The Offensive: *Hoffman v. Monsanto*

In *Hoffman v. Monsanto Canada Inc.*⁶⁹ (hereafter “*Hoffman*”), organic farmers Larry Hoffman and Dale Beaudoin filed for class action certification for their legal claim against Monsanto and Aventis (subsequently Bayer) over the loss of their organic canola market. The *Hoffman* claim was launched in 2002. Certification was denied in the Saskatchewan Court of Queen’s Bench in May of 2005, and that decision is currently under appeal. While the case is still relatively young in terms of its progression through the court system, it has already garnered significant interest and debate over the legal issues involved. *Hoffman* represents the first case in Canada where agricultural producers

⁶⁹ *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225.

have gone on the offensive to try to impose liability on biotechnology developers for the impact of their technology. To date, there is no similar case in the United States.⁷⁰

While Larry Hoffman and Dale Beaudoin are the representative plaintiffs for the suit, the legal action was spearheaded by the Saskatchewan Organic Directorate [SOD], an umbrella organization for organic production and related enterprise in Saskatchewan. This fact would later cause some complications for the claim. As an organization concerned with the welfare of organic agriculture, SOD was concerned by the introduction of genetically engineered crops into the environment. By condition of their organic certification, organic producers are not allowed to use any synthetic pesticides, fertilizers, or genetically engineered organisms in their agricultural production. Given the prolific nature of canola, however, organic farmers are at risk of GMO transfer through the same means at issue in the Schmeiser case, albeit with different consequences. They are also at risk from the general contamination of the canola seed supply as “few, if any, pedigreed seed growers in Saskatchewan will warrant their canola seed to be GMO-free.”⁷¹ According to the Hoffman statement of claim: “Contamination of organic products by prohibited substances such as GMOs can result in the rejection of shipments and substantial losses to organic farmers.”⁷² Consequently, production of organic canola has essentially stopped and canola has been removed from organic producer’s crop rotations as a result of their inability to keep the prohibited material out of their crops. The claims of Hoffman and Beaudoin would support this contention.

⁷⁰ The issue in *Hoffman* is different from the Starlink Corn affair as Starlink was unapproved for human consumption and was not permitted for release into the human food chain.

⁷¹ *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225 (Amended, Amended Statement of Claim, January 10, 2002, at para. 26).

⁷² *Ibid.* at para. 10.

Both Larry Hoffman and Dale Beaudoin are organic farmers, certified through the Organic Crop Improvement Association International [OCIA]. Larry Hoffman farmed transitionally since 1989 and became certified organic in 1991. He farmed approximately 2400 acres in Spalding, Saskatchewan, first growing organic canola in 1994. Under cross-examination, Hoffman stated that he would have grown canola again in 1997, in a normal rotation, but decided against it. While he had had no contamination incidents with GM canola that he was aware of, Hoffman had become increasingly aware of the possibility of this occurring, and didn't want to take the chance of his crop being "rejected or put on hold."⁷³ Hoffman stated that given the evidence of contamination around him, "I would assume that if I have a crop of GMO canola beside me, I would assume that I'm going to get drifted too."⁷⁴ Instead of canola, he grew rye, peas and barley and calculates he lost somewhere from \$22 to over \$100 per acre, for 181 acres, depending on the price he might have received for his canola.⁷⁵

Dale Beaudoin farmed approximately 600 acres in Mayfield Saskatchewan. He farmed organically since 1988, but only became certified by 1995. His main crops were wheat, oats, canola and barley, and he grew canola every year from 1995 to 1999.⁷⁶ In 1999, Beaudoin signed a lucrative contract to produce organic canola for a company called Himex.⁷⁷ The contract required testing of the end product, with a threshold of GMO tolerance of 0.01%, which, despite following all OCIA production guidelines, Beaudoin's crop failed. As a result, Beaudoin lost his lucrative contract of \$16.50 per

⁷³ Ibid. (Cross-examination on the Affidavit of Larry Hoffman by Mr. Kuski and Mr. Leurer, Vol. 1, March 23rd, 2004 at para. 143).

⁷⁴ Ibid. at para 439.

⁷⁵ Ibid. at para. 154-5.

⁷⁶ *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225 (Cross-examination on the Affidavit of Dale Beaudoin by Mr. Kuski and Mr. Leurer, Vol. 1 at para. 176).

⁷⁷ Ibid. para. 188.

bushel. He did subsequently manage to sell his crop through regular organic channels, albeit at the lower rate of \$13.25 per bushel.⁷⁸ As a result of this incident, and the fear that such an incident could occur again and exclude him from organic channels, Beaudoin ceased growing canola.

The SOD was not simply concerned about the loss of canola, however. Roundup Ready wheat was on the horizon, and, as we saw in Chapter 3, the issue was hugely important for organic farmers. Given the effective end to the rising organic canola industry, the prospective introduction of a genetically engineered wheat variety represented a considerable threat. Therefore, a prime motivation of their legal action was to stop the introduction of RR wheat. Consequently, the class action not only sought redress for damage to the canola industry, but an injunction against the release of Roundup Ready wheat. As noted, in June 2004, in the face of enormous negative pressure, Monsanto withdrew its application for approval of Roundup Ready wheat. This withdrawal was a huge victory for organic farmers. It was a double-edged sword with respect to the commonalities of the class their case was to represent, however: while wheat was a pervasive crop, that would serve well to draw most organic farmers into the class, canola was much more selectively produced by organic farmers in Saskatchewan. Given the concerns for the future, the *Hoffman* case proceeded nonetheless on the canola issue alone.

In 2001, the Saskatchewan Organic Directorate set up a committee in order to facilitate the lawsuit, the Organic Agriculture Protection Fund [OAPF]. The function of the OAPF was to raise funds, handle media, publicize their cause through a website, and

⁷⁸ Ibid. at para. 194, 219.

generally manage the affairs that surrounded the litigation. New Class Actions legislation was on the horizon in Saskatchewan, and the plaintiffs held off their action until that time. The new Class Actions Act was brought into force on January 1, 2002, and the *Hoffman* statement of claim was submitted on January 10, 2002. As in *Schmeiser*, the significance of *Hoffman* extends beyond that of the immediate facts of the case. While the claims of Hoffman relate to damage to the organic canola industry, the case has two very significant features, one related to its content, and the other to format.

Firstly, the subject matter of the case is unique in that *Hoffman* represents an attempt by organic farmers to establish corporate responsibility for negative impacts of their technology. Organic farmers were not simply concerned about the loss of crops in their rotations, although this was a significant issue, but what that loss meant in the broader picture. They argued that what was at stake was no less than “the right to grow organic crops; the right to serve organic markets; the right to eat GMO free food; and the right to farm organically” (SOD, undated). Essentially, they argued for their entitlement to provide an alternative to industrial agriculture, and against any infringement on this entitlement. In essence, this is an argument against the ultimate act of expropriation: ending the organic industry and converting organic lands into GM crop lands.

Hoffman went on the offensive against this act of expropriationism, attempting to force liability onto the GM producing companies. The *Hoffman* claim asserts that when Monsanto and Aventis released their genetically engineered canola on the prairies they “knew or ought to have known” that it would contaminate the environment and damage organic production:

The Plaintiffs state that the Defendants knew, or ought to have known, that the introduction of GM canola into the Saskatchewan environment without any, or in the alternative, proper, safeguards would result in GM canola infiltrating and contaminating the environment, seed supplies, and property of certified organic grain growers.⁷⁹

In this manner, the plaintiffs' attempt to hold the biotechnology industry to the same requirements of awareness, attention and action similar to those imposed on farmers in *Schmeiser* with respect to the self-replicating technology.

The second point is with respect to format. As demonstrated in *Schmeiser*, a significant social concern around biotechnology had to do with corporate power, and the economic imbalance in any sort of dispute. This power imbalance was furthered by whose rights took precedence in the showdown between farmer's property and patent rights. Further, any altercation between an individual farmer and a biotechnology company would almost certainly entail a devastating loss for the farmer—irrespective of the outcomes of the case—due to the personal and economic cost of engaging in any litigation. Consequently, there are significant concerns that biotechnology companies have an unfair power advantage that allows them undue control over farmers.

If successful in certifying their claim as a class action, the organic farmers would go some way to reversing the corporate advantage. Firstly, the costs would not be borne by an individual, but through a broad based fund supported by organic farmers, and the cost of multiple lawsuits would be avoided. Secondly, through filing under the Class Actions Act, the plaintiffs would not be responsible for the defendants' costs in the event they failed, an enormously significant factor given that the litigation could otherwise be prohibitively expensive. Perhaps most important of all, in the event of a successful suit

⁷⁹ *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225 (Amended, Amended Statement of Claim, January 10, 2002, at para 34).

any resulting award would be increased proportionally by the size of the class, and consequently so would its negative impact on its developers, thus likely significantly affecting future biotechnology introductions. Lastly, such a ground breaking suit would attract a great deal of media attention and would provide considerable exposure of the organic farmers' concerns. Once certified, if *Hoffman* was successful in establishing corporate liability for wandering genetic technology it would represent a phenomenal social shift. Industry would then have to be attentive to both the costs and the benefits of retaining ownership over technology that was no longer in their physical possession.

Given the plaintiff's preferred format in *Hoffman*, the first step in the procedure was to gain certification as a class action. The criteria for class action certification in Saskatchewan include: a cause of action; an identifiable class; that the class has common issues; that class action is the preferable procedure; and that there is a representative plaintiff.⁸⁰ The evidence submitted for class action certification is of a preliminary nature, its purpose to demonstrate sufficient support for the cause of action. Consequently, this stage of the litigation is not intended to be a trial on the claims per se; rather, the role of the presiding judge is to assess whether the case meets the criteria for certification as a class action. Judge G.A. Smith subscribed to the widely applied "plain and obvious" approach to assessing the viability of the causes of action: whereby claims are to be assessed as generously as possible, erring on the side of protecting those who have a right to access to the courts, and with any decision to deny certification based on the finding that it is "plain and obvious" that the claims could not succeed. Class action certification of *Hoffman* was denied on May 11, 2005. In her 175-page decision Judge Smith found no

⁸⁰ s.6 of the *Class Actions Act*, as cited in *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225 at para. 25.

cause of action in the majority of the plaintiff's claims, relating to such common law torts as strict liability, trespass and nuisance. The judge did find that there might be some chance of a cause of action related to proper conduct of the defendants according to two environmental statutes. Ultimately, however, certification was denied on the basis that the plaintiffs had failed to prove their claim related to an identifiable class. The details of the judge's findings are described below.

With respect to negligence, the plaintiffs claimed that the defendants knew, or ought to have known, that the introduction of GM canola would infiltrate the crops of organic canola growers, and that they had a duty of care to prevent such an occurrence. Consequently, the defendants ought to have warned growers who purchased their GM products about the possibility of damage to neighbouring crops and advised them of practices (such as the use of buffer strips, tarping trucks hauling GM grain, and carefully cleaning machinery) that would have reduced the spread of the GM material. A significant issue with respect to this claim was the timing of the decisions of organic certification agencies to amend their standards to include a prohibition on GM material, and whether these standards extended beyond taking reasonable care to avoid contamination. Further, the Judge had concerns that the claim lacked evidence that the loss and damage to the plaintiffs' canola crops was foreseeable.

This type of technical logic is a necessary hurdle for legal claims, as is the detailed analysis of the applicability of previous case law to the claim at hand. For example, the plaintiffs claimed on the basis of the case of *Rylands v. Fletcher*, that the introduction of GM canola was a non-natural use of the land, with the defendants bringing onto their land something likely to do mischief if it escaped. However, this form

of argument logically redirected the claim of organic farmers against their neighbours, instead of their intended target the technology developers, a position they were unwilling to pursue. Consequently, an underlying issue with the claims appeared to be the difficulty of fitting the novel issue of GMOs under the traditional means of action available.

Similarly, the Judge expressed concern that the “relationship between the plaintiffs and the defendants... [failed to]... support a finding of relational proximity.”⁸¹ That is, the plaintiffs had to have been of such a close and direct relationship with the defendants that the defendants should have been mindful of their interests. The Judge found that the plaintiffs had “not alleged any relationship at all.”⁸² This gap between the creation and sale of GMOs and their dissemination into the environment appeared to be a recurring theme and a significant sticking point for the application of case law that evolved from more direct relationships, for example, the dumping of oil into someone’s lake, or felling trees onto their land.

Similarly, claims of nuisance rested on the premise that the organic farmers’ use and enjoyment of their land had been interfered with. The counter argument is that the high standards of third parties (the organic certification agencies) caused the loss of use and enjoyment, not the producers of the technology. While further questioning whether this loss had its roots in “hypersensitivity” the Judge conceded that the farmers’ claim is novel and consequently has difficult hurdles to overcome. Although she found that it was not plain and obvious that the plaintiffs would fail in the “use and enjoyment” argument, the claim would nonetheless fail because the defendants were not the cause—and thus were not liable for—any nuisance claimed. As the defendants only sold the canola, which

⁸¹ *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225 at para. 67.

⁸² *Ibid.*

required the active intervention of farmers in order to create the adventitious presence, finding the defendants liable would be the same as “holding the manufacturers of pesticides responsible for the nuisance caused by the harmful drift of the pesticide.”⁸³ The sentiment that this would be a highly negative evolution of case law was strong: “The implications of holding a manufacturer, or even inventor, liable in nuisance for damage caused by the use of its products or invention by another would be very sweeping indeed.”⁸⁴ However, the difference between finding a crow-bar manufacturer liable for a murder, where there could be a non-murdering use for a crow-bar, and finding the makers of GMOs liable for their dissemination into the environment (when the GMO canola was used according to its intended use), finds no play in such a conclusion. While mindful of the careful path that must be tread in the application of case law, it would seem that insufficient credence was given to the novelty of the problem that the new technology introduced.

Further to the novelty problem for the plaintiff’s claims, was the Judge’s apparent reluctance to contradict government approval of the technology. The Judge ruled that there were policy considerations to her decision, given that the plaintiffs had received federal approval to release the GM canola: “the imposition by the courts of a duty of care not to release these substances into the environment would therefore appear to be in conflict with express governmental policy.”⁸⁵ This reluctance to find liability for an approved product seems out of sync with the raft of approved products that have already run the gamut of liability litigation: tobacco would seem to be a strong case in point. The approach would seem to add an insurmountable level of difficulty to claims of this

⁸³ Ibid. at para. 114.

⁸⁴ Ibid. at para. 122.

⁸⁵ Ibid. at para. 171.

nature. Nonetheless, despite the Judge's reluctance to over-ride government approval, she found some room for questioning the technology within existing governmental approval processes. Consequently, it is within the context of such governmental approval processes that the plaintiffs found the most chance for their claims.

The Saskatchewan Environmental Assessment Act represented one potential avenue for the plaintiffs' claims that could pass the plain and obvious test. If the release of GM canola is construed as a "development" according to the meaning of the Act, then the defendants are required to conduct and submit an environmental impact assessment and obtain ministerial approval, or face liability for any loss, damage or injury as a result of the development. The requirement is that the plaintiffs demonstrate that the release of GM canola is indeed a "development," the determination of which is very difficult and vague, even for key agencies, but which likely could be characterized by: unique features, resource use, emissions, widespread public concern, involving new technology and having a significant impact on the environment. While noting the difficulty of proving that GM canola is a development in this sense, the Judge decided that it was "nonetheless impossible for me to conclude that it is "plain and obvious" that this statute does not apply in these circumstances."⁸⁶

The new version of the Saskatchewan Environmental Management and Protection Act [EMPA] was another avenue through which the Judge found some merit to the plaintiffs' claims. In 2002, Saskatchewan's EMPA was repealed and replaced with a new version, the EMPA, 2002. Given the change, the organic farmers made a claim under both versions of the act, asserting that (depending on which version) GMOs are a

⁸⁶ Ibid. at para. 192.

pollutant/substance that has caused loss or damage, and the defendants own/are responsible for the discharge and are therefore liable. Given its far broader definitions than the earlier version, the Judge found that it was not plain and obvious that a claim under the EMPA, 2002 could succeed. However, given that this version of the EMPA only came into effect after the alleged loss of organic canola markets, it was not applicable to that loss, but could only apply to any post-2002 loss, such as clean-up costs for GM canola invading organic farmers' fields.⁸⁷

The organic farmers' claims concerned damage and loss that occurred during the reign of the earlier EMPA, however. This version of the EMPA was more strict and violation required that a "pollutant" be "discharged" into the "environment," each of these having a very specific definition: for example, "environment" pre-2002 only includes soil, water or atmosphere, and therefore precludes the genetic alteration of plants; whereas post-2002 it has a much broader definition, which includes "organic and inorganic matter and living organisms," and even the "interacting natural systems and ecological and climatic interrelationships" that include the other components.⁸⁸ Similarly, the very broad "substance" of the later EMPA is much more encompassing than the very restrictively defined "pollution" of the earlier version. On the basis of these stricter definitions, the judge found no cause of action under the earlier EMPA, although there was some potential for amendments to the claim that might support such a cause. However, the plaintiffs faced another hurdle in that the basis of the EMPA argument rested on the contention that the defendants "owned" the patent to the genetically engineered material at issue. This claim was most specifically aimed at Monsanto, whose

⁸⁷ Ibid. at para. 169.

⁸⁸ EMPA, 2002, s.15(3)(a)(i), as cited in Ibid. at para. 161.

technology continues to be controlled post-sale through their Technology Use Agreement, and, surprisingly, was found to be without merit. The Judge's perspective on this issue was most significant in light of the Schmeiser proceedings and of the analysis of expropriationism.

In my respectful view it is not reasonably arguable that ownership of a patent in the modified gene and enforcement of patent rights through "technology user agreements" are sufficient to constitute "ownership" and "control" of the "pollutant" (GM canola seed and resulting pollen) after the seed is sold to farmers and cultivated by them, as these words are used in the Act. The "control" asserted by the technology user agreement is not control of when and how GM canola is cultivated or harvested, but only control, or restriction, of the right to save and use seed from the GM crop.⁸⁹

Consequently, the judge argued that the plaintiffs "do not reasonably support the conclusion that the defendants owned or controlled the "pollutants" at the time they were discharged into the environment."⁹⁰ Given all the restrictions and the threat of infringement that hangs over any unauthorized use of genetically engineered canola, farmers would be very surprised indeed to hear that the defendants did not "own or control" it.

In short, the Judge's decisions on the plaintiffs' causes of action revealed a number of disadvantages facing organic farmers with respect to attributing liability to the ownership that Monsanto had affirmed in Schmeiser. Between the novelty of the technology and the difficulty of applying existing case law to it, the problem of attributing liability to the technology developers when neighbouring farmers are the ones in physical contact with it, and the contradictory perspective on ownership and control, organic farmers are left with few means to counter the demise of their industry other than

⁸⁹ Ibid. at para. 157.

⁹⁰ Ibid. at para. 158.

negotiating with their markets and certification agencies to reduce or eliminate their prohibitions on GMOs. It would appear that were the approach in this decision to be upheld in a trial setting then the combined impact of *Schmeiser* and *Hoffman* would represent the ultimate act of expropriationism: not only are the biotechnology developers awarded the full benefits of ownership, but this award is not associated with any of the liabilities traditionally associated with ownership. At this level of the court proceedings, however, the merits of the case were only assessed to the extent necessary to establish the plausibility of a cause of action. Ultimately, the more formalistic aspects of the application—related to the identifiability of the class, commonality of issues, representativeness and preferability of the procedure—denied the other issues from gaining trial.

The most important of these form issues in the case related to the difficulty of ascertaining an identifiable class with common issues. There are significant variations inherent in farming that preclude easy identification of those who make up the class in the same way that victims in a plane crash or shareholders in a stock market scam are easily identified as a class. The identifiable class in *Hoffman* would depend on those who lost the market and those who suffered a loss due to clean up costs and other restrictions. Given the removal of wheat from the claim after Monsanto's withdrawal of its application, the number of organic farmers that would be negatively affected by GMOs and could be incorporated into the class decreased drastically.

The documented number of organic canola growers was very low, although the organic farmers contend that the industry was just taking off when they had to quit growing the crop. However, a variety of factors affect whether a farmer chooses to grow

canola, such as the difficulties of growing the crop under certain conditions. Consequently, many factors other than the market risks of GMOs, could have affected a farmer's choice not to grow canola. Further, attempts by the OAPF to solicit more testimonies on the issue yielded little. It would appear difficult to conclude otherwise than that the number of farmers involved is very low and that their identification would require individual inquiry, rather than broad class based criteria. This failure to properly identify the class was the deciding factor in denial of certification, and in concluding that class action was not the preferable procedure. This heterogeneity was articulated thus:

Members of the class sought to be certified farmed [sic] at various times, in various areas of the province, in various circumstances, were certified by various certifiers with varying standards (both among themselves and over time) and sold or tried to sell produce into various markets with varying standards (both among themselves and over time). The proceedings in this case would, in my view, inevitably break down into individual proceedings, requiring full discovery rights and a trial of the factual issues.⁹¹

Given the importance of not allowing class actions to inequitably make defendants liable for those they had no impact on, the proper delineation of who makes up a class is very important. Certainly, there were reasons for concern with respect to the pervasiveness of the issue of the loss of the canola market. However, while the decision might appear reasonable under the specifics of the small loss that organic canola represented, the logic behind the decision would seem to equally apply to a larger crop. Farmers will always be situated on different land, suitable for different crops, making decisions based on a wide variety of factors, such as speculating on the price for a certain crop that year, or whether they want to pursue the extra requirements for a higher priced contract for specialty production. These variables are the nature of farming, and therefore

⁹¹ Ibid. at para. 326.

would appear to create a significant barrier to farmers for asserting any sort of group claim against GMOs, excepting claims against unauthorized GMOs, as was the case in Starlink. The representativeness of the plaintiffs was another significant issue with respect to the potential for group action, and this will be discussed further presently.

Soon after their certification application was denied, the organic farmers applied for leave to appeal, which they were granted on August 29th, 2005. Two groups applied for intervener status on the case: the Friends of the Earth and the Saskatchewan Environmental Society. In November of 2006 this application was heard and on November 23, 2006 the appeal court judge denied intervener status to the applicants. The case is still ongoing.⁹² For organic farmers, the case is about defending their industry against the ultimate act of expropriationism; for biotechnology developers, it simply provides organic farmers “a platform for their anti-biotech position” (Trish Jordan, spokesperson for Monsanto, 2005).

Opposition

The two cases here have managed to garner a vast amount of media publicity, and stirred up a great degree of controversy over the introduction of genetically engineered crops, as has already been discussed in Chapter 3. Outside of these two cases—where the litigants are on the offensive in the court of public opinion—it is difficult to gain much qualitative or quantitative data on Canadian farmers who have had any such contact or involvement with biotechnology developers. As noted, those who are confronted by Monsanto and accept settlement rather than litigation must comply with a non-disclosure

⁹² *Hoffman v. Monsanto Canada Inc.* (2006), SKCA, (Application for Leave to Intervene), [2006 SKCA 132].

agreement, requiring them not to speak about the specific terms and conditions of the settlement. Given that only the Schmeiser case has as yet proceeded to trial in Canada, there is little doubt that the original number of interactions is considerably smaller than in the United States. These interactions do exist, however, and carry a level of threat not only for those involved, but also for the broader farming community. One individual who had received a letter from Monsanto, but was not yet legally precluded from talking in any way, declined even an anonymous interview as he preferred to “let sleeping dogs lie” rather than risk provoking Monsanto’s wrath (telephone conversation).

Some information nonetheless does reach the public. Percy Schmeiser, for example, in part of his campaign publicizes material that he receives from other farmers on his website. Three of what Schmeiser terms Monsanto’s “extortion letters” are available on the site. While the names have been removed from two of the three letters, there is no doubt that Monsanto could ascertain whose letters they were, and the publicizing of the letters themselves is an act of resistance. A few of the pertinent details are outlined below.

A letter dated November 12, 1998 informs the farmer that Monsanto has investigated and has determined it has “very good evidence” to believe that the farmer has 250 acres of RR canola.⁹³ The letter states that the company is willing to “refrain from commencing any legal proceedings” subject to a payment of \$115/acre for the 250 acres (for a total of \$28,750), commitment to Monsanto’s right to future testing, and agreement “not to disclose the specific terms and conditions of this Settlement

⁹³ All quotations are taken from letters that appear on Percy Schmeiser’s website: <http://www.percyschmeiser.com/>. Letters are available in the archives at: <http://www.percyschmeiser.com/Harassment.htm>

Agreement to any third party.” Another letter dated December 17, 2001 states that Monsanto has determined that the farmer has improperly planted 3,420 acres of its RR canola in 2000. The letter references the Federal Court case against Schmeiser to indicate that the precedent has been set for Monsanto to be awarded profits plus costs, and that while “[t]he amount of those costs have not yet been determined... Monsanto has reason to believe that they will be substantial.” Given that the Trial Court’s judgement of profits in Schmeiser was \$19,832 for 1030 acres of canola, averaging \$19.83 per acre, costs were the only avenue for significant economic threat. Monsanto offers to settle the disagreement “amicably” for an amount of \$50/acre, totally \$171,000, or it would proceed according to its legal options. The last letter is dated December 7, 2004, and claims the farmer has 700 acres of unlicensed canola. While it references previous telephone communication, it is interesting that the letter—dated after the Supreme Court decision in Schmeiser—provided no settlement amount, but only suggested a settlement plan “that will enable you to continue farming in the future” could be worked out in the alternative to going to court.

The farmers who testified in the Schmeiser trial about the unwanted presence of GM canola on their land provided further insight into Monsanto-farmer interactions. Mr. Gerwing, for example, first made contact with Monsanto over his GM canola when he saw a Robinson Investigation truck parked at the elevator:

He was in there and I told him I wanted a leather jacket. I heard they give away leather jackets if they report that somebody is growing Roundup Ready without their—what you call it—fee for growing it.⁹⁴

⁹⁴ *Monsanto Canada Inc. v. Schmeiser* (2001) [2001], 12 C.P.R. (4th) 204 (F.C.T.D.), 2001 FCT 256 (Trial Proceedings, 2000 at 1123).

It is unclear whether this action was sardonic or indicative of the lack of awareness of the seriousness of the problem, given that it occurred in 1998. In either case, while testifying that Monsanto ultimately responded to his GM canola problem, Mr. Gerwing indicated some resentment towards the company:

But it's something I can't control. But when I phoned them to, what they were going to do about their canola, like I asked them, is it their canola or is it—like this fellow informed me that it was Roundup Ready canola after that and I asked him, 'Well, is it my canola now or is it their canola? Or who owns the seed to it?' They said they own the seed but they wanted me to do the spraying to kill it.⁹⁵

Mr. Boser similarly testified that when the Monsanto representative confirmed the likelihood of RR canola, he became pretty upset:

Well, basically, at that point I was a little upset to have his contamination on my land because I've never used Roundup Ready canola. And so I just said to him that if it's a Roundup Ready canola and it's—you claim to have the patent to the seed, I suggest you remove it from my property.⁹⁶

Despite the fact that in both cases Monsanto did respond, neither indicated the level of satisfaction with the interaction that Monsanto's lawyers strove to establish. Mr. Boser for example, testified that he indicated to Aaron Mitchell from Monsanto that there were still pockets of plants growing that had been too small to pick. He indicated that Mr. Mitchell suggested 2-4-D wouldn't help and probably cultivation would provide his best result.

Monsanto's counsel: So Monsanto continues to assist you to deal with this problem to the extent it exists today?

⁹⁵ Ibid. at 1125.

⁹⁶ Ibid. at 1109.

Mr. Boser: No, I wouldn't say that.⁹⁷

Mr. Gerwing's communication similarly indicated the limitations to Monsanto's assistance with the management of their patented technology:

Monsanto's counsel: And Monsanto representatives offered to follow up with you again this year to ensure there's no problem, correct?

Mr. Gerwing: No, I haven't heard nothing from them.⁹⁸

While such insights as the settlement letters and the testimony provided by these farmers are rare, they do provide some indications of the nature of the interaction between farmers and Monsanto when there are issues related to their technology. Whether in claiming infringement of their technology, responding to complaints about their technology, or even in rebutting liability for their technology, as we saw in *Hoffman*, Monsanto appears in control at all times.

For Schmeiser, the issues of his case are very much social justice issues, and he invested considerable energy publicizing what he felt were the bullying tactics of the Monsanto Company. With respect to his own relationship with Monsanto, Schmeiser considered it much more than a legal battle, and he felt that the company was using all sorts of tactics to discredit him, if not break him financially. For example, Schmeiser complained that the company framed its interaction with him in terms of creating an even playing field, when farmers like Schmeiser would otherwise get an unfair advantage over those who paid the technology fee. Schmeiser strongly objected to this, given his perspective that he was only practicing his normal farming practices: "That was an effective way to get farmers to say, well, why should he get away with it. They are 200

⁹⁷ Ibid. at 1116.

⁹⁸ Ibid. at 1126.

miles away, what do they know about it. Monsanto has reps in every region. I don't have any" (SK#9, Schmeiser). There was little doubt that he was going to use everything he had to fight back, consequently, for Schmeiser, the right for farmers to save their own seed has become a crusade.

There is little ambiguity in the crusade that Schmeiser has launched against Monsanto during his trial, however it is also clear that this resistance did not abate at its close. Relying on Monsanto's evidence in Schmeiser's trial that they were available to remove the unwanted presence of their patented material, Percy's wife, Louise Schmeiser, filed suit against Monsanto in a small claims court in Humbolt, Saskatchewan for the \$140 cost of removing unwanted RR canola in her organic vegetable garden. The case was heard March 21, 2005. The small claim suit again garnered a significant amount of media publicity (see for example, Hansen, 2004), and once again generated interest in the issue of power distribution between farmers and biotechnology companies: given that Monsanto had sued Schmeiser over the presence of canola that they claimed to own in his fields, could his wife sue them for the cost of having to remove 'their' canola when it was unwanted? Despite the media publicity, however, less than a handful of people attended the actual hearing.

The claim stated that volunteer canola had appeared in the Schmeisers' shelterbelt and in Louise's garden in the summer of 2002. Two applications of Roundup to the canola in the shelterbelt revealed that it was Roundup resistant. Louise Schmeiser had repeatedly requested by letter that Monsanto come and remove the offending plants by a certain deadline, and when these requests were ignored, she had the plants removed and sent Monsanto the bill. A number of factors contributed to the dismissal of the claim,

such as the fact that Louise Schmeiser did not attend the trial as she was unwell, and was unable to testify. It is also no small point that the Schmeisers were actively engaged in litigation with the defendants at the time of the alleged contamination. The case was nonetheless significant for continuing to tease out the legal aspects of the technology, particularly with respect to the standards for documenting the presence of RR canola, and the role of Monsanto with respect to volunteers of its canola.

Percy Schmeiser provided impressive evidence documenting the issue with the canola: he documented the spraying of the canola in the shelterbelt, by himself and another party, he provided dates and took photos of the canola in the shelterbelt and in the garden, and also follow up photos post-spraying. He did not provide evidence on the concentration or rate of application of the Roundup, however. In Monsanto's defence, Mr. Ripley, a technology development representative for Monsanto, testified that the rate of application of Roundup is crucial and that certain environmental factors can affect the effectiveness of Roundup. Therefore, a lab test is required to positively identify the presence of RR canola. "It was his opinion that spraying was not an accurate test to determine if the Monsanto gene was present."⁹⁹ The case was ultimately dismissed on the basis that it was inconclusive whether the canola plants in question were Roundup tolerant. Despite the fact that the Supreme Court of Canada in *Schmeiser* had said that "a canola plant that survives being sprayed with Roundup is Roundup Ready Canola,"¹⁰⁰ the Small Claims Court judge found that a higher standard of evidence as to the presence of RR canola was required in this case because Schmeiser had not denied its presence in the previous case, and because its existence was the primary issue in the current case.

⁹⁹ *Schmeiser v. Monsanto Canada Inc.* (2001), SK Small Claims Court, Humboldt, SK, at para. 22.

¹⁰⁰ *Monsanto Canada Inc. v. Schmeiser* (2004), 1 S.C.R. 902 at 914, 2004 SCC 34.

The Court found:

...in view of the absence of evidence with respect to rates of concentration and the environmental conditions during the spraying as well as the Defendant's evidence that only a lab test would be the ultimate determinant of whether or not the Roundup resistant genes were present in the plants I cannot conclude that the Plaintiff has proven that these are Roundup Ready plants on a balance of probabilities.¹⁰¹

By these standards, only a lab test, which farmers are unlikely to easily access, is considered sufficient to establish the presence of RR volunteers for farmers seeking redress over its presence.

A second significant issue was raised with respect to whether Monsanto has a duty of care with respect to removing any unwanted canola. As in *Hoffman*, the defence placed a heavy emphasis on the fact that Monsanto had been given federal regulatory approval for "unconfined release" of its product. Consequently, the Court could find no evidence "that there was, in fact, a duty of care to the Plaintiff to ensure that there is no unwanted spread of Roundup Ready canola plants."¹⁰² Rather, while there was evidence that Monsanto had responded to farmers' complaints of unwanted presence of their GM technology in the past, this was only indicative that Monsanto "voluntarily assumed" this responsibility.¹⁰³ If the position of the Small Claims Court holds, not only will farmers have a very difficult time proving the presence of RR technology that they do not want, but Monsanto will be under no obligation to remove it when they do.

Schmeiser's interaction with Monsanto did not stop there, however. Despite having quit growing canola of any kind, Schmeiser claims that in September of 2005 his

¹⁰¹ *Schmeiser v. Monsanto Canada Inc.* (2001), SK Small Claims Court, Humboldt, SK, at para. 42.

¹⁰² *Ibid.* at para. 49.

¹⁰³ *Ibid.* at para. 50.

chemfallowed field was invaded by RR canola. Monsanto agreed to remove the plants but only on condition that Schmeiser sign their legal release, which he refused to do, subsequently putting the document up on his website. The form for the removal of unexpected volunteers states in part:

It is understood and agreed that the said delivery of product is not deemed to be an admission of liability on the part of any of the Releasee.

It is further understood and agreed that the terms of the Final Release & Settlement of Claim shall be treated as confidential and shall not be disclosed to others without the written consent of Monsanto Canada Inc. and it is hereby declared that the terms of this settlement are fairly understood, that the amount stated herein is the sole consideration for this release and that, the said product is accepted voluntarily for the purpose of making a full and final compromise, adjustment and settlement of all claims for losses and damages resulting, or to result from any of the matters referred to in this release. ("Release," Monsanto vs. Schmeiser, Website)

In an October 2005 media article, Schmeiser is quoted as estimating his clean up costs to exceed \$50,000, for which he intends to send Monsanto an invoice, and is threatening to file suit (Pratt, 2005). Trish Jordan, Monsanto Canada's communication officer, has responded that "In this situation it would appear that Mr. Schmeiser is not really interested in assistance. He's interested in continuing his media campaign" (as cited in Pratt, 2005). It would appear very likely that she is right.

What impact has Schmeiser's many years of resistance against Monsanto had? Despite three levels of court, Monsanto's patent was upheld. There is little doubt that now that Monsanto has had its patent affirmed, it will increase its enforcement efforts: "We did have a number of people waiting in the queue, but (Schmeiser) was the first case where we attempted to find out if the patent was valid" (Trish Jordan, as cited in Lyons, 2001). It is very likely that *Schmeiser* drastically reduced the amount of damages

Monsanto would have hoped to receive in such cases. Depending on the size of acreage in question, the greatest expense a farmer is likely to face in litigation is legal costs. This not only affects Monsanto's motivation for future litigation, but the economic threat it can wield in settlement offers. However, even given the Supreme Court's ruling in *Schmeiser* that each side had to pay their own costs, and that future cases are unlikely to proceed as far through the courts, these costs can still be formidable: "Where it hurts an individual like ourselves in the decision is when the court ruled that we each had to pay our costs up to that point. Our costs probably was in the neighbourhood of well in the excess of \$400,000" (SK#9, Schmeiser).

Schmeiser's legal actions have also provided a far greater amount of exposure to numerous issues around agricultural biotechnology, and have provided some clarity with respect to what might constitute "innocence" for the Courts. It is also likely that his campaign increased the overall exposure of related issues like the Seed Sector Review. For groups such as the National Farmers Union, who are actively campaigning on the issue, the changes attempted by the SSR and the patenting of genetically engineered seeds are part and parcel of the same drive to alienate farmers from their right to save their own seed.

For organic farmers, the introduction of genetically engineered organisms went from an issue that was irrelevant to their farming operations to a pressing concern in just a few years. Once faced with the prospect that this new technology was going to have a negative impact on their burgeoning industry, they fought for a way to influence the outcome. Opportunities to do so were not easy to come by, and at the failure of

alternatives, the Saskatchewan Organic Directorate began to feel that legal action was the only route:

This was an issue back in probably '99, '98, we went to the provincial government lobbying, and said we're looking at if you guys don't do something about this GMO stuff—we had a meeting in Regina and we were there, expressing our concerns, and basically threatening some kind of legal action. Of course the government never thought we would do it (SK#6, Taylor).

Contrary to these expectations, members of the SOD were sufficiently concerned about what impact the introduction of GMOs could have on them that they felt they had to act for the sake of their organic industry. In this context, it needs little emphasis that the Hoffman case is not simply the result of two organic farmers who sought refuge in a representative organization, but has a significant degree of deliberate action from an umbrella organization that wished to represent the concerns of its members more broadly and avert further negative impacts from impending GMO introductions.

In an effort to mitigate the impact of the litigation on the representative plaintiffs, and as advised by their counsel, the SOD and the representative plaintiffs entered into two written agreements: one was an “agreement to act as a representative plaintiff,” which outlines the role of the plaintiff, asserts his agreement to attend Court as required, and gives authorization for the SOD-OAPF to retain and instruct counsel on his behalf; the second was a “legal costs indemnity agreement,” which protects the representative plaintiff from any award of costs which may be levied against him in the course of the litigation. The Judge expressed concern that as a result of these agreements the plaintiffs have “relinquished control” over the lawsuit. The evidence to support this contention was certainly there: while Hoffman was one of the twelve SOD-OAPF committee members,

he had no independent right to conduct action outside of his role on that committee; Beaudoin had never attended a committee meeting and was not even aware of all the identities of the committee members. The Judge found that a representative plaintiff has the responsibility of prosecuting the lawsuit, and that these duties cannot “be delegated to another party who is not answerable to the Court.”¹⁰⁴ Consequently, she concluded that neither plaintiff could be found to “fairly and adequately represent the interests of the class.”¹⁰⁵

In their defence, the SOD characterizes the relationship between the SOD and the plaintiffs thus:

SOD is not suing Monsanto; the plaintiffs are suing Monsanto. We are facilitating the lawsuit. We have an agreement with the plaintiffs.... Both plaintiffs are on the committee as well. It is kind of a chicken and egg thing. There was a move afoot to take some sort of legal action, and we were the right responsible body to help make it happen. (SK#6, Taylor)

Such perspectives notwithstanding, it is understandable that the Court might construe the role of the plaintiffs as being a means to an end for the goals of the SOD-OAPF. Nonetheless, there is some difficulty in construing the committee involvement as negative to the interests of the class, or somehow less in the interests of the class than similar actions that are initiated by lawyers. The SOD believed that it had a legitimate class interest and sought the best means of representing its interest through the legal system. The fact that there are more interested parties than the plaintiffs would seem to increase the representativeness of the action, not decrease it. While the plaintiffs were amenable to tearing up the disputed agreements, this was not sufficient to change the perspective of the Court.

¹⁰⁴ *Hoffman v. Monsanto Canada Inc.* [2005], 7 W.W.R. 665, 2005 SKQB 225 at para. 337.

¹⁰⁵ *Ibid.* at para. 335.

The benefits of a committee run class action lawsuit are large for the plaintiffs, however, considering the toll such litigation would take on an individual plaintiff without such committee involvement. In fact, it is quite possible that if the only way such litigation could proceed would be through an autonomous individual plaintiff, then it might not happen at all. Considering the limited options for organic farmers, litigation to force liability for the inadvertent presence of GMOs is an important avenue. It is also an avenue that is unlikely to proceed without class action certification:

In regard to this case, not being certified would probably spell the end of the litigation in all likelihood. The individuals do not have the wherewithal to pursue it on their own, and they are not likely to get the support they need just to pursue it through actions. It just becomes non-feasible to do it. There is a major concern about cost. (SK#1, Zakreski)

As is already evident, the case is about much more than canola, and the SOD's determination to fight the issue is directly related to its concerns about the introduction of future GMOs. For example, while wheat has been withdrawn, the next concern is GM alfalfa. On the assumption that such litigation remains a possibility for them, the SOD has not reduced its drive to prevent GM contamination of their industry. With respect to GM alfalfa, the president of the SOD indicated their intention to continue the fight:

We have written to Monsanto alerting them that we are aware of their possible intention to introduce GMO alfalfa, and we will probably—if they try it—we will probably try to take legal action against them through the injunction process. (SK#6, Taylor)

The goal of the fight is bigger than the particular issue of canola, but is about liability in general. While establishing outright liability would be a monumental victory for the SOD, the lesser goal of requiring compliance with any of the environmental acts would provide a significant avenue for their concerns to be heard in the future. If this

were to occur, the victory would be in forcing the release of any new GMOs to be subject to a number of considerations and public hearings, much like those who were opposed to GM wheat considered necessary.

If we can attach any area of liability, under the environmental acts, I mean I'm hoping that this is what will happen. That from now on if we get something then they have to do an environmental assessment before they release it. That for me is the ideal situation, even if we don't win damages or this and that; I mean we're not in it to make money. ...if we can get it so that they don't just release GMO alfalfa, or before they have the proper hearings, just like a hog barn or anything else. (SK#6, Taylor)

While the odds are stacked against them, this is a fight that the Saskatchewan Organic Directorate appears unwilling to drop. The impact of this resistance is still in the making. Further, much in the same way that Schmeiser continues to be a thorn in the side of the biotechnology industry, the impact of the SOD litigation already extends beyond its legalities. For one, it brings the issue of liability into the light, and renders visible the otherwise invisible externalities of the introduction of agricultural biotechnology, providing fuel to the anti-GMO campaigns of environmental and other NGO groups. For another, the case highlights aspects of the technology that require an unavoidable social decision about property rights that cannot be resolved through reference to pre-existing legislation—in the manner that health and safety decisions are regulated under pre-existing statutes through 'substantial equivalence.' Once raised by the Hoffman case, there is no doubt that the issue of liability has earned a seat at the agricultural policy table, whatever the actual outcome of the case. As the solicitor for the plaintiffs puts it:

...if the case is successful, it's significant because it established liability, and that would be of interest to legislators. But if there is no liability, then you at least know that the existing law can't address liability problems with these crops, and the government should be looking at enacting legislation to deal with it. (SK#1, Zakreski)

Of course, legislators have been known to ignore such regulatory needs, particularly on such 'hot' issues as agricultural biotechnology, where any sort of decision is likely to attract negative attention.

Conclusion: Hoffman v. Monsanto v. Schmeiser

In sum, Canada is clearly moving from its early reluctance to patent life forms to an approach to intellectual property more in keeping with that in the United States. These changes to the laws around patentability evident in the shift from *Harvard College* to *Schmeiser* are consistent with other changes in agriculture. The Seed Sector Review, and the growing incidence of seed contracts are already demonstrating a consistent shift towards a full commodification of the seed. With respect to the changes that are evolving in the court cases around agricultural biotechnology patents, the evidence in Saskatchewan points to an almost impressive legal fiat of expropriationism stripped of many of the unpleasant repercussions normally associated with ownership.

In assessments of expropriationism, these cases cannot be looked at separately as *Monsanto v. Schmeiser* and *Hoffman v. Monsanto*. The two represent an integrated package of property rights decisions. Contrasting the perspective on ownership in *Schmeiser* with that of *Hoffman* and even with Louise Schmeiser's Small Claims Court decision, it would appear that corporate ownership over patented seed is seamlessly maintained through the invention's re-generation and through any of its wanderings, while this same ownership stops at the first point of sale with respect to liability. If this were to be upheld, it would appear to be a flawless transition to accumulation based on expropriationism: biotechnology companies will be granted the benefits of ownership without many of the normal responsibilities, while farmers bear the costs. In *Hoffman v.*

Monsanto v. Schmeiser, there is little ambiguity as to who has come out the property rights winner.

Percy Schmeiser's legal battle with Monsanto did much to expose the expropriation of farmers' property rights that are associated with the introduction of patented genetically engineered crops. In the eyes of the law as it currently stands, patent rights trump property rights. This case was certainly affected by the fact that Schmeiser had been aware of the patented material and, according to the trial judge's findings of fact (which Schmeiser disputes), segregated it for propagation. A true case of an "innocent" infringer, therefore remains to go before the courts, where "innocence" connotes lack of knowledge and/or a rebuttal of the presumption of use raised by possession (through lack of use or intention to use the patented material). Many questions remain with respect to this scenario, most importantly, what percentage of patented material constitutes "occasional" presence in a farmer's field, and what percentage constitutes infringing presence. In addition to concerns about at what point a farmer crosses the infringement line, other questions evolve out of the combination of findings: what are the grounds for countering the presumption of use, and how difficult is it for a farmer to do so; while Schmeiser's scenario failed to rebut this presumption, what scenario would; should a farmer spray to assess for Roundup tolerance or not spray to avoid determinations of use; if a farmer knows that Monsanto will not remove its GM technology unless he signs a release, but doesn't wish to do so, will this make him liable to an infringement suit? Even if such uncertainties are ultimately resolved in a farmer's favour, given the expense of litigation the practical outcome might not be in his favour.

Certainly, such concerns are tempered by the contention that technology developers are unlikely to wantonly pursue their customers. There is no doubt that abuse can and does occur, however, and given the imbalance of power already at play it is troubling to have such uncertainties. With respect to the lack of independent sampling and handling procedures, they become extremely significant, leaving it in the hands of the technology developer to not only bring the accusation of infringement, but also be responsible for gathering, holding, and testing all the evidence. While farmers could commission independent tests, this is likely to be very costly. Given that the benefits of the patent accrue to the patent holder, there are also equity concerns in that the Supreme Courts' construction of infringement puts the onus on farmers to become the guardians of the patent holder's technology. Lastly, it is also important to note before concluding that the discussion of *Schmeiser* does not touch on a highly significant aspect of genetically engineered seeds in Saskatchewan, and that is the Technology Use Agreement. As *Schmeiser* was not a Monsanto customer and did not sign a Technology Use Agreement, the contractual provisions of the TUA did not come under legal scrutiny. Such issues have advanced much further in American case law, and have raised numerous questions regarding the contract's restrictive terms, indicating that when such a suit occurs in Canada there will be an equivalent airing of significant social issues (see for example, Kaiser, 2005).

Set in contrast to *Schmeiser*, the first significant legal decision in *Hoffman* would certainly seem to indicate that biotechnology developers will get to have their cake and eat it too with respect to ownership and control. The case is still ongoing, however. While very early in the evolution of case law for establishing liability for genetic contamination,

Hoffman would appear to have the potential to effect important changes in the way in which biotechnology is introduced into agriculture. Of course, as it currently stands, the struggle is over certification as a class action. Should the case ever receive class action certification, the plaintiffs' success in the trial is another question entirely. Nonetheless, considering the barriers to certification evident in *Hoffman*, certification itself would be hugely significant, and would lay the groundwork for future actions of this type.

For those who have taken to resist the technology and its proprietary aspects—what I term expropriationism—the strategy has definitively been two-fold: one part litigation; one part capitalizing on the publicity raised by the litigation. By all appearances, the rapid expansion of biotechnology in Canada has been an economic agenda, with relatively little attention given to regulating risks or to addressing the new property issues that arise with the advent of self-replicating inventions. Despite being predominantly excluded from the policy process around agricultural biotechnologies, NGOs and ENGOs have managed a sustained public pressure offensive on the industry, in part thanks to their alliance with the two lawsuits outlined here. The Schmeiser and Hoffman cases are steeped in moral and ethical objections to the proprietary changes associated with agricultural biotechnologies: Schmeiser believes that patenting life forms should not be permitted, and farmers' right to save their own seed should never be constrained; and Hoffman, Beaudoin and the SOD believe that the organic industry has a right to exist and to produce GMO-free crops, as they and their customers desire, and that the benefits of GMO ownership carry associated responsibilities.

Although some might disagree with the extreme to which Schmeiser has taken his position on the GM issue, it is certain that few would have the stamina and the drive to

take these issues as far as he has. It is also certain that without Schmeiser, many of the changes that are occurring, including some questionable aspects of power, would have occurred below the radar. Similarly, Hoffman has also raised the ire of those who think that the loss of their tiny organic canola market does not warrant such a legal show. Nonetheless, as a consequence of *Hoffman* nobody can claim that liability hasn't been introduced as a significant agricultural policy issue. At its media peak, the case irrevocably associated patents and ownership of genetic material with the question of liability. Whether it will force its way onto the agenda for new policy formation or fade back into the background may have much to do with its ensuing legal chronology. In sum, it is likely that the greatest accomplishment of these lawsuits has been increasing the transparency of the changes that are occurring, and opening up the potential for publicly motivated policy development because of it.

CHAPTER 5

FROM WHEN COTTON WAS KING TO KING MONSANTO

The other thing you have to remember is that a lot of folks in Mississippi, two generations ago, were living on very hard scrabble farms, doing everything by hand. I've got kinfolks who are long removed from farming, but they grew up in it, and couldn't wait to get out, and they still think only in terms of every new technology that has ever been available to agriculture—from tractors, herbicides, anything that comes down the pipe—its only possibility is in being a wonderful thing that will help you from having to work as hard.... Intense back-breaking labour is bad, therefore all technology is good. (MS#23, Media/Organic Producer)

That's the least of my worries, is agriculture biotechnology. (MS#30, Mississippi Department of Agricultural and Commerce)

I don't see it as any different of a tool of conventional crop breeding or inorganic fertilizers that came on in the probably early 20th century. Or moving from a mule to a tractor was technology. Or moving to an airplane was technology improvements. I don't see that it's any different. You have to continue to evolve. That's just part of it. (MS#3, GM Producer)

As we learned in Chapter 2, the United States is by far the leader in biotechnology, with respect to its early experience with the technology and with respect to its extent of adoption. We also learned that the transgenic transformation of American agriculture is occurring in key agricultural crops, such as soybeans (87%), corn (52%), and cotton (79%) (United States Department of Agriculture [USDA], National Agricultural Statistics Service [NASS], 2005, "Acreage"). By all appearances, the United States is very pro-biotechnology. However, given the immensity of the geographic and cultural domain of the United States, there is considerable differentiation even within the

country, as reports of GMO protests and local initiatives in places such as Mendocino County in California would seem to indicate. The state of Mississippi would seem to represent the opposite extreme.

The state of Mississippi is in the deep south of the United States, its southern end bordering the Gulf of Mexico. Mississippi has a population of 2.8 million spread over 30 million acres, much of which is forested. Average monthly temperatures in Mississippi range from a low of 34.9 degrees to a high of 92.5 degrees, Fahrenheit (Netstate.com, "Mississippi"). Summers are long and hot, and winters are short and mild, allowing for an extended growing season. At one time, when slaves were considered property and cotton was king, Mississippi was counted amongst the richest states of the United States. Now the state is ranked the poorest of all U.S. states, though much of the social, cultural and economic infrastructure of its cotton days is still evident.

Almost 40% of the state of Mississippi is farmland (USDA, Economic Research Service, "State Fact Sheet"). In 2004, Mississippi had 42,200 farms (Ibid). The average size of farm is 263 acres, although there is great variation in these, ranging from the smallest low-resource farms to the massive cotton farms in the delta region. Over 50% of farms are under 100 acres, and 90% of the farms are under 500 acres (Ibid). Only a very small proportion of Mississippi's farms make up the bulk of agricultural production, however: in 2002, 5% of farms were accountable for 75% of the state's agricultural sales (USDA, NASS). The bulk of very small farms are subsistence production for the state's poorest. Geographically, row crop agriculture in Mississippi is divided between the delta and the hills areas. Along the west side of the state, runs the Mississippi river, providing the rich soils of the Mississippi delta. In the wide, flat, delta region, soil is good, water is

plentiful, farms are expansive and cotton still dominates. This region is where the largest farms of Mississippi are located, easily five to ten thousand acres. To the east of the delta, are the hills, only qualifying as such by contrast to the flatness of the delta. Farms are smaller in the hills, more diversified, and broken by forested areas. While not a focus of this study, inklings of attitude differences around biotechnology can be seen between farmers in the hills and the delta.

In the post WWII era, agriculture in Mississippi became more diversified, although both row crop agriculture and cotton remain important to the state economy. Now agriculture more broadly speaking—including poultry, forestry, catfish and cattle, as well as row crops—is the number one industry in Mississippi, worth \$6 billion dollars (Mississippi Department of Agriculture and Commerce [MDAC], “Mississippi”). Broadly characterized this way, agriculture provides direct and indirect employment to 30% of Mississippi’s workforce, and is significant to all of the state’s 82 counties (Ibid). Cotton now ranks after poultry and forestry in Mississippi agriculture, though it is still the number one crop, bringing in \$598 million dollars in revenue each year (Mississippi State University [MSU] Extension Service, “Crops: Cotton”). Leaving aside animal husbandry and forestry, the main agricultural products for Mississippi (in order of production value) are cotton, soybeans, rice, hay and corn (USDA, NASS, “Mississippi State”). The extensive crop rotation evident in Saskatchewan does not appear as prevalent in Mississippi, although some certainly practice it. Cotton in particular, especially on the larger farms, is often grown year after year, sometimes with some acres put to soybeans and corn to hedge for market fluctuations. Rice is usually grown in a different area, where the soil is heavier clay, and sometimes is grown with soybeans.

Given the genetic traits that have been the focus of biotechnology development and the key crops in which they have been introduced, Mississippi farmers have had a significant amount of opportunity to access agricultural biotechnologies. Of the state's top five agricultural crops, transgenic varieties are available in three of them: cotton, soybeans and corn. Although transgenic rice is not yet commercially available, Ventria's recent attempt to introduce pharmaceutical rice in Missouri made it a topic of some salience in neighbouring Mississippi (Elias, 2006). Cotton, soybeans and corn are all available with the Monsanto Company's Roundup Ready, technology—crops genetically engineered to allow for over the crop application of Monsanto's herbicide Roundup. In 1996, Monsanto began the launch of its Roundup Ready products: RR soybeans were launched in 1996, RR cotton in 1997, and RR corn in 1998 (Monsanto Company, 2005). In 2004, Bayer CropScience launched LibertyLink cotton, an alternative herbicide tolerant system to Monsanto's RR system. Monsanto introduced insect protection for crops using Bt in cotton (Bollgard cotton) in 1996 and in corn (Yieldgard corn) in 1997 (Ibid). Stacked RR and Bt varieties became available in cotton in 1997 and in corn in 1998. While reportedly on the very near horizon, there is currently no competition with Monsanto's Bt system available in Mississippi. To date, Bayer's alternative to Monsanto's RR cotton has only captured an estimated 3% of the market. Therefore, as of 2005, discussions of transgenics in Mississippi are essentially discussions of Monsanto's transgenics.

Once introduced, adoption of transgenic soybeans and cotton has rapidly grown, though in the early years farmers reportedly balanced between the convenience promised by the technology and hesitations over a perceived 'yield drag' (decrease in yields)

potentially resulting from the technology's insertion into older varieties of the crop. Within a few years the technology was available in newer varieties and debates about yield drag appear to have abated. By 2005, barely ten years since its introduction, 96% of the cotton and 96% of the soybeans grown in Mississippi are a transgenic variety of one type or another (USDA, NASS, 2005 "acreage"). Corn statistics are not available for Mississippi, however adoption has been considerably slower than that for cotton and soybeans. The benefits of the transgenic systems to corn have been less pressing, due to the greater availability of alternative management techniques, and less corn borer insect pressure in some regions of the state. However adoption of RR corn is reportedly strongly on the rise, as will be discussed presently.

This chapter will draw on interviews with agricultural stakeholders and knowledgeable informants to provide some insight into how the introduction of transgenics into agriculture has affected agricultural production. I conducted 39 face-to-face interviews with approximately 41 respondents in Mississippi in the months of May and June, 2005. In addition, one interview was conducted by email in February 2007. This chapter draws mainly on the responses of 33 of these interviews, which included 16 agricultural producers (3 organic, 10 GM, and 3 conventional), 12 with agricultural organizations, government representatives, and other stakeholders, and 5 with knowledgeable informants, such as academics and media representatives. Once again, a list of interviewees is provided in Appendix B. The remaining 8 interviews, while contextually important, predominantly referred to the litigation that will be discussed in Chapter 6.

The interview data revealed that with respect to the physical aspects of the technology, there are few objections to its performance and to its role in agricultural production: by all accounts biotechnology has only increased farmers' potential strategies for production management. In fact, this adoption has been so enthusiastic that there are even signs of technological dependence beginning to emerge. On the other hand, farmers are keenly aware of the limited source of the technology that they have come to rely on, and concerns are prevalent over the power imbalance between farmers and biotechnology companies, essentially Monsanto. Control is an issue and signs of animosity are evident: however, these concerns appear to have less to do with the legal aspects of biotechnology than with a more general perception of Monsanto as dictator over agricultural production.

Evolving Technology in Mississippi

Because of the heat and humidity of the south, insect and weed management are a large part of farm management in Mississippi. Without the long, killing frost of winter experienced in Saskatchewan, weeds and insects are a much greater pressure in Mississippi. Any tool that helps with these pressures is going to be given strong consideration by the southern farmer. As the statistics indicate, adoption has gone much further than mere consideration, and is almost complete in cotton and soybean crops in Mississippi. For the vast majority of farmers and agricultural stakeholders in Mississippi, the genetic technology in itself is viewed with unmitigated approval. Farmer interviewees who used the technology were virtually unanimous in their praises of its physical attributes. The words of one user can best be used to summarize the average Mississippi producer's perception of the genetic technology: "It's so easy. It's such a simple, easy thing to do, it's just wonderful" (MS#34). There are, of course, dissenting voices, but

these are extremely few and far between. What little contrast can be found primarily comes from those who operate outside of row crop production, notably, small market producers who are more closely tied—if not actually involved in—sustainable agriculture movements. For those who love the technology, its praises are extensive. Transgenic crops are reported to reduce farm management, labour, and energy requirements, decrease risk, and increase a farmer's free time. Much less unanimously, some also argued for economic benefits to the technology. However, while the vast majority of farmers and agricultural stakeholders unequivocally appreciate both the Bt and the RR technologies, these two technologies were adopted, and continue to operate, under different dynamics:

The Roundup Ready [RR] technology is fundamentally a tool of efficiency and convenience. All the benefits of weed control evident in RR canola in Saskatchewan are maximized in the high weed and insect pressure environment of the Deep South. Roundup Ready technology is used by 96% of soybean farmers and (between RR and RR/Bt stacked) 82% of cotton farmers in Mississippi (USDA, NASS, 2005). Extension agent estimates are that 50% of the corn in Mississippi is now Roundup Ready, after a recent acceleration in adoption in the last few years due to 'drift' problems (airborne chemicals moving off target), to be presently discussed. Because Roundup Ready crops allow the herbicide to be applied over an already growing crop, these crops can be used in no-till farming, thus conserving moisture and reducing the amount of cultivation a farmer has to do. As one farmer explains it:

I mean it used to be that we cultivated cotton. We had cultivators and ploughed the ground, and we'd make 2 or 3 or 4 trips with the cultivators.... But now we plant it and spray with it, boom... and maybe come back and spray it one more time, and then maybe once more with a

lay down rig to put a chemical down, to keep the cotton once it gets big to keep the weeds from coming up all through August and all. It just makes it so much faster and so much easier to do. (MS#3, GM Producer)

Ease of use is a management issue. As one farmer in Mississippi explained to me, when a farmer in the delta says he is going to *do* something to his crops, it means he is going to have it done. Reduced cultivation means farmers need less labour, which is not only expensive but is reportedly difficult to maintain in Mississippi, despite its status as the poorest state. Further, the nature of RR crops means that less care has to be taken to prevent damage to the crop, which up to the 4th leaf is not damaged by the herbicide, thus requiring a further reduction in management. This also means that if poor weather conditions prevent ground rigs from getting on the land to spray, the chemical can still be applied by air. Fuel and equipment are two additional high-cost inputs in agricultural production that are affected by the introduction of the technology: less trips to the field means less equipment is needed and fuel costs are drastically reduced—particularly in the current context of high oil prices.

Despite the apparent reductions in costs, the economic benefits of the technology are ambiguous. For the above reasons, farmers already have an incentive to adopt the technology irrespective of economic benefit. The economic benefits are taken as a given by some, who hypothesize that with less weeds they are getting more yield, which necessarily increases profits. Others have put pencil to paper and calculate no difference in profit given the high cost of inputs. There are indications that the economic benefits of the technology accrue to those who capture its efficiency benefits by farming larger acres. As explained by an expert in agricultural economics, even in the case of yield drag,

which was an issue in the early years of the technology's introduction, this ability to increase acreage under the RR system maintains a producer's profit margin:

[I]f you could farm x acres before, you can now farm x plus 15% because the Roundup technology allows you to expand. And so, if you are making a dollar before per acre and now you are only 99%, but you've got 15% more acres, so that's what's led to a lot of the adoption of the Roundup in terms of soybeans producers. (MS#35, Agricultural Expert, Economics)

Some evidence of this could also be found in conversation with producers:

I wouldn't have taken [the extra fields] on, probably, if it wasn't for Roundup. I wouldn't have had the time or the extra money or the labour. (MS#6, GM Producer)

Obviously, not all farmers can capture these benefits, and as farm sizes increase those who cannot capture these benefits will be at a relative disadvantage and could eventually be forced out. This impact of the technological treadmill on farm size is an important trend in the political economy of agriculture, but one that goes beyond the scope of this study. The economics of agricultural biotechnologies will be discussed further with respect to the costs of the technology. However, irrespective of economic benefit, there is no doubt as to the merits of the technology for the producer: the contrast between farming before Roundup and after weighs in the background of conversations about the technology with farmers. Sometimes this contrast is explicitly articulated. For example, one farmer articulated the difference through reference to his fields, where weeds could be seen rising between the cotton. In the herbicide tolerant farming system, this only required an application of Roundup: in the past, it would have required a difficult balance of attempting to eradicate the weeds without damaging the crop.

Twelve years ago, if this looked like this, I'd have been having a heart attack right now. Bad as it looked right here, I'd have been having a fit that we had to cultivate. Try to spray up under it an' everything. That's one thing, it [the RR system] eases your mind quite a lot. (MS#4, GM Producer)

While similarly 'easing the mind' of the farmer, farmers have a somewhat different relationship with Monsanto's Bt technology than that offered by the convenience and efficiency of the RR technology. Between strictly Bt varieties and Bt/RR stacked varieties, the Bt technology is used by 73% of cotton farmers (USDA, NASS, 2005) and an estimated 30% of corn farmers (Bt is not used in soybean crops). The Bt toxin protects corn plants against pests such as the corn borer and cotton plants against the bollworm and budworm, the number one pest problem for cotton. In 1995, Mississippi cotton crops suffered a severe heliosis (the species of worms which include bollworm and budworm) infestation. As a result of the infestation farmers had to invest a huge amount of labour and chemicals in an effort to avert the damage. Even given the drastic increase in chemical inputs, there was no guarantee the farmer would not lose his crop in any case. Ultimately, the infestation in 1995 was so devastating to cotton farmers that in its wake, many farmers did not survive, and for those who did survive, cotton farming became a high-risk activity. It is in this context that the new insect resistant Bt crops were introduced. The new Bt technology had already been poised for launching prior to the 1995 outbreak. After the outbreak, farmers were reportedly so keen for its introduction that they pressed for its early release and planted all they could get their hands on.

Following are three farmer's descriptions of typical experiences with the introduction of Bt cotton after the 1995 outbreak:

They knew we had a disaster in '95. It was a blessing when it came out. I mean, nobody was fired up about growing cotton in '96 after that big disaster we had out here.... It put a lot of people out of business in this area, it sure did. The 4th July we thought we had a good crop. We thought we had a pretty good crop. By the 10th of July we had that next flight of moths come in and couldn't kill the worms...you took to spraying and the next day the crops all covered you know it's over with. We picked anywhere from 3-400 lb of lint. We going to pick 1,000 any other time. Sometimes more than that. [...] I just don't think we'd be in the cotton business today if it wasn't for the Bt. (MS#4, GM Producer)

Bt after 95, I don't know how much cotton would have been left in Mississippi if we had another year like that in '96. I mean, people were losing \$200-250 per acre. It was devastating. When you have a loss like that, it takes 8-10 years to get over it. Bt really made a difference. Now, somebody in north Mississippi, or north Arkansas, or the boot hill of Missouri might say RR may have a weed that fit it, and they might not have the trouble with worms that we did, so it might not have been the critical part. But right here I'd say it was the critical part of us staying in production. (MS#3, GM Producer)

Prior to the Bt cotton we were having to spend up to \$150 an acre controlling tobacco budworms. It was unacceptable. We couldn't continue to do that. People were going broke right and left.... When I say spending \$150 dollars an acre controlling tobacco bud worms, we were not controlling them, so we were having the damage as well as tremendous cost. So it came along at a time that it saved the industry, in my judgement. Now it could get out of hand so it could kill the industry, if it wasn't contained, so to speak, cost and whatever, but there's no doubt that the technology... I mean, we could have lived without the Roundup technology, the glyphosate, but the cotton industry, I don't know if it could survive. (MS#34, GM Producer)

Consequently, for many agricultural stakeholders, Bt is not just seen as another improvement to cotton farming, but as the salvation of cotton farming. The technology provided the means to stay in business for those who survived long enough to gain that technological foothold against nature's destructive tendencies. By all accounts, this technological foothold has been extremely successful. So much so that heliosis is no longer the number one pest in cotton production. One agricultural consultant stated that Bt had changed the dynamics of pests in cotton production:

When we know we have that protection on the front end, we know that we're not going to get significant damage at any time in the year from heliosis damage, which has been, up until the introduction of Bt, our number one pest in cotton. That's what Bt has done. It has actually changed the dynamics of our pest complex. Whereas heliosis used to be our number one pest concern, now it is what we call secondary pests, such as plant bugs. (MS#25, Agricultural Consultant, Cotton)

Worm control is a variable cost, with some years facing high infestation and others being good years. As a pesticide that is directly incorporated into the plant, Bt offers full protection to plants all the time, not just when the toxin is externally applied. This reduces the amount of management required, for example, the need to regularly check fields for evidence of worms so that they can be sprayed before they burrow into the crops (where they are unreachable by conventional sprays). Further, the in-plant pesticide reduces chemical applications, thus again reducing trips to the field, fuel, labour and equipment costs.

Few technologies will match the favourable conditions for introduction that Bt faced in Mississippi. However, even without this industry-saving introduction, the physical attributes of both RR and Bt technologies only received praise from interviewees: they increase efficiency and reduce risk. More management is actually required around the issue of drift, which will be discussed, but overall less management is required for the wealth of other farm production issues: when to spray for bugs or weeds, management of labour, etc. In some ways these extend beyond ease of use issues to reduce very significant risks, as in the use of Bt. Overall, genetic technologies are reported to take many of the risks out of farming and to make production more manageable: essentially, they remove variables from the equation of successful farming.

A number of farmers also saw environmental benefits to the technology. While the RR system still requires herbicide application, farmers cite Roundup as one of the more benign herbicides. The main environmental gain however, is seen to be the reduction in pesticides, the amount of which agricultural stakeholders report to have been drastically reduced since the introduction of Bt (especially in contrast to 1995). Worker safety is another issue that was raised, as the reduced chemical application required by Bt reduces worker's exposure to chemicals. To be sure, contrasting examples of negative environmental impacts from these technologies can be readily found with a quick Internet search, as can arguments around the temporary nature of any environmental gains. It is likely that farmer's perspectives are affected by their immersion in the short-term logic of profit making. Nonetheless, the point here is that many of the farmers in Mississippi who use the technology, argue it to be a benign alternative to conventional farming practices, in addition to providing a farmer with vastly greater control over the management of his farm. It would seem that in Mississippi, the Franken-technology is actually a princess in disguise.

The Drawbacks

Resistance and Drift

Princess though it may appear, agricultural biotechnologies still garner some negative comments. However, in the context of all its benefits, agricultural stakeholders raised only two concerns related to the physical aspects of the technology itself—drift and resistance (by both insects and weeds)—one of which, resistance, is really a concern with maintaining the continued viability of the technology rather than a concern about the technology itself. Strong negative sentiments over the technology only really come to

light over its non-physical aspects, such as the price of the technology, the concentration of ownership, and farmer's current and projected future relationship to the producers of the technology.

With respect to insect resistance, the Bt technology is sold with requirements for refuges, where a percentage of non-Bt crops must be grown to prevent insect resistance from developing. These requirements differ depending on region—for example, refuge requirements for Bt corn are higher in cotton growing areas, such as Mississippi (50%), and lower in corn growing areas (20%). A farmer can select different strategies, varying refuge percentages with different cropping configurations, but the refuge itself is a condition of Monsanto's Technology Agreement. By most accounts, farmers accept this interference in their production habits as a necessary requirement for maintaining the benefits of the technology, and by all reports they respect the requirements. The refuge requirements are not completely devoid of detractors, however, and some argue that they are an unnecessary burden on producers as there are sufficient natural refuges in existence. None of the producers I spoke to made this claim, but other stakeholders, such as an expert in agricultural economics, mentioned it. Producers themselves appeared to accept the requirement and none reported any signs of insect resistance.

Weed resistance is another issue, however, and the experiences of producers are beginning to resonate with the warnings of environmentalists. Many farmers reported some experience or knowledge of developing resistance in weed species. Mare's tail, in particular, seems to be a growing problem. While not outright resistant, according to some, it was increasingly difficult to control and required repeated chemical applications. For the most part, weed resistance problems were discussed in reference to it becoming a

significant concern for the near future, but more immediate concerns also existed. For example, one producer when asked if resistance was a problem replied:

Mare's tail, which was no problem whatsoever for years, all of a sudden it has become a major factor.... What a lot of people are doing right now who have mare's tail, they are having to do something that they never dreamed they would do again, they got people out there chopping the stuff down. [...] There's people around here who have major problems. And if they allow it to make seed this year, they might not be able to farm the ground next year. I mean it's serious. Whoever in the world thought mare's tail would be a problem, but it is. It really is. (MS#34, GM Producer)

Interestingly, while there is resonance with environmentalists on the topic of resistance occurring, in the agricultural community it is considered a normal part of production. Resistance occurs and new chemicals are developed. Therefore, in the case of biotechnology, resistance is considered something to be delayed, if not actually avoided, in order to protect the functioning of the technology. At the same time, there is acknowledgement that the game with nature is ongoing, and that resistance will eventually occur. More specific to the biotechnology, concerns about resistance are tied to concerns about the limited source for the technology, and farmer's vulnerability in depending on this one source for the solution to future problems.

Another issue that arose out of the physical properties of the technology was the issue of drift. Drift is the issue of off-target chemical application. This is an issue that has particular salience for areas such as the Mississippi delta, where the wind can pick up a chemical and carry it for a mile or two onto someone else's farm and crops. Chemical application and drift issues preceded Roundup, and even now remain issues in non-GM crops. However the widespread adoption of Roundup Ready technology and the consequent widespread application of Roundup and other glyphosates as post-emergence

chemicals seem to have drastically exacerbated the issue, particularly when the technology was first being adopted and sensitivity to the issue was far lower.

With Roundup, I think when it first came out, and this is my opinion, a lot of other crops weren't used to it, people weren't used to spraying Roundup as widespread as they were, and we may have had a little problem, but now it's cut down. (MS#30, MDAC)

The fact that RR crops were resistant to the herbicide meant that those using the crops could relax their care around chemical application somewhat. However, unlike when everyone was using conventional crops and chemicals, RR growers use Roundup at a time when conventional growers would not for fear of damaging their crops. This later application makes Roundup drift dangerous to the non-RR crops. While damage from drift can be severe, it also can be quite subtle, resulting in a hard to verify loss in yields. Nonetheless, drift complaints became significant enough that ultimately the problem instigated new regulations designed to reduce drift: regulations controlled application timings and wind speeds; aerial applicators were required to log where, when and at what wind speed they applied chemicals (to aid in assessing drift liability); and education programs were started to help farmers reduce drift through drift control agents, spray tip sizes and related means.

Overall, the new regulations appear to be working and drift problems have decreased, however, even in the context of the new sensitivities, problems can arise due to the nature of the technology:

Last year, I tell you what, there was some cases, where—you know cotton you can only spray it to a certain size, leaves—and it was so wet in June you know, a lot of cotton was almost at the 5th [leaf], and they couldn't spray it with the ground rigs, so they had to spray it by airplane, and it stirred up some controversy about, you know, what's going to happen with all this. The farmers had their backs against the wall, their herbicide

product was Roundup and all of a sudden guess what, they couldn't spray. Some people pushed the envelope on that one; they pushed it enough that I'd say maybe there was some damage. Maybe there was some drift damage. But the ag. pilots are the one that have to, you know, it's hard decision, he has to tell his customer, 'no, no, no, no, no'. (MS#33, Seed Dealer)

Obviously, such regulations can be quite burdensome to producers and there are strong indications that farmers are taking protective measures to prevent further government intervention. Farmers repeatedly expressed an awareness of their neighbour's farming practices, and they narrated that they communicate as a matter of course in order to avoid drift problems.

Everybody pretty well wants to know what kind of crop their neighbours are doing. Everybody that I know is... with cotton I don't know anybody who plants conventional cotton anymore... Roundup Ready cotton, so you just have to ask are your beans and are your corn Roundup Ready? (MS#6, GM Producer)

We are doing that more now than we ever have. Which is good. We'll ask everyone around us is this Roundup Ready or not Roundup Ready. We are being more cautious now with it. We aren't having the problems we were having 2 years ago. We were all just learning two years ago. We'll call each other up. If we have something that isn't Roundup Ready, we'll be sure to tell the neighbours, watch out for this field. [...] We are getting the situation under control. It's not a problem now than when it first came out. People just didn't realize. (MS#24, GM Producer)

Prevention of damage through good neighbourly relations can only be a benefit to all. On the other side of the equation, however, are indications that part of the improvements in damage reports are that farmers are declining to report damage in fear of further application restrictions. On more than one occasion it was stated that unless damage is extreme, farmers keep mum following a code of deference to the damage they may one day reciprocate on their neighbour, in an effort to stem further restrictions. A

more worrisome trend considering the concentration issues to be discussed is that farmers are being forced into GM adoption in order to prevent such damage.

As noted, the adoption of transgenic technology has not been as swift in corn, in part due to the availability of good conventional chemical strategies and in part due to a perceived yield drag with the transgenic varieties. Problems with drift have been a particular issue for corn growers, both because the amount of conventional corn has remained high and because corn is particularly sensitive to Roundup drift. Consequently, preventative adoption of Roundup Ready corn is now increasingly occurring.

[Drift is] Enough of a problem I guess where a lot of growers have switched to utilizing RR corn to protect themselves from drift issues or drift problems, even though they had more hybrid choices available, and maybe a slight yield advantage with conventional hybrids. (MS#21, Agricultural Expert, Corn)

A lot of people in the delta, I mean there's so many RR varieties now that a lot of people routinely choose RR varieties just to prevent getting drifted on. (MS#3, GM Producer)

And there's one disadvantage now, so many people are using the Roundup, you almost have to make sure you use the Roundup as an insurance policy so your cotton won't get killed if you don't have it. Corn especially. We were forced into planting Roundup Ready corn, as I was getting so much crop damage. (MS#24, GM Producer)

The problem of drift is far greater for those in the delta than in the hills area, where farms are smaller and more divided by natural barriers. It is also far greater for corn growers. Nonetheless other growers run some risk of drift damage if they grow non-RR crops. The issue of drift is significant enough that it potentially poses a barrier to competition in the Mississippi delta. For example, one farmer I spoke with who had land in both the delta and the hills area, grew Liberty Link cotton on his land in the hills, but only grew Roundup Ready in the delta area because of the drift. Monsanto was the first

technology to come out and now that it has been widely adopted the risk of drift onto non-Roundup crops is great, leading to the risk of crop damage to the farmer and liability risk for others. This is not just an issue with conventional crops, but an issue for the adoption of other varieties of GM crops, for example Liberty Link cotton. Where Liberty Link is planted alongside Roundup Ready there is the potential for crop damage from drift. The incentive for staying with the widely adopted Roundup is therefore significant. As one farmer explained it to me: “If you plant Roundup Ready like everyone else has got, you aren’t going to have any problems” (MS#4). Drift then, is not simply a management concern, but raises some monopoly control issues as well.

Price Control

The love for the GM technology is clear in relation to all its physical attributes. Even drift and resistance issues are considered things to be managed in order to maintain the use of the technology. It is only when the non-physical attributes of the technology are discussed that stakeholders begin to express significant negative comments towards it. Control issues featured prominently. In addition to the occasional reference to export restrictions or market concerns, queries about drawbacks to the technology were inevitably responded to with the question of costs. Costs featured largely not only with respect to the practical issue of the expense of the technology, but were inevitably tied to the issue of control, and farmer’s powerlessness in the face of a single supplier of their technology. Control issues were not limited to costs but manifested in a number of topics—restrictions on seed saving, availability of conventional alternatives, risks of drift on conventionals, and equipment and infrastructure changes—that all ultimately related to whether farmer’s technological dependence would ultimately hold them hostage to the

whims of one company. There was a sense that many of these issues were in flux and everyone concerned was poised to see the outcome. Competition was the solution on the lips of many concerned about these issues, but whether this salvation was inevitable or hoped for was frequently unresolved. Stakeholders were also asked their opinion about the lawsuits between Monsanto and farmers in the area. While there were many who had opinions, and some who hoped the outcome would positively affect their future, there was little sentiment of a commonality of fate or of solidarity: those who took the legal route, took it alone.

The number one drawback cited over GM technology was its cost. Very few agricultural stakeholders did not mention the cost of the technology. The sentiments ranged from 'it is very expensive but at this point it is still worth it,' to various articulations of it is hugely, unreasonably expensive and there is no end in sight. Prices had just taken a dramatic jump in the 2005 season, and even among those few who accepted the high cost, the majority qualified their position to depend on there being no further such increases. Producers must purchase both the seed and the technology fee, and in addition to various changes in pricing schemes, costs were on the increase for both.

The costs are something that I think has got to be addressed.... For RR cotton it doubled, pretty much: it went from \$13 to about \$25-26.... That's for the tech fee. That's for their capped rate that is about 3.3 seeds per foot. If you aren't in their program of course it increases. (MS#19, Agricultural Expert, Cotton)

As the above quote indicates, there are a variety of factors that affect the final price. At the same time, significant changes in the pricing structure make strict comparison over time difficult. For example, in the Roundup Ready system, the RR

technology requires the use of a glyphosate-based herbicide, such as Monsanto's Roundup. Once Roundup came off patent it faced significant competition from generic glyphosate herbicides. When RR crops first came on the market, their use was tied by technology agreement to the use of Roundup. This was later removed from the agreement, as will be discussed further in Chapter 8. In an apparent response to the loss of much of its herbicide market, Monsanto lowered the price of its herbicide to be more competitive with the generics and increased the cost of its technology fee. Similarly, while the technology fee used to be charged to farmers on a per acre basis, it was now charged on a per seed basis in cotton. Changes such as these are the basis of two significant issues raised by stakeholders: the first, simply stated, is price control; the second, relates to production control, essentially, Monsanto's various rules and rewards programs increasingly dictate aspects of production that were previously a farmer's prerogative.

Firstly, with respect to the cost, the high frustration over the increases was palpable and it was irreversibly tied to the sentiment that farmers have no choice but to take it. The following characterize the sentiment quite well:

They pretty well dictated this year. They came in and increased their soybean fee, and increased their cotton fee, and increased their other fees, and what can you do about it. I mean as a farmer, and as a consultant, because we have to deal with their economic situations, what can you do when this company comes in here and says we're going to up \$20 a bag on this stuff and going up \$5 a bag on this other stuff, and you're sitting up here saying, I've got no other choice. (MS#29B, Agricultural Consultant/Producer)

They are scaring us. If we do have a chance of making any money in the future, we're scared that they are going to keep on raising it. And we're going to get squeezed here and there, wherever we get to have some extra

income. We're scared they're going to be raising it more and more.
(MS#24, GM Producer)

In response to queries regarding the justification for the cost increase Monsanto responded thus:

Generally, our pricing philosophy for our trait technologies continues to be based on sharing the profit potential delivered growers by our products versus the cost and benefit of the alternative products that they may otherwise use. (MS#40, Monsanto Company)

Nonetheless, those who thought the cost was still fair for the benefits they were getting existed but were rare. The general sentiment from the majority of agricultural stakeholders was that now that 97% of the farmers had bought into the GM system, they were trapped into paying whatever the cost. A particularly sore point with soybean farmers was the price they were being charged for soybean seed, which they were no longer permitted to save due to the patents on the technology.

With respect to seed saving in general, the impact varies by crop. Seed saving restrictions have had no impact on corn production, for example, as corn is a hybrid crop. Hybrids do not reproduce offspring genetically consistent with the parents, and therefore producers buy fresh seed every season in any case. Cotton is only slightly more saveable, though it was not commonly practiced. While it is technically possible to save cottonseed, cotton has to be ginned and then acid delinted in order that it can fit into the modern seeder. The infrastructure to do this has declined and acid-delinting is only done in a limited number of facilities, mainly outside the state. While the opportunity for seed saving with cottonseed is already curtailed in a practical manner by the decline in ginning and acid delinting facilities, very few cotton farmers seem interested in pursuing this option in any case. In fact, many cotton and soybean farmers reported that they had not

saved seed in the past because seed was cheap and plentiful, and why hassle with saving seed when quality controlled seed could be easily and cheaply purchased. The sentiment: “Why not buy good quality seed because it wasn’t that expensive anyway” (MS#6) was not uncommon. As one farmer explained it to me, those farmers who would save seed, would typically buy fresh seed every couple of years or so in any case, in order to get the newer varieties.

Hypothetically then, restrictions on seed saving brought by genetic technologies only significantly impacted soybean farmers, some for whom the practical impact on farming practices was only moderate. Of course, the impact likely differs by size of producer, as smaller outfits are more likely to use this method to control costs. However, with the advent of genetic technologies restricting producers from saving their seeds and obligating them to purchase new stock every year, the cost of not saving seed increased dramatically. Now that farmers had to purchase seed every year in order to use the technology, the price of soybean seed climbed in accordance with this trapped market—more specifically, it had ‘gone wild’ to the point where soybean seeds worth only \$6 on the commodity markets cost the producer \$30 to purchase as an input. This fact was not lost on soybean producers.

We can’t save our seed. They’ve got the variety and we think it’s the best variety to plant. We have no choice, we’ve got to pay this exorbitant price for the seed. So something’s out of kilter there, that they’re able to shove that down our throat.... They do a mark up, but that’s because they’ve got something we have to have, and we’ve no other way of getting it. (MS#34, GM Producer)

Rising costs of seeds not only make farmers feel hostage to cost increases they cannot opt out of, but also affect production practices. High seed costs affect planting

rates of seed, as farmers try to reduce their input costs. In addition to soybean seed price increases, the change of cottonseed pricing to a per seed basis—with the increased technology fee now included in the price of the seed—shifted the bulk of the high input cost of GM farming onto the cost of the seed itself. Consequently, whereas seed used to be the cheapest of a farmer's inputs, it has now become something to regulate and minimize where possible.

As one farmer articulated this change in practices:

It used to be real cheap. I'm saying not too many years ago it was around \$50 a bag. You go back, it was really cheap. The seed was the cheapest thing. You could just plant a whole lot of seed. When I was young you'd plant a whole row of seed, then you'd cross plant to get the right population, and then they'd block out, to cut down the population that way. But now you want to know exactly how many seed. You plant exactly the same. I was planting 2 seed every 8 inches. (MS#6, GM Producer)

Precision planters make it possible for farmers to regulate the exact depth, width and placement of the seed, in order to designate the exact number of seeds planted per acre. While reducing the seeding rate this way reduces costs, if taken too far it carries a risk that producers will not get the desired yield. Monsanto's profit strategies are not limited to pricing strategies for the seed and the technology fee, but also manifest in their rewards program, which is then again linked to the seeding rate. The following explanation from an agricultural expert outlines how the change affects profits for the company, while creating incentives for farmers to belong to the rewards program:

You see, if they charge a certain rate per acre, they'll just be getting that rate. If they charge per seed, and they up the technology fee, and back the cap down to 3.3 [seeds per foot], which is not in our recommendation—my recommendation is you go no lower than 4.0—then they are actually getting more money than if you paid per acre. [...] If you use their program, then they cap your seed technology fee at \$25 per acre in that

instance. Whereas if you use a generic [chemical]... then you don't get that cap. So if you did plant more seeds per foot than the 3.3 or whatever their cap is, then you are actually paying more for the technology. The way they've done it is really, I mean it's brilliant on their side, from their marketing program, if you don't use their product and you plant a higher seed rate then you actually pay a lot more for their technology. (MS#19, Agricultural Expert, Cotton)

Leaving aside the admiration for the marketing tactics, the narrowing of options for producers is apparent as 'incentives' become increasingly compelling. Monsanto's rewards programs are designed to maintain customer loyalty to the use of Monsanto's herbicide Roundup. By restructuring the prices and organizing the rewards program in this way, the incentive for farmers to use Monsanto's herbicide over the generic is considerable, despite the fact that it is the existence of the generics that forced the price of Roundup down in the first place. Similarly, replant protection is another motivation for using Monsanto's herbicides, as with a commitment to use Roundup, farmers in the rewards program who experience a planting failure are provided with a rebate on repurchasing seed. Given the difference in price between generic and Roundup, this wasn't sufficient motivation for some farmers. However, now with the changes in the pricing structure of seed to include the technology fee (instead of charging the technology fee by the acre), this motivation is greatly increased. Refunds for replanting appear to vary, but seed companies often offer farmers some sort of replant guarantee, where they would replace a portion of the seed, for example 50%. In this case, the affected farmer only had to repurchase the portion of needed new seed. When Monsanto changed the technology fee to be charged per seed instead of by the acre, a farmer who has to replant has to repurchase the technology fee with the seed: if 50% of the seed must be purchased again, Monsanto is ultimately compensated 1.5 times for the technology fee.

Monopoly Control

While any company that is the sole proprietor of an essential product is going to be the recipient of some consumer objection, the negative perspective of Monsanto significantly outstrips this sort of grumbling. Repeatedly stakeholders indicated a negative relationship between producers and the company they were beholden to for their technology, as is evident from the following examples:

[T]he way they went about this... they don't want just what I've got and he's got, they want what you've got—they want it aaaaaall! And they got greedy. It's been very obvious. In cottonseed, they are charging by the seed. [...] Who the hell are they kidding? [...] They [growers] hate them. You know, the little crap they keep coming along. They coming along, they want you to sign contracts, then they want to charge you by the seed for cotton, they just keep changing the rules again. They already got 98% of the market. Who gives a damn about signing contracts and then count your seed and put them in a bag! [...] They got the grower, they got him tied he can't go any other way and he hates that. He resents it.... They've just got so many little rules. (MS#20, Agricultural Expert, Soy)

I don't think you could find a farmer in this region that likes Monsanto. They have the worst PR that could possibly be.... It seems like they would be trying to work on the PR and do good things, but it just seems like the whole company is arrogant.... It's kind of like, 'we're it, and you all have to go through us and we don't care. (MS#24, GM Producer)

The sentiments expressed are not only limited to money and price increases, but frequently extend into issues of control and relative power. There was no doubt in the minds of those who deal and work with the company that Monsanto is 'it'. While a few hesitated to call this an outright monopoly if state and federal officials declined to designate it as such, the majority had no such qualms. Monopoly in name or not, there is no doubt in Mississippi agriculture that Monsanto rules the roost.

Monsanto's got you where they want you. They've positioned you, as opposed to positioned themselves. (MS#26, Producer)

Even though you've got different bags with different names, it's still the same choice. And that one individual still has control over that choice. And he's going to get the same amount of money no matter what he does. (MS#29, Agricultural Consultant/Producer)

In sum, there is a general sentiment that Monsanto makes the rules for the agricultural community and these rules shift accordingly as Monsanto strategizes for its maximum benefit. There is a distinct sense that now farmers have become dependent on the technology, they are tumbleweeds subject to whichever way Monsanto blows. This awareness of power imbalance even affects the seed dealers who have the contracts with Monsanto and speculate on the impact of competitors coming on the market. For example, one seed dealer explained to me his concerns that as competitors come on the market he suspects he would have to make a choice and gamble on the winning technology, as Monsanto might pressure dealers to maintain a certain share of their business or lose their licence.

Therefore producers would seem to be facing a loss of control as a result of their use of biotechnology. At the same time, farming in Mississippi has changed to such a great degree as a result of the technology introduction, that to some extent producers have become dependent on it. Within ten short years of its adoption, it is not in any way unusual or striking to hear a farmer make statements about biotechnology such as:

We can't grow cotton without the Bt. (MS#4, GM Producer)

They're holding all the cards; what are we going to do about it. They're like, 'don't buy our seed and go back to conventional cotton,' but no, we can't do that. (MS#6, GM Producer)

If this dependence is indeed the current state of agriculture in Mississippi, the challenge to producer control over agriculture would seem to be significant. Of course,

the resounding response to such implications by the technology's staunchest defenders is that producers can simply go back to farming conventional seeds. This begs the question whether farmers indeed could opt out of the technology if they so desired.

A Return to Conventional Agriculture?

Interestingly, the availability of conventional seeds seems an ambiguous point. Arguments were presented on either side. On the one hand are those who argue that conventional seeds are available, even good quality ones, going so far as to show me listings of seeds with yield reports. On the other hand are those who argue that conventional seeds are incredibly difficult to find, and aren't available in good yielding varieties. No doubt there are explanations for the polarity of perspectives—for example, there are ample indications that some institutional agents want to protect against negative perspectives of the technology, which assertions of lack of choice might support. At the same time, some producers might try to soften the contradiction between their expressions of outrage and their continued use of the product. Obviously, much further research would be required for any strong conclusions to be drawn. However, there are certainly indications that the option of a retreat to conventionals is on the road to losing its viability. The fallout of the 2005 price increase provides an excellent example for this point.

The greatest indication of the problems of reverting to conventionals came about as a result of the fee increases. The fee increases in 2005 were sufficiently substantial that there was talk by frustrated and angry farmers of going back to a conventional system. This sort of sentiment seems greater in the hills area where the farms are smaller, drift susceptibility is less, and resentment over the technology is greater due to resentment

over the cross state differential in costs. In any case, enough interest in conventionals appears to have been generated to create a minor crisis in supplies.

One conventional cotton farmer explained his experience:

This past year they increased the RR fee and the Bt fees quite substantially. Enough to really make people around here really rethink buying some of those cotton varieties.... This year [an acquaintance] got the same seed dealer I did to search for conventional cottonseed, and got brought in conventional cottonseed and planted it on their land for the first time in years, this year. Because they were highly upset about the tech fee increases, and so more or less as their way of rebelling against that, they chose to go back conventional. As a matter of fact there were several farmers looking in to doing that and the seed availability just wasn't there. Thankfully we got in on the front end of it and got our seed. A lot of people were still looking for seed right up to planting time. (MS#12, Conventional Producer)

Similarly with respect to soybeans, an expert in soybean production explained to me how farmers upset by the price increases were thwarted in their efforts to abandon the genetic varieties in favour of conventional ones:

I had more calls this year from farmers wanting to grow conventional varieties, with farmers whining and moaning, 'I can't get them, what am I going to do?' (MS#20, Agricultural Expert, Soy)

Availability, of course, relates not just to strict availability of seeds, but availability of good quality, high yielding seeds, as yield is where the producer makes money. While conventional seeds are available, those who seek them out claim that the choice of varieties is not good. Companies are phasing out conventional varieties and the vast majority of new varieties are offered in RR, Bt or RR and Bt stacked.

Another producer describes his experience:

I started to plant some conventional cotton, and there are almost no.... Out of, I don't know how many varieties are available on the market. There might be 200 varieties available. You can probably count every

[conventional] variety available on one hand. And probably not need every finger to do that. [...] Well, when I say not having choices available, the choices of good yielding varieties. There's not but about 3 available, and one that would have a yield comparable to the genetically modified crops, and there was very little of it available. (MS#14, GM Producer)

There seems to be consensus that if farmers wanted to revert to conventional seeds there would not be the supply available for them to do so, at least in the immediate sense. To some extent, the apparent lack of availability of conventional seed is a matter of lack of demand. Farmers have wholeheartedly embraced the GM technologies, and in seeming consequence of the laws of supply and demand, conventional seeds have become harder to obtain. Quality debates aside, for those few who want the conventional technology, seed dealers can still obtain it for the customer by purchasing it on the market from somewhere else and shipping it in. The problems arise when the need is immediate and full scale, as seed requires advance notice for adequate supply to be produced. As one seed dealer explained it to me, his soybean production is 100% RR this year, and if there was a total shift in demand he would not have the conventional supply available to meet his customers needs. He would need at least 14 months notice for such a change, and if he had enough demand in his customer base, then he would produce it locally or contract someone to do so for him. An agricultural agent who reported the complaints he received about the lack of availability of conventional soybeans provided a similar perspective:

You know, when you go, less than 10 years, going from 100% conventional to 98% Roundup, it's a big change. You can't expect someone to grow you conventional on the whim that you might buy. [...] We had growers who wanted to grow conventional and couldn't get them, couldn't get the seed. And they had a hard time understanding that. And they probably will continue to have a hard time, but it's not a decision you make overnight. You can't decide today, I'm going to have conventional

varieties for next year. That decision is for 2 years down the road, it's not for next year. (MS#20, Agricultural Expert, Soy)

Despite the big crush for conventional seeds, the seed dealer I spoke to was looking at maybe growing a fraction of conventional seeds, if at all. More than one informant stated that while farmers will say they refuse to spend \$30 per bag on soybeans, in the end they would turn right around and do it anyway because of the relative hardship of reverting to conventional production in comparison with using the genetic technologies. Consequently, a significant drawback to maintaining production alternatives is the retrenchment of public breeding programs. While there is still some public breeding in existence, varieties are not released as conventionals. Therefore not only do farmers lose a source for conventional seed, but they also don't have the alternative of the public bred varieties acting as a check on the demands of the private companies.

Of course, dependence on the technology is not just a factor of seed availability. A number of structural changes to agriculture make a return to conventional production difficult. Infrastructure problems are already evident for those few cotton producers who would like to farm conventionally, and would like to save seed in order to retain the availability of varieties they like. Those who do want to attempt this are at a significant disadvantage with respect to cleaning and storage of their seed. For example, liability concerns make seed cleaners very reluctant to handle conventional seed in this way.

As the genetic technology reduces cultivation and chemical application, it also reduces the equipment needs of producers. Producers who no longer have viable working equipment will be unable to return to conventional production without significant capital.

In addition, for those producers who went the opposite direction and expanded their acreage in response to the reduced need to work the land, these acres themselves are an impediment to reverting back to conventional production, as the time to cover the acres would be prohibitive. Lastly, drift, as already mentioned, is another issue that could hinder reversion to conventionals. Without a full-scale shift back to conventionals or towards another herbicide resistant program, there is a significant degree of risk for those who would choose not to farm with the Roundup program.

For many producers, their relationship with the makers of the technology—and their relative disadvantage—in the present tense is enough to concern them. However, a few considered the impact of the current changes on their future production, and for these, control issues took on even greater salience. In this context, economic concerns about being beholden to one company became linked to broader concerns that when a problem developed, this one company may or may not be in a position to address it. Therefore, while weed and insect resistance are problems that those in the agricultural business have come to expect, their dependence on one company for the solution to these problems was a new development, and one that carries a certain amount of risk. What for Monsanto might be a lost market opportunity—for example, the failure to come out with a new product on time when resistance to their existing product develops—could be devastation for those who have become dependent on GM as the method of production. One of the more articulate expressions of this concern came from an agricultural consultant who was adamantly anti-monopoly, and who harboured no doubts about Monsanto's monopoly status:

I do not like the idea of Monsanto owning everything in the country, and us having to rely on one company to furnish us with what we have. I am

more anti-Monsanto than I am anti-GMO. I consider GMOs a tool. How long that tool is going to be available and effective I don't know.... What concerns me is that because of the GMO-Monsanto relationship is we've destroyed the ag-chemical business. And so the traditional products that we've had all these years... you know, I don't have researchers I can call today that I could call ten years ago and ask questions, because they don't exist, they don't have jobs anymore. The market place is not there. Monsanto owns the market place. The competitors are no longer in business. They have taken their research and sales force down to a small level. It concerns me what is going to happen five years from now. As the mare's tail becomes resistant that you've all read about, as other things become resistant, what is going to be there, and is Monsanto going to be the only person that's going to be available to furnish us with what is there because the others are out of business? (MS#29A, Consultant/Producer)

In this sense, for those who have become completely dependent on the technology—either through lack of equipment, larger acres, or loss of skills—a market failure by Monsanto along these lines could be the end of their business. The issue of alternatives is therefore an issue of control as well as an issue of having something to go back to, in the event of a failure of the technology.

Fields of Opposition?

While farmers clearly love the technology, the open resentment of Monsanto and the wealth of control concerns would seem to elicit some active opposition. Nonetheless, despite the highly negative attitude towards the company, and the litany of cost and other control issues raised, actual struggle against Monsanto appears negligible. Certainly, resistance is loudly promised—and perhaps even seriously considered—by those who toyed with the idea of reverting to conventional varieties in response to the price increases. Outside of this, there were no signs of lobbying, subversive seed saving, or any other forms of resistance to the industry.

Two factors seem to figure largely with respect to the lack of resistance by farmers. The first is that despite all control concerns, there appears to remain a great deal of faith in the workings of the market. A frequent mantra of agricultural stakeholders was that with competition, the control issues around genetic technologies would be resolved. Repeatedly stakeholders would complete thoughts on their frustration with Monsanto with statements on the ameliorative power of competition. In part, this faith in competition could be bolstered by an anathema of regulation; in part, it could be bolstered by the glimmer of new biotechnology companies on the horizon.

Secondly, producers seem to have a fear that they will lose the technology, which they have come to depend on. More than once the sentiment was expressed that you don't want to rock the boat so much that you are going to lose a technology on which they had become increasingly dependent. For example, one GM producer who considered returning to conventional crops after what he considered Monsanto's "price gouging" ultimately decided against doing so because he had gotten so used to the technology:

I guess I've also gotten somewhat addicted to or dependent on the technology and wasn't completely ready to let it go. Maybe a little bit of me was...I used it so long it's like someone on crutches. I've used it so long and you're kind of unsure—it's like training wheels on a bicycle, you're not ready to throw them off quite yet. You could probably do it, but you're not 100% sure of going back to doing some of the older ways. (MS#14, GM Producer)

Such outright expressions of technological dependence were rare, but the sentiment was not. Producers were not shy to state such an affinity for the technology that it smacked of dependence:

I really think it's a necessity. We went back to conventional, it would be tough. (re Bt, MS#3, GM Producer)

This dependence was much greater for Bt, given the concerns over worm control, but was evident for the ease, convenience and efficiency of Roundup as well:

... I think that when they see the prices they will respond to it, but when you hold them down to the line, they are going to plant it every time because it's a lot easier. (MS#19, Agricultural Expert, Cotton)

[I]t's so much easier raising a crop now than it was 10 years ago. So I don't want to go back to the way we were. (MS#24, GM Producer)

While no resistance appears to have been initiated from within the agricultural community, efforts have been made from the outside. For example, it was reported to me by more than one producer that a number of attorneys from Atlanta, Georgia attempted to initiate a class action lawsuit against Monsanto in an effort to try to recoup some of the technology fees on soybeans. However, even then, resistance to the control of Monsanto had to be balanced by the fear producers had of losing the benefits they felt the technology brought:

[E]very one of us in that room and everyone that was at the meeting knew that we paid x number of dollars, and we knew what we paid it for, and rather than take the chance of not having the availability of the technology.... I knew going in what I was doing, and I knew what I was going to pay, and I paid it, and I'm not willing to take a chance and lose something that's good. (MS#31, GM Producer)

The relationship of producers to biotechnology would therefore appear to operate in a tension: on the one hand, their appreciation of the technology has led them to increasing dependence on the technology; on the other hand, producers are experiencing the drawbacks of this dependence in their relative lack of power with respect to the makers of the technology. At this point, the benefits are still outweighing the losses. In all likelihood, the overall costs (particularly with respect to control issues) are likely to increase as the technology becomes even further entrenched over time, although the

strictly economic aspects of the technology will need to retain a slight benefit. The trajectory of changes within the agricultural sector as a result of biotechnology are fairly clear. At the moment, however, the benefits are still too great for producers to offer any significant resistance to these changes.

These dynamics can best be summarized in the words of two producers who themselves try to articulate the lack of resistance:

If I'm raising RR cotton, and RR soybeans, and you know, my stress level is a whole lot less, and come Friday I'm through with my work and I don't have to worry about working all weekend, and I'm making a living, then I'm happy. Until it gets to that point when it's strangling somebody.... And again, I told you, I'm not against the technology, I'm more against the individual who owns the technology, I just think their britches are going to get too big for them one of these days, and there's just not going to be enough competition left. (MS#29A, Consultant/Producer)

Everybody is concerned but they all want the ease of using the technology. Don't worry about it they'll just take the ease of using the technology. So it's the kind of thing you're always going to do later. We'll always do it later. We'll look at this contract closer and find loopholes in it. Well, it just never happens. (MS#10, GM Producer)

Environmental sustainability could be another source of resistance to the industry. For the vast majority of farmers and agricultural stakeholders in Mississippi, the environmental and health issues that have been the lightning rod for controversy around biotechnology outside of the state do not appear to be a factor for concern. However, as we readily saw in Saskatchewan, the economic imperative behind modern agriculture is often so great that support is unequivocal from those who practice it. Opposition is most likely to come from those outside of it, such as organic producers and environmental organizations. In Mississippi, these outsiders were hard to find. In 2002, the first year for which data on certified organic farms was available, there were 160 certified organic

farms out of the total of 42,200 farms (USDA, ERS, “Mississippi Fact Sheet”). Therefore, less than half of a percent of all Mississippi farms are certified organic. Prior to 2005, there was no organic certification board within the state. The only grower support organization for organic farmers, the Mississippi Organic Growers Association, was defunct when I contacted it, and the past organizer stated that he just couldn’t get enough members. Interviewee stakeholders with a more environmentally sustainable bent stated that while many small farmers farm sustainably, certification involves too much paper work without sufficient return. Therefore, despite the lack of strictly organic organizations, a number of grassroots organizations promoting sustainable agriculture—sustainability broadly conceived as environmental as well as economic sustainability—are in existence, many of which are concerned with low resource producers. For example, the Sustainable Agriculture Working Group (SAWG) is interested in promoting more sustainable agriculture production, particularly through promoting small farmers who produce through farmer’s markets, and Mississippians Engaged for a Greener Agriculture (MEGA) promotes sustainable farming, primarily among the African-American farmers of the Delta. More environmental attitudes can also be found in the Sierra Club and the Green Party.

Members of these groups are more likely to raise objections to the technology. However, perhaps due to the limited number of objectors, even these who do have objections state them with an air that the continuation of the technology is inescapable. Organized resistance to the technology on health or environmental grounds is virtually non-existent, and all my queries, wherever directed, were met in the negative:

We really haven't had any issue with Frankenfoods or anything like that.... Whether it's safe to eat or to grow. It's really not an issue here, whether it's bad for you. (MS#3, Producer)

As a member of the newsprint media explained to me:

The people who care about something of that nature [GMOs] are typically in college towns. Mississippi has college towns that have a very diverse culture, and the rest of Mississippi is not really diverse at all, and those would still be new ideas to those towns. (MS#23, Media/Organic Producer)

Even in the more environmentally progressive groups, objection to genetic technology cannot be assumed. For example, despite the anti-GMO position taken by the national level of the Sierra Club, the Mississippi chapter does not advocate this position. With respect to sustainable agriculture producers and organizations, there appears to be somewhat of a divide with genetic technology issues, likely in part because the vast majority of sustainable producers are involved in fruit and vegetable production. Even when there is overlap, such as in the limited number of small resource producers who produce row crops, knowledge of the technology appears limited. However, there were some concerns raised regarding the availability of non-GMO seeds, given Monsanto's ongoing seed company purchases.

[If Monsanto] continues that, it will get to the point where there would no longer be organic seeds. I don't see where he would have a capture there, or a market there, for organic seeds at the same time as he is pushing or promoting all the different types of herbicides and pesticides. (MS#28, MEGA)

The lack of environmental concern around the technology appears consistent with the environmental values of the state more broadly. Whatever their differences, you are unlikely to find a member of the Agricultural Producer's Association of Saskatchewan referring to organic farmers as "nutcases," as did a member of the Mississippi Farm

Bureau, the largest general farm organization in the state. This value difference is not a limited personal view but found fairly frequent expression, for example in the agricultural expert who argued in favour of the high capital input of GMO farming as “the right way to go,” but against organic farming for disadvantaging the commodity prices of those who “can’t afford” to take that route.

Therefore the environmental and sustainable agriculture picture that emerges in Mississippi is very different from that in Saskatchewan. In essence, where resistance to agricultural biotechnologies in Saskatchewan can be found in both the environmental and alternative agriculture sectors, that type of resistance is largely absent in Mississippi. Further, what little objection there is to the industry on environmental grounds operates with no apparent connection to—or even awareness of—the control issues raised by farmers. This is again in stark contrast to the extensive networking of anti-GMO contingencies in Canada.

While resistance to the social reorganization brought by biotechnology in agriculture is not forthcoming from either producers or the environmental and alternative agriculture sectors, it is evident in the very limited forum of the patent infringement lawsuits initiated by Monsanto in Mississippi.

Mississippi Farmers in Court

Every person I spoke to had heard, in general, about the lawsuits between Monsanto and select farmers in Mississippi. The details and significance of the cases themselves will be discussed in Chapter 6. The issue here is the role, if any, that these lawsuits played in the actions of the agricultural community. Overall, there was a good

basic awareness of the issue of seed saving that was the basis of the lawsuits. Further, Scruggs raised anti-trust issues in his case, and there was also a fair awareness of this issue. Often the awareness appeared to go no further than these issues, however. To some extent, this appearance might have been the result of a southern gentlemanliness at play, which precluded naming names and discussing what might be the equivalent of 'dishing dirt' on private affairs. One regional agricultural representative I spoke to before the interviews suggested that for this reason it might be best to stick to generalities rather than mention names. This contention appeared borne out in a number of interviews, where interviewees might refer to vague knowledge of a gentleman engaged in such a lawsuit, while snippets of further discussion reveal this awareness to be much greater.

Overall, there was a fair amount of empathy for the issues the farmers engaged in the lawsuit were pursuing. Broadly speaking, there appeared to be two categories of responses to the issue of the lawsuits: those who subscribed to a clear view of right and wrong, and regarded seed saving violators accordingly; and those who had broader concerns with the balance of power between companies and farmers, and who consequently had some empathy for farmer litigants, regardless of their guilt. While distaste for those who blatantly violated contracts was palpable, the latter nonetheless greatly outnumbered the former.

First, were those whose view of right and wrong precluded any consideration of the extenuating circumstances that might have led to the seed saving violation at issue in the lawsuits. For these respondents, those who signed contracts knew what they were agreeing to, and if they saved the seeds anyway, they knew the risk they were taking in doing so.

[H]e knew up front that he wasn't supposed to do it, and he did it anyway for his own profit. In that sense in itself, you know, I think he was wrong. I don't agree with the amount they charge for the technology fees and the seed and what not, but if I have an alternative and I don't use it, then it's my choice. (MS#14, GM Producer)

I think generally, most folks know, if you sign a contract, you sign a contract. It's an agreement between two parties. If it says I will not save seed for replanting in honour of the agreement, I think generally, most everybody is going to honour that side of it.... (MS#5, Farm Bureau)

I'm on the side of Monsanto in that case. We are using something that they developed that they are selling and they are going to continue to develop things in the future that we need if we are going to stay in business, and they need to have that return. If farmers don't want to pay the fee they can plant conventional varieties. (MS#3, GM Producer)

There was little empathy for the farmers involved, who were seen as dishonestly attempting to profit from what was commonly known was prohibited. These stakeholders felt that the technology provided a benefit, and the laws were in place to ensure those who developed the technology captured sufficient benefit to produce more inventions. A key component for many who held this position was that those who didn't like the restrictions should simply opt out of using GM technologies and should farm conventional crops.

On the other side, were those whose concern over what I would characterize as balance of power concerns, over-rode considerations of the specific infractions involved. These respondents mainly focused on the issue of costs, and monopoly power, and often referred to the lawsuits with a somewhat passive sentiment of 'I hope it helps us.'

As far as my viewpoints, as far as me wishing they'd stick it to him [Scruggs] or nothing, I don't. I hope he gets the point across to him [Monsanto]. I'm hope he does something that will help us. I hope they realize that they are going to have to do something with us to help us turn a profit. (MS#13, GM Producer)

Farmers who had this perspective were also the most likely to be concerned about the limits on alternatives to GE, whether due to the lack of availability of conventional seeds, the dependence they felt on the technology which precluded reverting to conventional, or other reasons.

Most commonly, farmers balanced what they saw as a distasteful infraction and an acknowledgement of broader issues that perhaps could only be settled through this type of action. This balance is perhaps best characterized by the expressions of one of the few producers who ultimately opted to grow conventional cotton, although continuing to grow GM soybeans:

[T]he one thing about the lawsuit—and I won't even mention names, everybody supposed to know who it is—but they said that the man that's involved.... the biggest man involved in the lawsuits, several smaller farmers were involved—but the big man that they are really after, he is the only man that is strong enough to fight Monsanto and possibly win. So they said he has the best potential of anybody of knocking them down. So everybody is kind of rooting for him in that respect. However nobody agrees with what he did that I have talked to. They know why he did it. They know why he was mad enough to do it. The way I understand it he saved some seed when he wasn't supposed to. He claims they are his seed. He bought and paid for them, he can do whatever he pleases. We understand where he is coming from, but we all knew what the contract said. You know, like I said, I signed it the first time. I haven't signed it thereafter because I know when I open that bag of seed that I am bound. (MS#12)

Essentially, there is a sense that breaking a contract is tantamount to being ill mannered in Mississippi: it is not a southern thing to do. At the same time, concerns about Monsanto's monopolistic character and—while not always articulated as such—the perceived anti-trust aspects of the manner in which they conduct their business, are prevalent. For the most part, these perspectives are held loosely together. While there is not a great deal of affinity for those who engaged in violating contracts, there is a

mutuality of concern over the more general issue of Monsanto's level of control, and an acknowledgement that this might be the only means of addressing the imbalance.

Outside of the issue of seed saving, and the awareness farmers had of the broader issues that the lawsuits might affect, there is no evidence that the legal framework around GM technologies affected the actions of farmers in Mississippi in any way. No doubt, this can be at least partly attributed to the extent of GM adoption, which renders contamination concerns moot. It is telling that the only farmer to raise the issue of a potential personal impact of the lawsuits was also the only farmer who grew conventional cotton that I spoke to:

A farmer my size, I couldn't even pretend to go to court to fight them. You know, if they said I did something wrong, and they want me to pay, I guess I have to, because I haven't got \$20,000 to go to court to fight them, even if I know I'm right. Because it wouldn't be worth it to me, depending on the penalty. (MS#12)

Such limited assertions aside, there were no indication that farmers were adopting GM technology for any reason other than their sincere appreciation of it.

Nonetheless, despite the general lack of affinity for the farmers involved in the lawsuit, barring regulatory intervention at the state or federal level, the lawsuits are likely the only chance of ameliorating the power imbalance between Monsanto and producers.

Without a challenge in the courts, and the laws being changed, we will not go back there to farmer control. Why should they give it up? Why should the companies give up something they've already got? (MS#20, Agricultural Expert, Soy)

Conclusions

Within each individual farmer's survival strategy, the GM technology makes infinite sense. At the current prices, though just barely in some crops, the technologies

are arguably on par with conventional varieties. At the same time, they provide producers with some significant advantages over conventional crops. With respect to Bt, the benefit is risk reduction, with the technology acting as an insurance package of sorts. In light of the 1995 heliosis outbreak this is not a minor consideration for farmers. With respect to Roundup Ready crops, efficiency and convenience are the bigger factors. The few apparent objections to the biotechnology industry in Mississippi do not share the characteristics that those in more environmentally reactive areas such as California: those few who find environmental and health issues of the technology to be an issue, only find it to be so due to its effect on the marketing of their product, and even this is only a distant factor. Given these physical advantages, therefore, genetic technologies can be seen to have increased control for farmers with respect to providing them with further tools in their agricultural production.

This increase in control needs to be qualified, however. While individually farmers are choosing to adopt the technology, their individual decisions are creating a structure that has reduced their choices and their ability to direct their own agricultural destiny, and this may become worse in the future. As long as the technology is working and is priced within reach (if only barely) of farmers, the drawbacks to such a structural shift may not be readily apparent. However, they are not likely to remain concealed for long. There is little doubt that genetic technologies in Mississippi are currently under monopoly control, and that control affords a vastly greater power to the makers, rather than the users, of the technology. This was evidenced with respect to prices, seed saving restrictions, and replant policies, for example. Even if competition should succeed in breaking in, it is likely to remain a limited amount of competition due to the high capital

involved in biotechnology. Further, any new providers of the technology will not necessarily compete with Monsanto in a manner—outside of pricing—that will restrict the gains in control Monsanto has made over producers. Whether this is expropriationism or not, is highly dependent on whether farmers have alternatives to the genetic varieties: will farmers be able to revert to conventional varieties if they find the use of the technology has become too restrictive?

The response to this depends on two further questions. First is a question strictly about availability: are conventional varieties still available for farmers who would wish to use them? The answer to this is not definitive. While still available, conventional varieties of cotton and soybean seeds are definitely not as readily available for purchase as transgenic ones. Nonetheless, a reduced number of conventional varieties can still be obtained, if not from a local seed dealer, then brought in from somewhere else. Obviously, supply and demand is a significant factor, as seed suppliers have no interest in maintaining supplies that they cannot sell. While conventional varieties are still available, farmers who sought them claimed that the available conventional varieties were not as good, and were usually older. Planting older varieties represents a significant loss of yields. Some farmers have stated that if they could purchase non-transgenic crops that could provide the yields of transgenic crops, they would do so. While the actuality of this may be quite different, the rising prices have definitely intensified the interest in this question.

Secondly, is the question of the viability of a return to conventional production: will farmers be capable of returning to conventional farming? All indications are that the switch to transgenics is monumentally helpful to the management of larger tracts of land,

in a business where profits are based on volume. However, those who expanded would have the most difficulty reverting to conventional. These are also the producers gaining the greatest rewards from the technology and the least likely to balk at the prices. The issue of risk due to the increased glyphosate drift resulting from the prevalence of glyphosate resistant crops is another issue. This is a much bigger concern in the delta area, where wind is a significant factor. The use of Roundup Ready corn is apparently on the increase due to problems with damage due to drift. Obviously, to the extent that producers feel they must purchase the GM seeds as a defensive mechanism against such problems, the issue of expropriationism becomes much more salient. Similarly, the infrastructure for acid delinting cottonseed, and the chemical and equipment base for conventional farming have also faced a significant retrenchment. In the context of competition, this could be a natural technological evolution of farming (leaving aside environmental considerations, for the moment). In the context of patents on seeds restricting seed saving and a single supplier of the necessary technology to continue farming with GM crops, this technological dependence becomes highly significant to the social structure of farming.

In the transition to GM varieties as the new reality of cotton and soybean farming in Mississippi, farmers were left with one company to deal with, and that one company decides rules, contracts, loyalty schemes, and, of course, prices. The sentiment of farmers is that they have lost control as a result of this dependence on the company. While loss of control is largely framed in terms of cost (producers having no alternative suppliers), control issues were also evident in the restrictions on seed saving, differential prices depending on region, and a number of other changes instigated by the Monsanto

Company, such as shifts in pricing schemes (per acre or per seed), and restrictive incentive and rewards programs. In the manner of death by a thousand cuts, this can be characterized as loss of control by a thousand schemes. While most stakeholders would likely accept a technical distinction that Monsanto does not have a monopoly, the majority I spoke with express nonetheless that in all practicalities, Kingdom Monsanto is ruling strong.

Nonetheless, resistance to the GM technology is virtually non-existent, though talk was high after the price increases of 2005. Competition is held out by many as the solution to their increasing loss of control. Many have faith that free trade, capitalism, and the great American way will save the day, although uncertainty remains regarding the openness of the field to competition given the control Monsanto had over the market. Further, due to the prevalence of Roundup, the transfer to another GM product in the delta would face a double hurdle of entry, both in market competition and by adding an element of risk to early adopters. Given the corporate benefits gained by the restructuring of agriculture under GM technology, even if competition entered the stage it could still choose to replicate, rather than compete with, the unfair patterns set by Monsanto.

The question of expropriationism would appear to be given an indeterminate answer, although the trend is towards an advancing expropriation. There is no doubt that restructuring is occurring in agriculture as a result of the introduction of biotechnology. Whether this new tool will ultimately render agricultural producers contract labourers or glorified sharecroppers remains to be seen, although the prognosis is not good. However this story is still unfolding, and variables could enter the picture to change the apparent trend. While it is difficult to hold the amount of faith evident in Mississippi agricultural

stakeholders, competition could certainly be one of these variables. Regulation could be another. The avoidance of regulation is desirable to Mississippi producers, as was most apparent with respect to the issue of drift. Given that aversion, many agricultural stakeholders stated that no new regulations were required. Those stakeholders who did make suggestions either emphasized educating the public and other nations about GMOs in a way that would protect their markets, or they suggested doing 'something' that would ameliorate the imbalance of power (primarily with respect to price setting) between producers and Monsanto. The specifics of this 'something' were rarely apparent. While seeking any form of regulation was obviously anathema to Mississippi agricultural stakeholders (and likely to Mississippians more broadly), there is unlikely any other viable means to contain the imbalance between producers and the holders of the technology they have come to rely on.

Before drawing final conclusions about expropriationism trends in Mississippi, we will now turn to Chapter 8, and an investigation of the cases of *Monsanto v. Scruggs* and *Monsanto v. McFarling*, to enquire how farmer's control over agricultural production has fared in the legal forum.

CHAPTER 6

STARTING A NEW REGIME: TRAINING THE LOCALS

Farmers still have control over what seed they plant and whom they purchase it from. Restrictions on patented technology does not take away farmers' choice. (MS#40, Monsanto Company)

A New Legal Framework for Agricultural Production

From the preceding chapter, we have already seen that the motivation for Mississippi agricultural producers to adopt GM technology is strong. Whether due to the technology's merits, the high risk of chemical drift, or the fear of loss resulting from the relative disadvantage of competing with those who do adopt, there are very few who choose not to use the technology in cotton, soybeans, and, increasingly, in corn. Soon after its introduction, Monsanto's GM technology has become the basis of agricultural production in key Mississippi crops. Of course, as should be very clear by now, the changes to Mississippi agriculture do not just result from the technology's physical attributes, or from the difficulties of dealing with what is effectively a monopoly, but also from the legal structure that accompanies the technology. This legal structure stretches from international and federal law down to the contractual provisions of Monsanto's Technology Agreement (TA). To what extent is this legal structure initiating a reorganization of agricultural production in the United States?

This chapter follows the same format and asks the same questions as were asked of the lawsuits in Saskatchewan. As in that chapter, I will first briefly discuss the legal

framework for intellectual property protection of plants developing through legislation and case law around the patentability of life. As we have seen, while sometimes angry, most farmers in Mississippi are at the moment still willing to accept the trade-offs that are the condition for using the new technology. For the average producer, these trade-offs do not extend beyond production-level trade-offs of relative costs and such. Similar to Saskatchewan, however, many legal changes are evolving below the surface, their nature and extent still unfolding, and their application in practice still to be tested. Looking at some of the key issues that have arisen in litigation about the technology provides another means from which to assess the extent of reorganization of agriculture. I will draw on two court cases in Mississippi—*Monsanto Co. v. McFarling* and *Monsanto Co. v. Scruggs*—for specific examples of this evolving law in action, noting which issues are still to be resolved and what direction their resolution appears to be taking. I will then discuss this litigation in the context of resistance. Lastly, I will draw some conclusions regarding the nature and extent of expropriation that is revealed in the court cases, and what they suggest for its future trajectory.

The data for this chapter is made up of the decision documents from the two court cases, supplementary legal documents and interviews with litigants and their representatives, where possible. As in the Hoffman case in Saskatchewan, Canada, both the McFarling and the Scruggs cases are ongoing, and I can only interpret from the direction of the decisions made to date. It needs to be noted that as the number of such lawsuits in the United States far exceeds that of Canada, there is significantly more supplementary information available on the issues that arise and more farmers involved.

Given the presence of a case of some notoriety just across the border in Tennessee, interviews with two litigants there were also conducted.

Intellectual Property Protection

Overall, the United States has been a strong supporter of intellectual property rights protection, both nationally and internationally. As we saw in Chapter 1, private capital's struggle to pursue accumulation in seed breeding in the United States has a long history. Seed breeders have struggled to overcome the natural barrier to capital accumulation in the seed—that is, in its ability to reproduce itself—through various technical (e.g. hybridization) and social (e.g. legislation) means (Kloppenborg, 2004:11). The introduction of biotechnology has extended the potential of these technical and social efforts, such as through terminator technology and patents on life. While no less important a social phenomenon, the struggle over terminator technology is beyond the scope of this work. The following provides a more detailed look at the extension of intellectual property protection over genetic resources.

Intellectual property protection for plant genetic resources in the United States was first granted in 1930 through the Plant Protection Act [PPA]. The PPA offers an actual patent on plants, but is only applicable to asexually produced plants, such as ornamental plants and fruit trees (Evenson, 2000:14). Ultimately, the Plant Variety Protection Act [PVPA], governing sexually produced plants, was introduced in the United States in 1970, a full twenty years before similar legislation was introduced in Canada. Unlike the PPA, the protection offered to sexually produced plants by the PVPA was not a form of patent protection, but rather a certificate granted by the USDA that provided a number of exclusive rights to the certificate holder—such as rights to

propagate, import or export the variety. At the same time, broad exemptions to the PVPA existed, such as the right of researchers to use varieties for breeding, and of farmers to save and reuse seeds for their own use, as long as the amount of saved seed did not exceed that of the original amount that was purchased from the certificate owner (Ibid: 16).

Since the PPA and the PVPA, a third system of intellectual property protection over plants in the United States has emerged, in conjunction with the United States' evolving membership in the International Union for the Protection of New Varieties of Plants [UPOV]. The United States became a member of UPOV in 1981 and is currently party to the newest version of the Act, UPOV 1991. As noted in Chapter 3, UPOV 1991 supports protection for breeders while rendering optional the exemptions for farmers and researchers previously afforded under UPOV 1978. Under the 1991 version, therefore, the United States can choose whether to offer straight patent protection on plants or whether to continue with some sui generis system of plant breeder's rights, such as offered by the PVPA. Straight patent protection, of course, is much broader and does not allow for farmer and researcher exemptions—thus it would effectively end the practice of farm saved seed for any patented varieties.

Even before becoming a signatory to this latest version of UPOV, in 1999, evidence for a US predisposition towards intellectual property rights protection for plants was strong. Roberts (1999) states that the United States has been “clearly disposed to accommodate the vital new age of biotechnology,” and that both the United States Patent and Trademark Office [PTO] and the results of US Court decisions demonstrate a long history of support for the patentability of living organisms (Roberts, 1999:23). Similarly,

Vaver (2004) argues that the assertion found in US Congressional reports accompanying the enactment of the 1952 US Patent Act claiming the patentability of “anything under the sun that is made by man,” characterizes the tone of the US courts and Patent Office for the last 2 decades (Vaver, 2004:158). It is in these decades that sexually reproduced plants were clearly affirmed to be patentable under utility patents. Therefore, unlike in Canada, with its reluctant parliament and mixed court rulings, the decision process on the patentability of living organisms in the United States has been considerably quicker and far less ambiguous. In contrast to Canada, the American tendency has been for “instant patent gratification: issue first and ask subject-matter questions later” (Ibid: 159).

As in Canada, patent protection is a federal matter in the United States. Also as in Canada and many other countries, patent protection in the United States currently lasts 20 years and requires that a process or product be novel, useful, and non-obvious. According to Section 101 of the United States Code 35 (“Patent Act” hereafter), a patent can be obtained by anyone who “invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof” (United States Code, Title 35, Section 101). American case law about the patentability of life forms found its early roots in debates in the late 1800’s and early 1900’s over whether mere discoveries (rather than inventions) and products of nature could be patentable (for examples, see Roberts, 1999:23-24). Not until 1980, however, in the landmark case of *Diamond v. Chakrabarty*, did the patentability of living organisms find explicit judicial support.

The Chakrabarty case involved a bacterial culture that could break down crude oil, useful with respect to oil spills. The US PTO and the Board of Appeals had rejected

the patentability of the culture based on the fact that it was a product of nature, and that, as a living thing, it was not patentable subject matter (U.S. Congress, Office of Technology Assessment [OTA], 1989:8). The case ultimately was heard by the US Supreme Court, which decided that the human-made micro-organism was patentable subject matter. In consequence, *Chakrabarty* became “the linchpin to the explosion of biotechnology patents in the late 1980’s and 1990’s” (Dhar and Foltz, forthcoming 2005:4) and the “stimulus to the growth of the biotechnology industry” (U.S. Congress, OTA, 1989:8). It was, as Dhar and Foltz (2005:1) contend, the launch of “a new paradigm in biotechnology patenting.”

Post-*Chakrabarty*, it still remained to be seen whether such patents could apply to multi-cellular organisms. This was supported a short time later, in 1985, through the US PTO Board of Appeals application of *Chakrabarty* to plants in the case of *Ex Parte Hibberd*. It seemed that the patentability of multi-cellular organisms was now affirmed. Already at this early time, the contrast to Canada can be seen clearly with respect to the Harvard mouse. While the Harvard mouse was rejected for patent protection by the Canadian Supreme Court as late as 2002, the United States PTO granted the same mouse patent protection as early as 1988. Nonetheless, contention arose out of *Hibberd* over the fact that granting utility patents on plants seemed to be in direct conflict with the intentions of Congress in the establishment of the PVPA. Why would Congress have enacted the PVPA if they had not specifically wanted provisions in place that recognized the extraordinary aspects of intellectual property protection for plants, aspects that could not be accommodated by offering straight utility patent protection? This question is highly significant for agricultural production, as granting patents on plants would appear

to negate the intention of Congress to protect the rights of farmers to save and replant seeds.

Granting utility patents on plants, therefore, represents a significant loss to an ownership right (ownership of the progeny of their crops) that farmers traditionally held, and that was affirmed under the PVPA just fifteen years prior. The significance of the change for producers and for agricultural production more broadly motivated further court challenge, most notably in the case of *Pioneer Hi-Bred International v. J.E.M. Ag Supply Inc.* (Northern District of Iowa, August 19, 1998), which ultimately was heard in the Supreme Court of the United States (*J.E.M. Ag Supply Inc. v. Pioneer Hi-Bred*, December 10, 2001, hereafter “*J.E.M. Ag Supply*”). While addressed in the context of litigation involving an agricultural retailer rather than a farmer, the case took to the Federal Court the question of whether the PVPA “pre-empted the ability of the Patent office to grant patent protection for plant varieties” (Hamilton, 2005: 52). Both the district and appellate courts upheld the validity of the patents, and, ultimately, so did the US Supreme Court in its December 2001 ruling on the case. According to Hamilton (2005), the ruling showed that the Court was “not going to revisit the larger issue of the wisdom or legality of granting patents on living materials” (Ibid). It would seem that in the clash of rights over patenting seeds biotechnology companies had emerged the winners: the case of expropriationism seems unambiguous.

In consequence of this case law, intellectual property protection over plant matter in the United States is currently provided by three systems: the PPA, the PVPA and utility patents, which can be obtained on both sexually and asexually reproduced plants. While utility patents offer broader protection, they have stricter requirements, and thus all

three systems remain available to seed breeders. It is the utility patent system, however, which is the site of the current struggle over the commodification of the seed. As we shall soon see, the fight over the conflict between utility patents, the PVPA and the right of farmers to save their seed found a second wind in Monsanto's patent infringement litigation.

The Lawsuits

While infringement lawsuits existed under the PVPA and the PPA, only a limited number of such cases were ever prosecuted (Kershen, 2004:575). With the patenting of genetically engineered traits under utility patents, the number of cases is predicted to go up significantly (Ibid). Indeed, by all indications this is already well in process. In 2005, the Centre for Food Safety [CFS] published a report on the litigation around agricultural biotechnology in the United States initiated by the Monsanto Company. The CFS estimated that Monsanto conducts 500 investigations of farmers in the United States a year. As of December 2004, the Monsanto Company had filed 90 cases against 147 farmers and 39 businesses/farm companies—either over technology use agreement violations or patent infringement—from 25 different states (CFS, 2005:31). Nineteen of the 90 lawsuits were still ongoing at the time of the report.

The financial results of these lawsuits are not available because the majority of the cases are settled out of court for undisclosed sums, the details of which are protected by confidentiality agreements. For those cases that do proceed through the court system, however, it is clear that the economic impact on the farmers can be considerable. Allowing for the fact that the recorded judgements are often far below the actual cost of the entire proceeding to the farmer, the settlements range from a low of just over five

thousand dollars to a high of over \$3 million dollars (CFS, 2005:34). The mean settlement for those with recorded judgements is \$412,259.54 (Ibid). Given the high cost of litigation and the imbalance of power and resources available to those involved in such litigation, the vast majority of farmers—including some of the more outraged—appear to settle with Monsanto. For example, one case in the United States that began to garner some of the attention of the Schmeiser case in Canada was Monsanto’s suit against Nelson Farm in North Dakota in 2000. Despite the Nelsons’ full cooperation and the fact that the North Dakota State Seed Arbitration Board found no support for the company’s claims,¹⁰⁶ Monsanto persisted in their allegations. The outraged Nelsons launched a website and initiated a publicity campaign, vowing to fight “on the principles of our innocence” (NelsonFarm.Net, see also Schubert, 2001 and Witte, 2001). Ultimately, Monsanto dropped its case in 2001 in conjunction with an out of court settlement with the Nelsons, the details of which are protected by a non-disclosure clause.

Two court cases where farmers have not settled and that have risen to be cases of significant interest are based in Mississippi. Whether due to the prevalence of infringers or some other factor, over ten lawsuits have been filed against farmers in Mississippi, according to the CFS report. The two of interest here are *Monsanto Co. v. Scruggs* (hereafter “*Scruggs*”) and *Monsanto Co. v. McFarling* (hereafter “*McFarling*”). In many ways the *Scruggs* and *McFarling* cases are interconnected—even literally, as *McFarling* purchased seeds from *Scruggs Farm Supply* in 1999—and aspects of the cases unfold in

¹⁰⁶It should be noted that Monsanto “failed to participate in the arbitration hearing without good cause.” Judge Hoberg from The State of North Dakota Seed Arbitration Board nonetheless concluded: “The greater weight of the evidence show the Nelson Farm does not owe Monsanto any damage for patent infringement, conversion, or unjust enrichment because the evidence presented shows that none of these occurred. ...Nelson Farm has presented substantial evidence disproving Monsanto’s case.” (NelsonFarm.Net “Recommended Order.”)

reference to each other as they proceed through various levels of court. Unlike *Schmeiser* and *Hoffman*, which involved the issue of contamination (albeit from opposite sides of the liability question), the *Scruggs* and *McFarling* cases rest squarely on the issue of patent infringement resulting from seed saving, where the original seeds were purchased from Monsanto. Both of these cases appear unambiguous with respect to the evidence of infringing action undertaken by the farmers; both would appear to be about the process of meting out appropriate punishment for such actions; and yet both provide a determined challenge to the acceptability of classifying seed saving as an infringing action. One significant difference between *Scruggs* and *McFarling* is that *McFarling* is the only one of the two to sign a Technology Agreement, providing legal insight into the legitimacy of the contract itself.

Monsanto Co. v. McFarling

The facts of the charge of seed saving patented seeds against Homan McFarling are straightforward. McFarling is a soybean farmer in Pontotoc County in North East Mississippi. In 1997, McFarling bought 200 bags of Monsanto's new Roundup Ready soybeans. He liked the seeds and thought they saved on labour. He saved these seeds and planted them again in 1998, in conjunction with a further 1000 bags that he purchased. In both instances McFarling signed a copy of Monsanto's Technology Agreement. He saved and cleaned 1500 bushels of the resulting 1998 crop, and used these seeds in part to plant his 1999 crop, and did the same again in 2000. In person, McFarling has stated that seed saving has been a longstanding practice in his family: "We've always saved seed and replanted it. ... My dad saved them before that, and his dad saved them before that. We've always saved seed" (MS#16, McFarling).

Seed saving was part of McFarling's standard agricultural practice, and he claims that when he went to the seed dealer that first year to get a few acres of the new genetically engineered seeds for a trial, he wasn't aware that he wasn't supposed to save them. While presented with a Technology Agreement at the seed dealers, he claims he was unaware of its contents. Rather, as all farmers at planting time, he was extremely busy, and never read the contract he was presented with: "They said I had to sign it to get the seed, so I just signed it" (Ibid). If this is indeed the case, he wasn't allowed to remain ignorant for long. As early as 1998, Monsanto approached McFarling about his infringing actions, and attempted to obtain his records and proposed to settle with him for approximately \$130,000. McFarling refused: "I told them right then, no, I don't got that kind of money. And I didn't want to settle with them, I didn't think I'd done nothing wrong. You know, planting and saving seed, what did I do?" (Ibid). When asked whether it was explained to him what he was considered to have done wrong, he replied in the affirmative but his position remained unchanged: "Well I still didn't think I was doing nothing wrong. I still don't think I done nothing wrong now" (Ibid). In 2000, Monsanto filed suit against McFarling in the Eastern District of Missouri for patent infringement and breach of contract.

The McFarling case lacks some of the complexity of the Schmeiser case in that McFarling did not deny saving the patented seed. However, it more than makes up for this, by raising a wealth of complex issues with respect to both the patents and the contracts. Further, there were some chronological complexities to the case. The complex court chronology included efforts to change the jurisdiction of proceedings, a stay of proceeding pending a related Supreme Court decision, and summary judgment on some

claims and claims held in abeyance while others were forwarded for appeal, some all the way to the Supreme Court.¹⁰⁷ McFarling applied for a U.S. Supreme Court hearing once on the issue of jurisdiction, and again on the issue of patent validity. Both applications were denied. Currently the case is back in the Circuit Court on the issue of damages, and it may well result in a third Supreme Court application. Given these complexities, the following analysis proceeds by issue, allowing for some chronological shifting back and forth. These issues span from the extremely abstract (such as whether the patent includes the trait and the germplasm, or only the trait) to the very concrete (such as with respect to damages), but consistently McFarling is questioning whether the new system of plant patents and technology agreements are unfairly biased against farmers. This questioning ultimately draws in the whole agro-biotechnology delivery structure, from the perspective of patent misuse and antitrust legislation. Notably, the arguments in *McFarling* once again attack the validity of restricting seed saving.

In response to Monsanto's suit, McFarling had a number of defences, applications (such as regarding venue) and counterclaims. Notably, he did not deny seed saving. Rather, he relied on counterclaims against Monsanto—such as patent misuse and antitrust—to provide a defence against the charge of infringement. Given the centrality of the patentability of plants to the issues in *McFarling*, the District Court granted a stay pending the Supreme Court *J.E.M. Ag Supply Inc.* ruling regarding the patentability of plants. As noted earlier, in December of 2001 the U.S. Supreme Court ultimately ruled for their patentability. Consistent with his perspective, and despite the severity of his legal troubles, McFarling nonetheless indicated to the court that “unless enjoined he

¹⁰⁷ See footnote 99 and 101, for example.

intended to plant soybeans saved from the 2000 harvest in 2001.”¹⁰⁸ Monsanto applied for—and was granted—a preliminary injunction preventing him from doing so. In practice, McFarling clearly resisted the expropriationist tendencies of the new biotech regime. Having refused to settle, however, McFarling moved the issue from one that might be characterized as ‘training the locals’ in the new seed-saving rules of the biotech regime, to one that directly challenged these rules’ legitimacy.

The main claims of the case were finally brought to a hearing on a motion for summary judgment on November 5, 2002. Monsanto applied for summary judgement on their claims of patent infringement and breach of contract.¹⁰⁹ While the judge provided no written opinion, the reasons of the court can be found in the hearing proceedings. Judge Perry granted summary judgement on the former claim, as the “undisputed evidence shows that Mr. McFarling infringed the patent by saving and replanting the seeds.”¹¹⁰ With respect to breach of contract, summary judgement was granted for liability only, with damages remaining to be tried.¹¹¹ Judge Perry also granted summary judgement in favour of Monsanto on all of McFarling’s defences and counterclaims. The most noteworthy of these counterclaims related to violation of the PVPA, monopolization, unreasonable restraint of trade and violation of Mississippi antitrust law and patent misuse.

¹⁰⁸ *Monsanto Co. v. McFarling*. 302 F. 3d 1291 (Fed. Cir. 2002) at 1294.

¹⁰⁹ The claims were made for their two patents, the ‘435 patent and the ‘605 patent. The case proceeded only on the ‘605 patent after Monsanto withdrew the former. This withdrawal is becoming the subject of arguments regarding the defendant’s right to re-litigate the suit, given that the ‘605 patent was the basis of earlier decisions.

¹¹⁰ *Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Lexis 22259) (Hearing on Motion for Summary Judgment, November 5, 2002:50).

¹¹¹ Questions were raised around the 1997 contract with respect to the location of the restrictive contractual provisions (McFarling’s signature appeared on the front pages and the back pages of the contract were missing). The district Court consequently granted summary judgment on claim 3 (breach of contract) with respect to the 1998 contract with the 1997 contract held while the decision on the 1998 contract could be appealed.

As the PVPA argument suffered a significant setback with the decision in *J.E.M. Ag Supply Inc.*, the bulk of the arguments proceeded on the basis of antitrust and, at the very least, patent misuse: whereby the “patentee has impermissibly broadened the scope of the patent grant with uncompetitive effect.”¹¹² McFarling argued that the Technology Agreement created an illegal restraint on trade, in violation of the Sherman Act and in misuse of the patents. Specifically, McFarling argued that the Technology Agreement’s prohibition on seed saving constituted an illegal tying arrangement. McFarling’s defence claimed that the seed and the trait are two separate products that operate in separate markets, and that in order for a farmer to buy one of the products he has to buy the other. Rather than purchase the trait anew each year through a royalty payment to Monsanto and have the option of saving their germplasm, farmers are forced to purchase new seeds every year in order to get the trait. In this way they are forced to buy a product they may not want or need (new seed) in order to get one that they do (a licence to use the patented trait). The result is a windfall to seed dealers, who now sell to a captive market, at the expense of farmers.

On the basis of its physical attributes, the tying argument would seem to stretch credibility as farmers cannot independently purchase the seed and the trait but can only buy them together. Consistent with this view, Monsanto argues that they are one product and cannot be separated. A quick conclusion to the issue is complicated, however, when the structure of the technology’s dissemination is considered. Monsanto owns only a portion of the seed companies that sell their genetically engineered seeds. In addition, they licence their traits to about 200 seed companies, who then put the trait in their seeds

¹¹² *Monsanto Co. v. McFarling*, 363 F. 3d. 1336 (Fed. Cir. 2004) at 1341.

and sell them, collecting a royalty on Monsanto's behalf. In fact, in their bid to ameliorate monopoly concerns over their attempt to purchase a cotton seed company Monsanto is said to have argued that the seed and the trait were separate.¹¹³ Consequently, the issue of tying is not one that can be strictly determined on the physical attributes of the technology. Rather, it is an issue that is socially constructed, and important decisions regarding antitrust and patent misuse rest heavily on the nature of this construction.

While arguments on either side become highly abstract, the issue is extremely concrete for a farmer. Firstly, is the issue of the additional cost of a prohibition on seed saving. If a farmer, like McFarling, were to save his own soybeans he would only need to pay the cost of cleaning his seeds for saving, which is about \$1/bag and the \$6.50/bag technology fee. However, under the current system, a farmer must pay the \$6.50/acre and approximately \$25/acre (verify) for new seeds. For a farmer like McFarling who farms 5,000 acres, the cost of seed is approximately \$37,000 with seed saving and \$157,500 without, a difference of \$120,500 a year in input expenses. Obviously, some soybean farmers would save only a portion of their seeds, or even none at all, but for many the difference is significant. An issue that affects all farmers, however, is the price of the seed. The elimination of the 'secondary market' of saved seed has eliminated a significant source of competition for seed dealers. McFarling argued that this is an unreasonable restraint on trade that has resulted in artificially high prices, as seed dealers are catering to a trapped market. For example, the defendant presented evidence that RR soybean in Argentina, where seed saving is allowed, sells for \$12-15 per bag, versus \$20-

¹¹³*Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Lexis 22259) (Hearing on Motion for Summary Judgment, November 5, 2002:20)

23 per bag in the United States, where it is not.¹¹⁴ The practical significance of the argument is further bolstered when considered in the context of the preceding chapter's interview data regarding skyrocketing of seed prices.

While there was little doubt amongst the farmers I spoke to that Monsanto had monopoly control, the Courts require a more objective calculation. The distribution structure of genetically engineered seeds through licensing traits to seed companies also complicates this assessment. How much of the market can Monsanto be said to actually control? Market share differs depending on whether what is counted is only what Monsanto directly owns, or if the calculation includes the entire market for Roundup Ready seeds, some sold directly by Monsanto but the majority sold through the licensing arrangements with other seed dealers. The difference for RR soybeans is between 20% and 65 to 70% depending on this perspective.¹¹⁵ A further question remains as to how much control Monsanto exerts with respect to its licensees, with respect to the percentage of genetically engineered seeds they offer for sale, the combination of traits they offer, and the herbicide choices they provide to customers, among other issues. A component of the issue of market control is the impact of different technology fees and pricing structures in different markets. Consequently, decisions that Monsanto makes can disadvantage certain regions or countries, as in this case farmers in the U.S. find themselves disadvantaged compared with their competitors in Argentina.

Despite the defence's seemingly strong arguments that there were sufficient issues of material fact to warrant a trial with respect to these counter-claims the judge granted

¹¹⁴ *Monsanto Co. v. McFarling*. 363 F. 3d. 1336 (Fed. Cir. 2004) (Corrected Brief of Appellant. March, 2003:22).

¹¹⁵ *Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Lexis 22259) (Hearing on Motion for Summary Judgment, November 5, 2002:29).

summary judgement. Overall, the District Court Judge ruled that Monsanto was not impermissibly broadening the scope of its patent, as alleged by the defence. The judge did not find sufficient evidence that Monsanto exercised monopoly power or illegally restrained trade. Despite the fact that there appeared to be strong evidence to suggest that whether the genetic trait and the germplasm were in fact separate products was a question of material fact, and thus not a suitable subject for summary judgment, the judge ruled:

These products are not being illegally tied by any actions of Monsanto. They are inherently tied together as one single product, because the genetic trait is contained in the seed, and for there to be a seed capable of being planted, it has to have been propagated after the insertion of the gene, and so there is simply not two separate products....¹¹⁶

Underwriting many of the conclusions about antitrust and patent misuse in the Court's decision was the argument that McFarling could, if he wanted, purchase other seeds, such as non-RR seeds, and therefore was not constrained to repurchase the next year's seeds. This conclusion needs to be considered in light of the competitive disadvantage non-adopters appear to face with respect to the issues of time, labour, and seed availability discussed in the previous chapter. Perhaps even more ominous with respect to antitrust and patent misuse concerns, was the Court's perspective on the right of McFarling to bring these questions to hearing. Judge Perry found that McFarling lacked standing on the antitrust issue as he is "an indirect purchaser" and he "has not suffered any antitrust injury as required by the statutes."¹¹⁷ Such a ruling leaves farmers powerless to initiate an investigation, and perhaps resolution, of the monopolistic power they face in their dealings with Monsanto. There is virtually no chance of such an antitrust claim ever coming to fruition in this scenario as those whom the Judge contends

¹¹⁶ Ibid. at 49.

¹¹⁷ Ibid. at 46.

would have standing—the seed dealers—are the very ones who are benefiting from the system. Similar to the cause of Saskatchewan’s organic farmers it begs the question how farmers can affect change in a system that appears so stacked against them.

McFarling appealed the motion to dismiss to the Court of Appeals for the Federal Circuit, on the basis of his earlier arguments and further arguing that the prohibition on seed saving violates the doctrine of patent exhaustion on first sale. In this doctrine the sale of a patented product authorizes its purchaser to use and sell it, and consequently the monopoly rights of the patent holder are relinquished. Therefore, according to McFarling, the seed saving prohibition was unenforceable, as the patent had been exhausted as soon as the seed was sold. On the other side, Monsanto argued that it was within the scope of their rights to prevent others from making new, patented seeds from the purchase. The Court rejected McFarling’s argument for patent exhaustion, based on the fact that “the ‘first sale’ doctrine of exhaustion of the patent right is not implicated, as the new seeds grown from the original batch had never been sold.”¹¹⁸ Rather, they had been produced on farm from the first generation of patented seeds. While acknowledging the complexities and the high level of abstraction involved, this line of argument raises some serious questions about its necessary conclusion, as it would seem to open the door to supporting a decision that falls in either direction. For example, if the trait in the second-generation product had “never been sold” (and thus had not exhausted the patent placed on the first generation), following the same logic, can this generation be said to have been patented at all (again, as the patent was placed on the first generation)?

¹¹⁸ *Monsanto Co. v. McFarling*, 302 F. 3d 1291 (Fed. Cir. 2002) at 1299.

In another Appeals Court Decision on April 9, 2004, the court again affirmed the summary judgment findings of the District Court on the counterclaims, but not damages. The patent misuse argument proceeded on the same basis as in the District Court, that “[by] prohibiting seed-saving, Monsanto has extended its patent on the gene technology to include an unpatented product—the germplasm—or God-made soybean seed which is not within the terms of the patent.”¹¹⁹ The Court of Appeals acknowledged that the TA was not restricting the use of a product, but the use of the goods “made by, yet not incorporating the licensed good,” something which case law has not addressed under patent misuse doctrine.¹²⁰ The court nonetheless concluded that given the licensed good and the good made by it are nearly identical copies, “we must presume that Monsanto’s ‘435 patent reads on the first-generation seeds, [therefore] it also reads on the second-generation seeds.”¹²¹ Therefore, the TA was not found to inappropriately extend Monsanto’s patent, which reads on all generations of the soybeans produced. Consequently, while agreeing that the issue of whether the trait and the seed are separate or distinct markets is a question of fact and thus an issue for trial (as opposed to summary judgment), the Court held that the issue was not relevant to its holding, and consequently “declined to review it”:

McFarling is not alleging that he is unable to, or even that he desires to, purchase a “natural soybean seed and the Roundup Ready genetic trait as distinct items; he alleges only that Monsanto refused to grant him a license to use the second-generation genetically modified seeds in his possession after harvest in his preferred manner.”¹²²

¹¹⁹ McFarling, H. as cited in *Monsanto Co. v. McFarling*, 363 F. 3d 1336 (Fed. Cir. 2004) at 1341.

¹²⁰ *Ibid.* at 1343.

¹²¹ *Ibid.*

¹²² *Ibid.* at 1344.

Given the ruling on the licensing agreement, the court ruled that the antitrust counterclaim also failed, as if there was no patent misuse then there also was no violation of the Sherman Act (12). Further, the Appeal Court once again dismissed McFarling's arguments concerning the PVPA in light of the Supreme Court decision in *J.E.M. Ag Supply Inc.*, which found the two schemes could co-exist. In sum, McFarling failed to gain ground on any of his arguments, save the question of damages.

Obviously, given the newness of the technology and the many abstractions involved, there seems to be significant leeway in the application of case law to the technology. It would appear that where this leeway is applied, it is firmly in support of the rights of technology developers and contrary to the rights of farmers. Further, equity appears to be compromised by a lack of consistency in the social construction that supports these decisions, such as the slippage between whether the trait and the germplasm are singular or distinct products that appears to depend to a certain extent on the reason for the question. Cutting aside abstractions momentarily, the social issues are quite clear. In the conflict of rights between developers and farmers presented by self-reproducing technologies, a social decision has to be made: does the social need for technological development warrant patents on sexually reproduced plants? If so, does it warrant farmers paying a licence for that technology from one plant generation to the next? Assuming for a moment that this is the price to pay for a technological development that a society decides is desirable, the restriction on seed saving in itself is still highly problematic. According to Carstensen (2006) saved seed provides a cap on the "pricing freedom" of seed dealers, and no justification for such post-sale restrictions on

saved seed can be found in patent law (Carstensen, 2006:1072). Further, accepting such a restriction has repercussions:

In the case of seeds, the no-replant policy serves the interest of the patent licensees [the seed dealers] by eliminating saved seed competition, and not the narrowly defined interest of the patent holder. Moreover, the seed companies would have a substantial incentive to standardize on the Monsanto genetic system and not encourage the development of any other systems available. (Ibid)

Carstensen suggests that by granting rights to prohibit seed saving to Monsanto, the company could engage in other restrictions, such as dictating marketing and consequently taxing the sale value of the crop. Essentially, a restriction on seed saving has no legitimate purpose for the monopoly granted to the technology developer, disproportionately benefits seed dealers at the expense of farmers, and, in the process, provides avenues for increased market power by the technology developer. Given Monsanto's market share in the majority of soybean and cotton crops, the control that *McFarling* allots could have significant repercussions for farmers and farming.

No doubt in consideration of the importance of the issues and the novelty of the questions for case law, those involved in the litigation considered the case to have a good chance of being heard by the Supreme Court. The petition for hearing by the Supreme Court was forwarded on the basis of two questions: 1) "may a patent holder lawfully prohibit farmers from saving and replanting seed as a condition to the purchase of patented technology"; and 2) "does obtaining patents on products which are the subject of licensing agreements afford an absolute defence to any claim that the licensing agreements violate the Sherman Act."¹²³ The Supreme Court invited the Acting Solicitor

¹²³ *Monsanto Co. v. McFarling*. 363 F. 3d. 1336 (Fed. Cir. 2004) (Petition for a Writ of Certiorari, Waide and Associates, 2004 at i).

General to file a brief expressing the views of the United States on the matter, and the Acting Solicitor General found no reason to disagree with the findings of the Appeal Court, which it found to have appropriately rejected the patent misuse and tying claims on the basis of “settled law.” On this basis, the Acting Solicitor General submitted that the petition for a writ of certiorari should be denied. On June 27, 2005, the petition was denied.

Contracts of Necessity or Crushing Opposition?

Given that McFarling signed the Technology Agreement and then violated its terms, it would seem that at least the contract portion of the case should be fairly straightforward. It has been anything but. In addition to the seed saving restrictions already discussed, the contract has two other highly controversial aspects: a ‘forum selection clause, regarding which courts have jurisdiction over disputes, and a ‘120-multiplier’ clause, regarding damages.

The forum selection clause specifies:

The Parties consent to the sole and exclusive jurisdiction and venue of the U.S. District Court for the Eastern District of Missouri, Eastern Division, and the Circuit Court of the County of St. Louis, Missouri, (any lawsuit must be filed in St. Louis, MO) for all claims and disputes arising out of or connected in any way with this agreement and the use of the seed or the Monsanto technologies, except for cotton related claims made by grower. (Monsanto Company, 2006)

With this forum selection clause, any farmer that has a dispute with Monsanto, regardless of who initiated it or where the business in dispute was conducted, must travel to Monsanto’s hometown in Missouri in order for it to be litigated. Such a provision greatly increases the negative impact—not the least of which is the expense—of any such

litigation on the farmer. The forum selection clause is no doubt in part responsible for the fact that 46 of 90 cases have been filed in St. Louis, Missouri. Such a clause is, of course, not binding on those who infringe without signing a Technology Agreement. McFarling's defence—that he did not read the contract—is of the utmost practical significance for a busy farmer handed a document while picking up his seed, but it is of little legal significance. The question of the fairness of the contract as a whole increases its significance.

Already in 2000, McFarling had attempted to break the choice of venue clause based on lack of personal jurisdiction of the court. His request was denied.¹²⁴ On appeal, in August of 2002, the forum selection clause was again considered valid and acceptable by 2 of the 3 Circuit Judges, with Circuit Judge Clevenger filing a dissenting opinion. Judge Clevenger argued that the Technology Agreement was a 'contract of adhesion', a contract marked by parties that have unequal bargaining power that involves take-it-or-leave-it provisions, that are usually lopsided in favour of the drafter and where the purchaser has no other source for the necessary goods.¹²⁵ Clevenger took a stronger position on the contract of adhesion perhaps because he granted a greater importance to the use of glyphosate tolerant seeds than do others. Clevenger cited the rapid adoption of RR seeds in just a few short years, and noted that "farmers find glyphosate resistant soybeans far more competitive than ordinary seed,"¹²⁶ and also that Monsanto is the only source for these seeds. Consequently, he concluded that "taken together, these facts indicate that farmers sign the Technology Agreement if they wish to remain competitive

¹²⁴ *Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Lexis 22259).

¹²⁵ *Monsanto Co. v. McFarling*. 302 F. 3d 1291 (Fed. Cir. 2002) at 1300.

¹²⁶ *Ibid.* at 1301.

in the soybean market.”¹²⁷ In a powerful argument dissenting from the Appeal Courts decision on the contract provisions, Clevenger not only countered the arguments of the Court, but articulated where in his view they deviated from cited case law, which stipulated that adhesive terms such as forum selection be ‘reasonable.’¹²⁸ He further argued that the Court had taken an unprecedented step in supporting the provisions of an adhesion contract, and that, if any Court should go so far, it would need to be the Supreme Court. He rather bitinglly stated his opinion that:

My colleagues have the honor of making this court the first to enforce a forum selection clause in a contract of adhesion against a defendant in derogation of his constitutional rights.¹²⁹

While acknowledging the inconvenience of litigation against infringers for Monsanto, he argued that it “has been accepted as another cost attendant to the enjoyment of the patent right.”¹³⁰ Nonetheless, this opinion was in the minority, and the validity of the forum selection clause was upheld.

¹²⁷ Ibid.

¹²⁸ A full treatment cannot be given to the issue here, however, the case law basis of the enforceability of forum selection rested on a decision involving a cruise ship (Carnival Cruise Lines), which travelled internationally, and thus was vulnerable to suits launched in multiple jurisdictions. Given the case’s particularities, Clevenger provided a strong argument that Monsanto “can lay claim to few or none of the policy rationales” behind it. In the Carnival case, forum selection was imposed to create order and certainty, with the savings in litigation costs passed on to passengers in lower ticket prices. Cruise Lines rarely sue passengers, and if customers don’t like the contract provisions they can choose another cruise line. In Monsanto’s Technology Agreement, in contrast, the drafter of the contract is the plaintiff not the defendant, and the plaintiff can choose which cases to pursue. There is one law in the country and patent law is not affected by forum within the US. All business is conducted in the locale where the farmer resides, and understandably expects any legal proceeding to occur. As biotechnology seed prices are driven by demand not production costs, there is likely no economic benefit for the farmer in reducing litigation costs, as the savings would be unlikely to be passed on. Lastly, farmers cannot obtain glyphosate tolerant seeds—consistently seen as more competitive than non-glyphosate tolerant—from any other source.

¹²⁹ Ibid. note 4 at 1306.

¹³⁰ Ibid. at 1304.

The liquidated damages provision became another troublesome clause in the Technology Agreement. As has already been alluded, the issue of damages took on a life of its own in *McFarling*. In the 1998 TA, the text of the clause read that:

The grower agrees that damages will include a claim of liquidation damages which would be based on 120 times the applicable technology fee.¹³¹

Given that Monsanto has no way of knowing whether an infringing farmer will only save a limited amount of seed for his own use, or will exponentially multiply the seed for an unknown number of uses, including distributing to others, the company claims the 120 multiplier to be an approximation of those damages that exceed the lost royalty for the saved seed. Essentially, they claim for damages for a loss of control over their invention. In the hearing on the motion for summary judgment, Judge Perry supported this logic but ruled against the 120-multiplier, due to the legal technicalities of liquidated damages, which are intended to dictate damages that are difficult to measure.¹³² The formula proposed by Monsanto, however, requires an accounting of actual damages and then multiplies them by 120. This then constitutes punitive damages, which are unenforceable under Missouri law.

Leaving aside these legalities for a moment, the importance of the damages clause in this form of contract requires emphasis. The approach to damages that Monsanto seeks is one that, if legally supported, likely would terminate the farming career of most who infringe, as such a judgement makes bankruptcy seemingly inevitable for anyone except the very wealthy. At the time of *McFarling*'s seed saving activity, Monsanto's technology fee was \$6.50 per acre. As *McFarling* farmed 5,000 acres of land, if he saved all the seed

¹³¹ *Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Evidentiary Hearing, April 6, 2000:21)

¹³² *Ibid.* (Hearing on Motion for Summary Judgement, November 5, 2002).

and did not pay the \$6.50 royalty to Monsanto, the company would lose approximately \$30,000 in royalties. A finding of damages calculated using the 120-multiplier, however, would result in damages of approximately 3.8 million dollars.¹³³ This would seemingly result in inevitable economic ruin for a farmer who testified that his net worth was approximately \$75,000.¹³⁴

Based on her concerns over the 120-multiplier, Judge Perry recalculated liquidated damages according to her reading of an appropriate calculation, and she granted judgement against McFarling in the amount of \$780,000 for breach of the 1998 contract.¹³⁵ On appeal, the Circuit Court ruled that the liquidated damages clause was indeed unenforceable under Missouri law, again for the primarily technical reason that the multiplier does not approximate the amount of harm and, as a result, acts punitively: the clause was an “unenforceable and invalid penalty clause.”¹³⁶ It is significant to note that an important legal basis for the assessment of whether the 120-multiplier was punitive or liquidated damages rested on whether it violated the ‘anti-one-size-fits-all rule.’ If various levels of harm (such as seed saving of stacked cotton vs. RR soybeans, or seed saving vs. multiplying and selling saved seed) are treated with similar damages regardless of breach, then the sum is a penalty rather than a reasonable approximation of damages. The significance of this is that it would appear to leave open the rewriting of the clause in a more varied—and hence enforceable—manner in the future. The Court stated that when a clause is found unenforceable, only actual damages are available; hence, the Court vacated the damages award, and remanded the case back to the District

¹³³ *Ibid.* at 25.

¹³⁴ *Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Lexis 22259) (Evidentiary Hearing, April 6, 2000: 12).

¹³⁵ *Monsanto Co. v. McFarling*. (E.D. Mo., Nov. 15, 2002) (Lexis 27289).

¹³⁶ *Monsanto Co. v. McFarling*. 363 F. 3d. 1336 (Fed. Cir. 2004) at page 29 (orig. non-published doc.).

Court for a judgment based on actual damages.¹³⁷ The issue of damages has undergone a District Court jury trial and as of June of 2005 reached a judgment in the amount of \$376,318.00 plus costs of \$20,303.25—a judgment which is again under appeal.¹³⁸

The issues of the 120-multiplier and the forum selection clause are significant with respect to the imbalance of power between biotechnology companies and farmers. Given that Monsanto is reported to be donating some portion of its litigation proceeds, its lawsuits are more likely about prevention than cost recovery: the purpose of the 120-multiplier, efforts to triple damages for wilfulness, and the forum selection clause are less about economic benefit than about economic deterrent for farmers.¹³⁹ Within certain bounds, this is a reasonable means for a business to protect its interests. The balance of benefit, however, would appear to have far exceeded reasonable bounds. While the 120-multiplier has been struck down, and ultimately removed from the technology agreement, the forum selection clause remains. The ramifications of such imbalanced contractual provisions are increasing as the technology becomes a necessary good. A farmer planting conventional seeds is at some competitive disadvantage against his neighbours, therefore there is some pressure to accept whatever terms on which Monsanto offers its product. Even if these terms are disproportionately biased against a farmer, that farmer has little choice but to accept them or change competitive strategies—something that has more lucrative potential in places where there is a growing organic industry, for example. For most Mississippi producers, the advent of GM crops means that those who do not use the

¹³⁷ Ibid.

¹³⁸ *Monsanto Co. v. McFarling*, 363 F. 3d. 1336 (Fed. Cir. 2004) (Corrected Brief of Appellant, January 4, 2006, at 16).

¹³⁹ While it is commonly asserted in the farm community that the Monsanto company donates a significant portion of its legal awards to farm organizations such as the Mississippi Farm Bureau, the company itself only acknowledges that it returns “all pre-trial settlement dollars to the agricultural community” (Scott Baucum, 2007, Monsanto Company Trait Stewardship Manager).

technology now have less time, are able to farm less acres, and have less choice and poorer quality of seed stock in comparison to their GM competitors. Whatever the strength of the legal arguments around adhesion, there is no doubt that such contracts significantly disadvantage farmers.

Monsanto v. Scruggs

While still ongoing, the case of *Monsanto Co. v. Scruggs* (hereafter “*Scruggs*”) has the potential to take many of the issues raised in *McFarling* further in the legal system. Mitchell Scruggs and his brother Eddie Scruggs farm in North East Mississippi, with the bulk of their operation in Lee and Pontotoc Counties. Their farm operation is massive, and they are reportedly the largest farmers in three counties, with 20,000 acres under production: 17,000 acres of which are row crop production of soybeans and cotton. The brothers also operated a farm supply business, Scruggs Farm Supply, and cotton ginning facility. In 2000, Monsanto launched suit against Mitchell and Eddie Scruggs, and their farm supply company (hereafter, the “*Scruggs*”).¹⁴⁰ Monsanto’s main claim against the Scruggs was for patent infringement related to the alleged use of “brown bagged” (unlicensed) patented cotton and soybean seed containing Monsanto’s genetic material in their fields in May and June of 2000.

The case has a number of distinctive features. While the Scruggs purchased seeds, they did not sign a technology agreement. Therefore, unlike *McFarling*, the Scruggs could not be held to the forum selection clause or other contract provisions, and the content of the contract was never a subject of litigation. Consequently the lawsuit was

¹⁴⁰ The named defendants in the original complaint included Mitchell and Eddie Scruggs and Scruggs Farm Supply. By 2002, the defendants in the third amended complaint included Mitchell and Eddie Scruggs, Scruggs Farm & Supplies, LLC, Scruggs Farm Joint Venture, MES Farms, Inc., HES Farms, Inc., and MHS Farms, Inc. In all cases the defendants will be referred to as the “*Scruggs*.”

filed in the United States District Court of the Northern District of Mississippi, Western Division. Secondly, the fact that the Scruggs had a farm supply outlet cast their infringing actions in a particularly damaging light: if they would violate the seed saving prohibition, would they also sell the saved seed to their customers? At the very least, the Scruggs are known to have sold Monsanto's patented technology at their business without requiring farmers to sign the mandatory technology agreement. Consequently, there are allegations and counter allegations, some of which will be discussed, regarding the activities that occurred over the years leading up to the lawsuit. Notably, while Monsanto's claim refers specifically to the 2000 crop, the defendants are accused of having saved RR and Bollgard seed in 1997, 1998, 1999 and 2000.¹⁴¹ Lastly, the Scruggs are unique in their access to resources. Mitchell Scruggs himself has an estimated net worth of five to 8 million dollars.¹⁴² While far from equivalent to the resources Monsanto has at its disposal, he is in a significantly better position than most farmers to meet them in a court of law.

As in *McFarling*, the factual evidence of infringement is fairly straightforward. The Scruggs admit to purchasing Monsanto's genetically engineered soybeans in 1996 and cotton in 1998, and saving these seeds for planting in subsequent years and through to 2000.¹⁴³ In testimony Mitchell Scruggs admitted that much of his crop was genetically engineered, and that he had purchased initial supplies of the genetically engineered seeds. There were even allegations that the Scruggs sold the reconditioned patented seed at their farm supply outlet, although this is vehemently denied by the defendants.

Notwithstanding some of the unique elements to the Scruggs case, many of the arguments

¹⁴¹ *Monsanto Co. v. Scruggs*. 249 F. Supp. 2d. 746. (N.D. Miss. 2001) (Third Amended Complaint, 2002).

¹⁴² *Monsanto Co. v. Scruggs*. 249 F. Supp. 2d. 746 (N.D. Miss. 2001) at 760.

¹⁴³ *Monsanto Co. v. Scruggs*. 459 F. 3d. 1328 (Fed. Cir. 2006) (Brief of Appellants, May 2, 2005: 4).

they put forward in their defence are familiar to those in *McFarling*. Once again, we see a defence that is heavily steeped in the propriety of Monsanto's prohibitions on seed saving.

In January of 2001 the parties attended a two-day hearing to present witnesses and exhibits in response to a Motion for Preliminary Injunction brought by the Plaintiffs. Among others, the Scruggs advanced three main arguments as a response to the patent infringement claims: patent exhaustion; patent misuse and/or antitrust violations; and violation of the PVPA.

The Scruggs patent exhaustion argument actually predates that in *McFarling*, and is very similar in logic. In *Scruggs*, however, District Court Judge Pepper did not enter into abstractions concerning whether the second generation of seed was sold, but stated that patent exhaustion had no place where the sale was conditional (as with the TA), something which is considered a valid approach as long as the conditions are reasonable and not unjustifiably anticompetitive. Once acknowledged, Judge Pepper provided no further treatment of the issue of anticompetitiveness in his decision, the basis of which appears to be firmly situated on the TA's reasonableness. According to Pepper, without the TA, Monsanto's patent would be rendered useless, sales would be reduced, and the broader benefits of the technological development might well be lost: "it is quite conceivable that it would be commercially infeasible for Monsanto to offer the benefits of its patented biotechnology at all."¹⁴⁴ Consistent with this decision, with respect to the

¹⁴⁴ *Monsanto Co. v. Scruggs*, 249 F. Supp. 2d 746 (N.D. Miss. 2001). Note 4 at 753-4.

claim of antitrust/patent misuse, Judge Pepper concluded that the Defendants had not provided sufficient argument to warrant his consideration.¹⁴⁵

Of the three claims, that which claimed the alleged violation of the PVPA gained the greatest treatment by the court, and shed further insight into the patent misuse issue as well. While acknowledging that the *Pioneer Hi-Bred International Inc. v. J.E.M. Ag Supply, Inc.* case was pending review by the Supreme Court of the United States, Judge Pepper nonetheless had to proceed with his decision prior to that outcome. Drawing on the decision on the case at the Circuit Court level, Pepper concluded that the PVPA was no impediment to the enforceability of Monsanto's patent. This position was bolstered by his contention that as Monsanto did not apply for a PVPA certificate, it could not be held to the farmers' exemption within it. This logic is somewhat counter-intuitive, as it appears to posit avoiding permit application as a means to avoid negative attributes of permits. The logic is only upheld in the context of Judge Pepper's belief that Monsanto has a right to its utility patents. While the Judge acknowledged that there was a deeply-rooted tradition of farmers saving seed, he "decline[d] to presume that 'tradition' alone gives the defendants and other modern farmers the unmitigated right to appropriate the plaintiffs technologies to their own use."¹⁴⁶ This declaration of the supremacy of the rights of patent holders over the traditional rights of farmers is unambiguous, and sheds further insight into the Judge's rejection of patent misuse arguments, as to allow farmers to refuse Monsanto's single use restriction would be to allow consumers to "unilaterally

¹⁴⁵ Ibid at 755.

¹⁴⁶ *Monsanto Co. v. Scruggs*, 249 F. Supp. 2d. 746 (N.D. Miss. 2001) at 757.

determine the circumstances under which a patent holder's discovery is to be offered for use of sale."¹⁴⁷

On the basis of these decisions, Judge Pepper granted the Plaintiff's motion for a preliminary injunction. Among other things, the preliminary injunction prohibited the Scruggs from "all current and future purchase, acquisition, use, sale, offers to sell, transfer (except hereafter provided in paragraph 4, brokering, cleaning, delinting and/or reconditioning" of Monsanto's genetically engineered soybean and cotton seeds.¹⁴⁸ Given that the Scruggs had a farm supply and cotton ginning business, the repercussions were likely to be significant for the operation of their business. While acknowledging the negative impact of such a decision, the Judge ruled that the harm to the Scruggs was "largely self-inflicted," and that Monsanto was not obligated to afford the defendants the opportunity to sell its products.¹⁴⁹ Given the evidence regarding the Scruggs' potential sale of reconditioned seed and definite failure to obtain signed technology agreements, the request and granting of a preliminary injunction is not without merit. It is important to note the impact of such an injunction, however, given conflicting opinions on the essentiality of Monsanto's genetically engineered seeds to modern agricultural production in Mississippi, as we saw in the dissenting opinion over contracts of adhesion in *McFarling*: Scruggs Farm Supply was ultimately forced to close its doors. In August 2001, the preliminary injunction was partially lifted, under certain conditions and with no objection from Monsanto, in order to allow the Scruggs to operate their ginning facility to service the needs of growers in Northeast Mississippi. In November 2004, after a number

¹⁴⁷ Ibid.

¹⁴⁸ Ibid. at 761.

¹⁴⁹ Ibid. at 760.

of Summary Judgment decisions against the Scruggs, their prohibition against contact with Monsanto's technology was made permanent.

On June 14, 2004, the United States District Court for the Northern District of Mississippi, Western Division, ruled on a Motion for Summary Judgment on counts 2,3,4 and 5 of Monsanto's claims. Evidence was presented that all bags of seed were marked with patent notifications, and that despite this Mitchell Scruggs purchased and cultivated Monsanto's patented seed in contravention of this notification: from 1996 to 2000 Scruggs had cultivated his original purchase of approximately ten acres worth of Monsanto's soybeans to approximately 8,000 acres worth; and from 1998 to 2000 he had cultivated a few acres of cotton into over 2000 acres worth. In response to the "staggering" evidence of infringement, the Scruggs attacked the validity of Monsanto's patents, the scientific rigour of their tests for genetic presence, and pursued their three earlier arguments related to patent exhaustion, violation of the PVPA and patent misuse and invalidity. Related to these counts, Judge Pepper's opinion remained unchanged: he granted in favour of the Plaintiff's Motion for Summary Judgment, although he did allow that the patent exhaustion doctrine could be affected by antitrust violation, which remained to be considered in the remaining claims.

The decision with respect to the remaining claims was reached just two weeks later. In addition to arguing against the merits of the antitrust claims, Monsanto alleged that the defendants lacked standing to bring them, as they had also argued in *McFarling*. This issue was not resolved since the court found that the antitrust claims failed on their merits, and consequently it was not necessary to address the issue of standing. With

respect to patent misuse and antitrust the Scruggs' main claim was the allegation that Monsanto engaged in illegal tying with respect to four issues:

They claim Monsanto tied the purchase of seed to the purchase of Roundup through its grower license agreements and grower incentive agreements, as well as its seed partner agreements. As a further matter, the Scruggses argue that Monsanto illegally tied the Roundup and Bollgard traits in cotton seed.¹⁵⁰

Judge Pepper dismissed allegations of tying between traits and germplasm prominent in McFarling as a matter of law based on the McFarling Federal Circuit decision. The Scruggs proceeded to attack what they alleged was Monsanto's attempt at implementing a seed cartel through its web of seed partner licenses and creating a market disadvantage for farmers through tying arrangements, incentives, contracts and other means. Many of the arguments resonate with the complaints heard from farmers about the company. The Scruggs' defence was strongest on the claim of tying between Monsanto's Roundup Ready seed and its herbicide, given the specific stipulation to that effect in the 1996 to 1998 technology agreements. This stipulation was changed by 1999.¹⁵¹ In 1996 the relevant portion of the agreement read:

The Grower further agrees that if the Grower uses any glyphosate... containing herbicide in connection with the soybean crop produced, from this seed, the herbicide will be a ROUNDUP® BRANDED HERBICIDE (or other Monsanto authorized glyphosate-containing herbicide) labelled for use on ROUNDUP READY (R) soybeans. No other glyphosate containing herbicide may be used with the patent-protected seed.

In 1997 and 1998, the agreements read:

¹⁵⁰ *Monsanto Co. v. Scruggs*. 342. F. Supp. 2d. 568. (N.D. Miss. 2004) at 576.

¹⁵¹ By 1999, Monsanto had changed the requirement to include Roundup herbicide "or other authorized non-selective herbicide which could not be used in the absence of the Roundup Ready gene" (1999 Technology Use Guide, cited in *Monsanto Co. v. Scruggs*. 342. F. Supp. 2d. 568. (N.D. Miss. 2004) (Lexis 26691) at note 3.

If a herbicide containing the same active ingredient as Roundup Ultra herbicide (or one with a similar mode of action) is used over the top of Roundup Ready crops, you agree to use only Roundup branded, herbicide.¹⁵²

It appears obvious that any farmer reading this would conclude that in order to exploit the benefits of the herbicide tolerant technology they would be required to use Roundup brand herbicide, as opposed to a generic herbicide. Indeed, there was little doubt amongst the farmers interviewed that this was what was required of them, whether they chose to comply or not. Monsanto claimed that such restrictions were necessary to assure compliance with federal regulations that require chemicals to be used only according to their labelling, and Monsanto's Roundup was the only chemical labelled for "over-the-top" use. Further, Monsanto somewhat defied plausibility by arguing that farmers are not compelled to use Monsanto's herbicide Roundup as they had the freedom to choose not to use any herbicide at all over-the-top of the Roundup Ready crops (which would defeat the purpose of the higher priced seed) or they could use a non-glyphosate herbicide over-the-top of the Roundup Ready crops (which would kill both the crop and the weeds).¹⁵³ It would seem that the standard of 'reasonableness' in the practical manner that we saw called upon to support the permissible restriction that precluded exhaustion of first sale was not applicable to the other side of the argument and its requirement that this restriction not be anticompetitive: Judge Pepper concluded that the defendants failed to prove that "Monsanto forced farmers who wanted to purchase Roundup Ready seeds to purchase Roundup as well."¹⁵⁴ Farmers might conclude differently.

¹⁵² *Monsanto Co. v. Scruggs*, 342 F. Supp. 2d 568. (N.D. Miss. 2004) at 576.

¹⁵³ *Ibid.*

¹⁵⁴ *Ibid.* at 577.

The Scruggs' remaining claims did not fair better. The judge pursued a similar logic around choice to contend that despite licences prohibiting the use of non-Roundup glyphosate herbicides, seed dealers were likewise not forced to purchase Roundup herbicide: "although the provision at issue foreclosed seed partners from using glyphosate-based herbicides other than Roundup."¹⁵⁵ Further, he found no impropriety with Monsanto's incentive programs motivating seed dealers to incorporate its traits into a certain percentage of seed sold. He found against claims that farmers were forced to purchase the significantly higher priced RR and Bt trait stacked cotton due to an engineered shortage of straight RR cotton. Similarly, the Judge dismissed the Scruggs' contention that Monsanto's grower incentive program—discussed in the previous chapter—unlawfully required the use of Roundup, but instead held that it offered a voluntary option. All the issues are not reported here, and a full legal assessment is beyond the intentions of this analysis, but the pattern saw a number of claims consistent with concerns raised by farmers in the previous chapter rejected due to a lack of evidence or other failings. For example, while the 'voluntary' aspect of the incentive program is factually supported, the experience of farmers suggests that many feel economically trapped into accepting its terms. Given the rapidly increasing cost of the genetically engineered seeds, the pressure to use them to remain competitive, and the lack of alternative suppliers of similar technology, to operate without the incentive program can be prohibitively expensive for farmers. Similarly, farmers' comments regarding the difficulty of obtaining single trait or conventional seeds suggest some support for concerns with the seed dealer contracts. Despite seemingly significant practical questions

¹⁵⁵ Ibid at 578.

over whether Monsanto had indeed “implemented a seed cartel”¹⁵⁶ and was attempting to secure rights “beyond its lawful patent monopoly,”¹⁵⁷ the Court found insufficient doubt around these questions to proceed to trial, and granted Summary Judgment on all remaining counts.

The Scruggs appealed the District Court’s Summary Judgment, arguing that there were sufficient genuine issues of material fact on their trial claims to preclude summary judgment. Specifically, they further pursued their allegations that in the early 1990s “Monsanto developed a business plan to cartelize the soybean, cotton and other seed markets.”¹⁵⁸ They argued that Monsanto “misused its patents to impermissibly exclude competitors in trait and herbicide markets, create and police a seed cartel, raise prices, tie/bundle/leverage separate products, fix pricing components, mandate economic waste, harm competition, restrain trade and extract monopoly profits.”¹⁵⁹ Significantly, in its appeal brief the defence argued that it would be able to present new antitrust evidence in extensive testimony from experts not presented in *McFarling*.

Given the extreme importance of agriculture to the state of Mississippi, the Attorney General of Mississippi, Jim Hood, submitted a brief in support of dismissing the summary judgment and proceeding to trial. Attorney General Hood argued that the Scruggs presented sufficient evidence of Monsanto’s market power and “well documented allegations of disturbing exercises of such power.”¹⁶⁰ Hood found significant resonance in a number of the Scruggs tying allegations: for example, while post-1999

¹⁵⁶ Ibid. at 580.

¹⁵⁷ Ibid. at 584.

¹⁵⁸ *Monsanto Co. v. Scruggs*. 459 F. 3d. 1328 (Fed. Cir. 2006) (Brief of Appellants, May 2, 2005: 4).

¹⁵⁹ Ibid. at 8.

¹⁶⁰ *Monsanto Co. v. Scruggs*. 459 F. 3d. 1328 (Fed. Cir. 2006) (Brief of Amicus Curiae, Jim Hood, Attorney General State of Mississippi, May 20, 2005:20).

TAs no longer stipulate a required use of Roundup herbicide, there is evidence that Monsanto still enforces the earlier version of the agreement; Hood finds a rejection of tying in this context to be an extreme interpretation whereby “forcing is absent as long as purchasers have any other option, even one that makes no economic sense”¹⁶¹; further, Hood found no need for the trait and the germplasm to be tied, as even Monsanto conducts these markets differently in countries such as Argentina. While a number of the Attorney General’s concerns echoed the Scruggs with respect to farmers’ “choice” in the context of the “indispensable nature” of the Roundup Ready trait, his main concern was the application of Summary Judgment when the Scruggs had provided more than enough evidence to bring such issues to trial:

Monsanto’s inefficient and costly no-replant policy imposed on Mississippi and other American farmers has continually evaded judicial scrutiny on its merits- or potential lack thereof- as to whether it violates federal antitrust laws. The time is now ripe for such an inquiry.¹⁶²

According to Hood, creating such extreme requirements to withstand Summary Judgment could significantly impact the state’s economy.

Despite the application, the majority of the appeal court nonetheless affirmed the judgment of the District Court on all counts save the technical propriety of its 2004 permanent injunction order. The judgment was not unanimous, however, with Circuit Judge Dyk dissenting on the issue of the antitrust aspect of tying the use of the trait with the sale of Roundup herbicide on the basis of his reading of Supreme Court rulings. According to the dissenting judge, the effect of the tying arrangement—whether it is preventing illegal conduct (such as an unauthorized use of chemical) or actually

¹⁶¹ Ibid. at 10.

¹⁶² Ibid. at 16.

providing ancillary benefits—is not relevant to its antitrust status. He argued that there is no “implied antitrust immunity” brought on by federal law in this case.¹⁶³ He noted that it is significant that earlier agreements do not require “the use of a government approved herbicide” but a “Roundup branded herbicide,”¹⁶⁴ the result of which would be that “potential competitors are potentially discouraged from seeking regulatory approval or attempting to have the regulation modified or eliminated.”¹⁶⁵

The case is still ongoing. On September 13, 2006 the Scruggs applied for rehearing in the United States Court of Appeals for the Federal Circuit. It should be noted that a number of issues not relevant to the discussion have not received the attention here that a full discussion of the case would warrant. Notably, patent validity was an important defence in *Scruggs*, as might be expected in a case of this nature. More particularly, Monsanto’s genetically engineered crops are covered by a number of different patents, and important decisions in *McFarling* were based on the only one of Monsanto’s patents that included a claim to the seed in its patent (the ‘605 patent): however, while subsequent decisions in *Scruggs* were based on the *McFarling* decision, Monsanto ultimately withdrew the ‘605 patent from its claims in *McFarling*. This withdrawal has not only become the subject of appeals in *Scruggs* but has spawned arguments by *McFarling*’s defence that the issues in *McFarling* should be re-litigated. The details of the patent invalidity argument or the basis of the alleged discontinuity between *McFarling* and *Scruggs* are not necessary to discuss further here, except to note their existence and their potential role in the future of the cases. What both *Scruggs* and *McFarling* make

¹⁶³ *Monsanto Co. v. Scruggs*, 117 Fed. Appx. 729. (Fed. Cir. 2004) (Lexis 27519) at 1343.

¹⁶⁴ *Ibid.* at 1344.

¹⁶⁵ *Ibid.* at 1343.

clear is that the issues are far from undisputed, and that the transition to the new expropriationist paradigm is not occurring without challenge.

If You Do Not Believe: Challenging the Transition

As we saw from Chapter 5, there was not a great deal of resistance to genetic engineering in Mississippi on the basis of environmental, health or any of the usual concerns raised by environmental and other non-governmental organizations. The only significant objections arose around the issue of patenting seeds. Currently, any resulting resistance to the technology is primarily manifested in expressions of anger and frustration over the price of seeds and over the control that Monsanto is exerting, with few farmers returning to conventionals. If illicit seed saving is still occurring, few are admitting it. While it is impossible to conclude quantitatively, and non-litigants obviously feel some resistance admitting to such issues, there is a strong suggestion that in the early years of the technology's introduction resistance to the patenting of seed and the prohibition on seed saving was high. This resistance was very practically manifested in ignoring the restriction.

McFarling states that when Monsanto's genetically engineered crops were first introduced, the company was fervently monitoring farmers for seed saving; his characterization is reminiscent of Schmeiser's 'gene police':

Like back in '99 and 2000, they were everywhere. There was just people riding around, you know, checking. ... They already had an injunction on me at that time, so they didn't mess with me. A lot of these other boys they messed with, and all of them settled with them probably, except me and Mitchell Scruggs" (MS#16, McFarling).

The lawyer that represented McFarling had been involved in about 9 other cases that were filed. In the early days, his law office had group meetings with affected farmers, the vast majority of whom chose to settle with Monsanto. A paralegal involved said that in his perspective the reason for saving seed in the majority of cases was a sentiment of entitlement to seed that they had bought and purchased, and therefore felt they owned, and a resistance to what they felt was a disproportionately high cost for the technology. This sentiment replicated that offered by litigants:

It wouldn't be bad if they would only priced their system right. But patented cotton seed costs about \$400 a bag for Monsanto's system. A 50 lb. bag. Fifty pounds of cotton seed if you go to the gin with it you are going to get about \$2. You take that same \$2 worth of seed and treat it and get it cleaned it is going to cost about \$17 dollars, so they got a \$20 product and they are charging \$400. (MS#37, Litigant)

In the competitive context of farming, where non-adoption of a new technology spells a significant disadvantage, a number of farmers express a distinct sentiment of resentment in the face of narrowing options, and this certainly had something to do with infringing actions. There is also some indication that farmers did not comprehend the significance of the new technology for an agricultural transformation. Farmers and seed dealers were rooted in a particular way of doing things, and had seen many improvements and new varieties of seeds incorporated into their farming system. The PVPA had come in around 25 years before, when many of these farmers were already farming, and had not radically altered the practices of farmers. According to anecdotal evidence, violations of the PVPA were fairly common. Patented genetically engineered seeds with a technology agreement were perhaps given the same cursory nod. As a cotton farmer not involved in the lawsuits characterized it for me, while the restrictions on seed saving were known, the repercussions weren't: "They knew, [but] it's just like your mamma

telling you 'no' when you were a kid: there's 'no, don't you do it' and then there's 'NO, don't you DARE do it'" (MS#26, GM producer).

In addition to the potential lack of comprehension of the significance of the change, was the simple factor of the new technology's necessary introduction during one of the busiest times for farmers. Farmers confronted with a technology agreement under full steam of planting, may not even recognize the significance of what they are signing. As McFarling testified, he was unaware of the provisions in the Technology Agreement, and simply responded to the request of the seed dealer to sign the document: "they just handed it to me and said we've got to sign this to get the seed."¹⁶⁶ There have been indications that some seed dealers, responding to farm hands picking up loads of seed for busy farmers, simply signed the farmer's name onto the technology agreement, and that Monsanto itself had engaged in the practice of forgery. In 2004, Illinois farmer Eugene Stratemeyer was sued by Monsanto in what Stratemeyer alleges was a case of entrapment.¹⁶⁷ He turned his counterclaim into a class action lawsuit against the company under the Illinois Consumer Fraud Act when agents admitted to forging his and many other signatures on technology agreements (Schubert, 2001). Monsanto defended on the basis that Stratemeyer lacked standing and failed to allege potential injury (Farmers' Legal Action Group, 2004: 45). In the case of Kem Ralph, a farmer from Tennessee, the forgery of his signature on the Technology Agreement was also documented in court, although it is uncertain exactly who committed the forgery.

¹⁶⁶ *Monsanto Co. v. McFarling*. (E.D. Mo., Apr. 13, 2000) (Lexis 22259) (Evidentiary Hearing, April 6, 2000: 19,16).

¹⁶⁷ Stratemeyer alleges that a man approached him when it was too late in the season to start a crop and requested Stratemeyer sell him some seeds for erosion control. He reluctantly helped him, charging him only enough to cover the cost of cleaning and bagging the seed (Schubert, 2001).

Assuming the best, regarding such instances, it would seem that Monsanto had a job of training the locals to the new reality that they wished to accompany the release of their product. Their desired training has not been gentle, however, and the company's response to non-compliance has been quick and sharp, and for many it appears ruthless. There are many who believe that Monsanto selected a few farmers to prosecute as examples for the others. For example, a litigant just across the Mississippi border claims:

Half the people or more in this country were doing what I was doing, and they just picked a few. ... When it started they just picked a few of us out of our area. They picked three (MS#37, Litigant).

Out of those selected, Monsanto appears to spare no effort and expense in their prosecution. In the Scruggs case, for example, the Scruggs filed counterclaim against Monsanto for its pre-suit surveillance activities, claiming invasion of privacy, trespass, and tortious interference with contract and business relations, among other things. The most extreme example of which was that during the course of its investigation, Monsanto purchased an empty lot across from Scruggs Farm Supply and set up a trailer there from which investigators put the business under surveillance using video equipment and binoculars.¹⁶⁸ Investigators followed the Scruggs' family members and employees, and asked to search the trucks of customers. While the claims failed on their merits, the basic facts were not disputed.

In addition to such qualitative information demonstrating the extent to which Monsanto has gone in its prosecution, there is the quantitative data regarding judgments, where the correlation between the punishment and the crime seems significantly out of balance, with farmers held to technology agreements with extremely imbalanced terms. It

¹⁶⁸ *Monsanto Co. v. Scruggs*, 342 F. Supp. 2d. 602. (N.D. Miss 2004) at 606. (United States district Court for the Northern District of Mississippi, Western Division, July 2, 2004: 4)

is not surprising, under these circumstances, that many of those who find themselves in conflict with Monsanto accept settlements in the face of high stakes litigation. The amount of these settlements appears to vary significantly, with litigants citing other farmers who cooperated with Monsanto in its efforts to prosecute others receiving lower settlements that often in part commit the farmer to a certain amount of product purchase over several years. This cannot be verified as settlement information is bound by confidentiality agreements, but was more specifically articulated by a litigant with a specific example in Tennessee. For those involved in litigation, the sentiment is unequivocal that while many farmers saved seed, Monsanto's strategy was to string a few up and scare the rest into compliance. For these farmers, the prospects certainly appear grim. Monsanto is accused of such ruthlessness in their prosecution that even the innocent cannot afford to respond in any way other than to accept a settlement offer. Given that these concerns are raised by the limited few involved in litigation, they have to be taken with a grain of salt. However, particularly in the United States where there are a lot more cases, the evidence of the imbalance of corporate power and the manner in which it appears to be used—where such data is available—does nothing to assuage concerns.

For the most part, the strategy has been quite effective for Monsanto. A litigant just outside of Mississippi commented that while he knew many others who saved seed, when the lawsuits in his area started that was the end of it: "And I know people they got up and they started hauling their seed to the mill instead of cleaning them." (MS#37, Litigant). There was a sentiment heard more than once that there was no limit to what Monsanto would try to do to litigants, and therefore talking about the issue would only

incur the company's greater wrath. Publicizing the issue is difficult in this context, with litigants expressing apprehension even talking under promises of confidentiality to a researcher from Canada: despite promising to meet, one litigant changed his mind on this basis; another began to have doubts halfway through our conversation. The significance of this culture of fear is great, considering the transformation that the agricultural system is undergoing, and the huge amount of power Monsanto wields in the new system. For some, the prospect of a lifetime ban from the technology, as can be imposed on infringers, is sufficiently threatening. For others, the imbalance of power when there is a dispute is sufficient to end the conflict quickly. However, for a limited few, this imbalance of power only fuels greater resistance.

Tennessee cotton farmer, Kem Ralph became notorious for being the first person to go to jail over genetically engineered seed, when he burned the disputed seed in contravention of a judge's orders. As a result of his fight, Ralph was fined nearly three million dollars in damages for patent infringement (United States Court of appeals for the Federal Circuit, September 7, 2004). Ralph is a character of strong beliefs, and while his trouble was certainly exacerbated by his conviction that moral certitude trumps law, his case is nonetheless compelling for the vehemence with which he has fought the company. Ralph, for example, while warned by his accountant that I might be a spy from Monsanto, felt he had nothing to risk in talking to me. Similar to Schmeiser, Ralph was interested in fighting Monsanto in any way, even by broadcasting his story as widely as possible, and has regular contact with an editor at the local paper in an attempt to publicize his concerns. A documentary film crew from Australia had already visited to cover his story.

Ralph's perspective is unequivocal: "Even though I been in prison, I don't care. I feel honoured because I'm fighting these people...." (MS#38, Ralph).

While significantly more restrained in approach, McFarling has fought Monsanto in his own way. McFarling claims he rejected the initial settlement offer because he could not afford it. In 2004, after pre-court arbitration Monsanto made another settlement offer of 1.2 million dollars, half to be paid over the year, and half to be paid in future product purchases over a number of years. Again McFarling rejected it, he claims on the grounds that he didn't have the required initial instalment of \$300,000 dollars. While not privy to specific lawyers' fees and costs of the out of state litigation, it seems probable that he could be gambling with far more than that over the years of litigation with the company. More pointedly, when asked whether he would have settled if they asked for an amount he did have, McFarling replied: "No, I don't think so. I ain't never thought about settling." His position on the matter is simple: "I don't feel like I've done nothing wrong." As a case in point, despite his blossoming legal troubles, and when well into a demonstration of the grief Monsanto could cause him, McFarling maintained his intentions to continue his seed saving practices unless the Court ordered him otherwise.

Unlike McFarling, the Scruggs were not made a settlement offer by Monsanto, and so it cannot be definitively claimed that their line of defence was anything other than a desperate tactic in light of irrefutable evidence of their patent infringement. This seems highly unlikely, however, given the apparent consistency of Mitchell Scruggs' actions and opinions over the course of his interaction with the technology. From his deliberate cultivation and multiplication of Monsanto's patented seeds, to obtaining seed without signing a technology agreement himself, to later refusing to require farmers to sign

technology agreements, Scruggs showed no interest in appeasing Monsanto and every interest in reclaiming a farmer's right to farm saved seed. For example, Scruggs gained no financial or other benefit by not requiring his seed customers to sign Monsanto's technology agreement. Nonetheless, he felt strongly enough on the matter that he did not require them to do so:

It was no law or anything said that I had to force a farmer to sign a contract that I didn't believe in myself. I mean Monsanto just wanted the farmers to sign it so they would have some kind of strong arm on them (MS#15, Scruggs).

I interviewed Scruggs soon after the opening of his store, Scruggs Farm Lawn & Garden Home Improvement Warehouse, a huge new facility that opened in February of 2005. At that time, Scruggs cast his defence in broad terms, situating his legal issues in the broader concerns of farmers in the changing regime:

I don't think it's fair, then or today or anytime, for one company to use any type of technology to monopolize the whole seed industry and control the food and fibre of the world. That wasn't what patents were intended to do. To be misused and monopolized (MS#15, Scruggs).

There is little doubt that he recognizes the changes that are occurring in the broader context and sees himself as playing a defensive role in those changes. The intention to resist was clear, and it is not surprising that Monsanto went after him with such vehemence.

In sum, there has been significant evidence that farmers initially resisted the new paradigm prohibiting seed saving. While strong objections regarding Monsanto's level of control and the apparent unchecked pricing of seed are still prevalent and may one day press forth new initiatives, currently the practical manifestations of resistance appear limited to those whose battle has been moved to the court system, and who have not

settled with Monsanto. For those who have taken this path, the obvious question becomes whether their resistance has had any broader impact. To some extent, the resistance has had some effect on publicizing the issues, although this has certainly not matched the publicity garnered in Canada. Resistance has had some effect beyond that of publicizing the issues, however.

By far the greatest impact of McFarling's counterclaims against Monsanto was the removal of the 120-multiplier. After McFarling's challenge and the Circuit Court's ruling that the clause was unlawful, the 120-multiplier clause was removed from the Monsanto Technology/Stewardship Agreement. Remedies in the technology agreement are now stated to be: "patent infringement damages to the full extent authorized by 35 U.S.C. S 271 et sequ..." (Monsanto Company. "2006 Monsanto Technology/Stewardship Agreement"). The removal of this clause removed a significant threat that Monsanto could use against infringing farmers, as many farmers facing 120 times the damages might be more inclined to accept a settlement offer than risk fighting the company. According to a paralegal involved with a number of the cases: "A lot of the farmers have settled with Monsanto because of the 120 multiplier.... Nobody could pay it. That I'm sure made a lot of people settle" (MS#18). Similarly, the prospect of such legal challenges was likely instrumental in the removal of the contentious glyphosate and trait tying in earlier Monsanto technology agreements.

Of course, the single greatest potential impact of such resistance is still pending. While not yet effecting any change, the greatest chance for significant reversal of the expropriationism that has occurred in conjunction with the introduction of genetically engineered seeds lies in the antitrust and patent misuse counterclaims. While McFarling

was not successful in his challenges, in many ways he set the stage for the Scruggs case, and the evidence and the lines of argument appear to be gaining in strength. Given the differential structure of technology dissemination in countries such as Argentina, where the trait and the germplasm are not tied, and given the rising interest in the issue by agricultural economists, the issue is unlikely to escape further challenge. Lawyer Jim Waide notes that after McFarling's Supreme Court bid, Scruggs has a much better chance of bringing an antitrust challenge as their resources are much greater, whereas McFarling did not even have a patent lawyer on his case (MS#22). The importance of the issues to the broader farming community is also gaining exposure, as can be seen by the involvement of the Solicitor General of the United States in McFarling and the Attorney General for the State of Mississippi in Scruggs.

Conclusion: The Still Shifting Legal Terrain?

In conclusion, the evidence from Mississippi points to an ongoing reorganization of agriculture, whereby farmer's property rights are transferred to biotechnology companies, and farmer's ability to control their own farming practices is restricted. There is little doubt that the judicial support of utility patents on plants initiated by *Chakrabarty* has resulted in a proprietary loss for farmers, whose ownership over the progeny of their crops has been expropriated through a legal chronology towards the full patentability of sexually reproduced plant forms. Where farmers were once able to use the seed saved from the preceding year's crop if they so chose, they are now obligated to purchase seeds anew when using patented varieties. As we have seen from the preceding chapter's discussion of farming in Mississippi, the shift to production based on these patented genetically engineered varieties has been almost wholesale for key agricultural crops

such as soybean and cotton. Therefore the legal phenomenon of patents on life, in conjunction with the technological treadmill represented by the introduction of genetically engineered crops, work together to expropriate Mississippi producers' control over their seed.

As we also saw in the previous chapter, the loss of control over the seed, has resulted in a broader loss of control, as farmers are increasingly hemmed in by high seed prices and diminishing control over other farming factors—such as which herbicide they use and their seed planting rate—dictated by their technology choice. Monsanto, specifically, has created a web of contracts and incentives that seemingly dictate many of the options for farmers, while creating lucrative opportunities for seed dealers. Without resistance, the further entrenchment of agricultural biotechnologies is leading to an inevitable shift in control over agriculture from farmers to technology developers. Given the imbalance of economic power between technology developers and individual farmers, resistance at the farm level is difficult. Whether legally considered contracts of adhesion or not, there is little doubt that the provisions of the technology agreement have been so punitive as to hinder resistance. Given the difficulty farmers have in gaining standing for making antitrust arguments, resistance on a broader scale is even more difficult.

As we have seen in *McFarling* and *Scruggs*, however, there is nonetheless some resistance. While this resistance has had some limited impact—such as with respect to the 120-multiplier—it has also left many questions pending resolution. Most importantly, *McFarling* and *Scruggs* have raised more anti-trust and patent misuse questions than they have answered. Notably, a delicate legal balance has been struck by various levels of court on the question of whether the trait and the germplasm are separate or unified. This

very abstract question has significant practical repercussions, and a seemingly contradictory approach is necessary to maintain the efficacy of patent rights on traits contained in self-reproducing material. On the one hand, the trait is distinguished from the germplasm in the construction of the patent. It is the trait, not the seed or the plant itself, which is patented. At the same time, however, a farmer wanting to save seed and simply pay the additional technology royalty to Monsanto cannot. Arguments that this is an illegal tying arrangement of the desired trait and the unnecessary seed are refuted by claims that they are one and the same. The social construction inherent in this and related issues is obvious, and given the newness of the issues raised by genetically engineered seeds, and the gaps that have to be filled in for existing case law to apply to the issue, there would appear to be some flexibility with respect to how the many abstractions are interpreted.

In sum, significant issues with respect to farmer's loss of control have been raised. Some losses are the product of social choices about the value of technology development and the need to reward such development. Other losses are less clear as to their social utility, such as the profits accrued to seed developers in light of the restriction on seed saving, and appear to have more to do with solidifying a new regime than balancing social benefits. Given that neither McFarling nor Scruggs has yet managed to escape summary judgment on patent misuse and antitrust issues, the expropriationist trend appears to be set to continue unabated.

CHAPTER 7

CONCLUSIONS

We must not allow our options to be foreclosed by ceding to capital the exclusive power to determine how biotechnology is developed and deployed. (Kloppenborg, 2004: 279)

Introduction

Patents were created for the benefit of inventor and society more broadly: through the incentives they offer, they provide a means of stimulating innovation, research and development. It is a quid pro quo relationship, whereby at the end of the patent's term, the benefits of the invention are available for the common good. This relationship was conceptualized long before patents on life forms became an issue, however. Now that they have, the quid pro quo seems to have been questionably translated. Genetic engineering has turned life forms into inventions, but these inventions fundamentally differ from those before: they are self-reproducible. Turning seeds into patented inventions has facilitated a social reorganization of one of the most essential of human industries, our system of food production.

While the adoption of genetically engineered seeds results from the choices of individual farmers (albeit, choices constrained by the adoption practices of farmers in preceding years), the social reorganization of agricultural production is a result of the proprietary context of these seeds. The paradigm of proprietary agriculture that found its footing in hybrid seeds and the PVPA has reached its climax in patented genetically

engineered seeds. The institutional support for this paradigm is somewhat less established in Canada, but the direction of its development is following the trends set in the United States. From patents on life, de-regulation, technology agreements and recent case law over liability, the proprietary emphasis on the dissemination of these seeds has been increasing in both nations.

The consequences of this proprietary emphasis are also increasingly evident: prohibitions on seed saving; imbalanced technology contracts; declining producer control over production decisions; and industry driven crop development. There is strong evidence that the transition to agricultural biotechnologies is indeed reorganizing the agricultural sector such that farmers will likely face even further reduced production choices and an increasingly impeded ability to affect the terms and conditions under which they produce. That the technology itself can be applied in ways that bolster the already strong linkages between input suppliers and processors of the resulting crop only exacerbates the situation. Ultimately, the decline in producer control over production is a loss for society more broadly, as a small number of private enterprises dictate what will be produced, how, and for what market. Evidence is good that environmental, social, and even agricultural benefits can be undervalued or outright abandoned in this system. Government regulation and investment into public breeding could offset the negative impacts of this proprietary shift, however there has been little evidence of such counterbalancing in either Canada or the United States. Further, this proprietary-oriented reorganization of agricultural production has not resulted from a national inability to regulate in the face of international trade agreements—it is clearly state-supported.

The legal and regulatory focus of this research is not intended to downplay the physical aspects of the technology. Certainly, a number of existing and potential biotechnological traits carry the possibility of significant social impact. Even keeping to the currently available commercial applications, the physical aspects of the technology have suggested both benefits and a number of social concerns. To date, however, it is the proprietary changes that are demonstrating the greatest potential to affect a far reaching, long-term, socio-political reorganization of agricultural production. Consequently, they are the focus here.

What Price Adoption? Expropriationism in a New Era of Agriculture

Both in Saskatchewan and Mississippi, the adoption of GM technology has been the result of rational production decisions by individual farmers who must assess such factors as whether the technology decreases dockage, increases yields, reduces risk, or provides efficiency benefits. Given the economics of agricultural production, few farmers can afford to make production decisions on any other basis. At the current prices, though to differing degrees depending on crop, a vast majority of farmers are finding that using the technology provides greater gains than not using it. In this strictly microeconomic sense, and leaving aside any health or environmental risk issues, the technology simply offers another tool for the farmer's survival kit.

In Mississippi, the technology is considered by many farmers to have been their salvation, although there are concerns that this may not last, as insect and weed resistance develop. In Saskatchewan, farmers are slightly less enthusiastic, but still quite keen. Many find the technology has vastly improved their ability to grow canola, but harbour the sentiment that perhaps the endless fields of yellow will ultimately lower their margin

of return. Nonetheless, the technology provided Saskatchewan farmers with enough of a taste of what it could do that many hold it out to be their future: whether it be in drought or frost resistance, or in the creation and supply of new niche markets where they can compete against international production, the technology represents a way of staying ahead of the game—or at least in the game. In both Mississippi and Saskatchewan, this game was unequivocally considered to be a global one, and the farmer that could play Duddy Kravitz was the farmer that survived.

This adoption is not coming without a substantial cost, however, that is over and above the ticket price of the technology. There is certainly a concern over the technological dependence that is evolving as farming transitions to a very limited number of products that link pesticides and herbicides to seeds, thereby reducing the insect and weed management burden—but also the skills required to deal with them should such limited technology fail. Of even greater concern, however, is the proprietary framework that is associated with the technology. It is through this framework that both farmers' proprietary rights and their control over agricultural production more broadly are being 'expropriated.'

The evidence of expropriationism in the support for intellectual property rights on plants is unequivocal. In the United States, from the first patent on life to upholding the patentability of sexually reproducing plants over the PVPA, the legal chronology towards patenting seeds and ending the farmers' exemption with respect to seed saving has been unwavering. The 'anything under the sun' dictum has persevered despite efforts to qualify it, most recently by legal arguments that Congress would not have passed the PVPA if it had wanted patents on plants. The approach to patents on life in Canada had

some initial significant differences from that of the United States. Canadian patent offices and courts have been much more reticent about patenting life forms, and the historical chronology has shown a progressive qualification of the definition of invention in a way that ultimately excluded higher life forms in *Harvard College*. It appears that *Schmeiser* represents a significant departure, however. Thus, while it has certainly been the case pre-*Schmeiser* that “[m]ore man-made things... remain unpatentable under the Canadian than the American sun...” (Vaver, 2004:159), the post-*Schmeiser* patent regime in Canada may be much more in line with that of the United States.

The most significant result of this institutionalisation of intellectual property protection on life forms for agriculture is, of course, farmers’ loss of the right to save their own seed. The resulting commodification of the seed eliminates an important economic survival strategy for farmers, forces them to increase their dependence on expensive inputs, and removes their alternatives in the face of rising seed prices. This institutionalisation in itself represents an expropriation of farmers’ traditional rights. As these inventions are self-reproducing, however, there is the additional issue of genetically engineered crops volunteering in farmers’ fields and initiating a contest between the intellectual property rights of technology developers and the property rights of farmers. This clash of rights initiates a host of legal questions, such as: Who owns the resulting crops? Who has to remove them? Who is liable if they are used? Consequently, the potential for expropriationism here hangs in the balance of significant legal decisions that are still unfolding in the case law around the technology. While the legal framework is still evolving, the tentative answer to many of these questions has favoured the rights of technology developers over those of farmers. Consequently, a related issue is whether

these proprietary aspects are driving farmers to adopt the crop out of liability concerns. The evidence for this is weak. Much greater evidence is provided that the main motivation for adoption is the competitive disadvantage of not adopting any technology that can provide an efficiency gain, regardless of how temporary any associated profit increase may be. Of course, problems with drift have motivated some who do not experience this efficiency gain to nonetheless adopt the technology.

Expropriationism is not only evident in the intellectual property rights, prohibition on seed saving and initial resolution to the clash of rights, but a number of control issues are also associated with the adoption of the technology. These are brought to light with the greatest clarity in Mississippi. While Saskatchewan producers are not as emphatic in their love for herbicide tolerant canola as Mississippi farmers are for their herbicide tolerant soybeans and cotton and insect resistant cotton, their satisfaction has been sufficient that about 92% of canola in Saskatchewan is herbicide tolerant of one form or another, approximately 75% of it genetically engineered. The difference between Saskatchewan and Mississippi, however, is that while such extremely high transgenic acceptance means one stop shopping in Mississippi—at the Monsanto Market—in Saskatchewan, producers can choose from Monsanto's RR, Bayer's Liberty Link and even BASF's non-transgenic Clearfield variety of herbicide tolerant canola. Consequently, as the transition to GM varieties has become the new reality of cotton and soybean farming in Mississippi, farmers have essentially been reduced to dealing with one company, and that company decides rules, contracts, loyalty schemes, and, of course, prices.

The level of control Monsanto holds leaves farmers vulnerable to agreements that they would likely not accept in a more competitive environment, such as the restrictions on their choice of herbicide (first by contract and later by 'incentive' agreement). While the situation in Mississippi is somewhat more extreme than that in Saskatchewan, concentration is intrinsic to the current structure of the agricultural biotechnology sector. In such a context, choices that a technology developer like Monsanto makes can have an enormous impact on farmers' well-being. For example, Monsanto's decision to sell the technology and the trait as one instead of licensing the technology separately has had a two-fold impact on farmers. Firstly, farmers lost the right to save their own seed, thereby providing seed dealers with sales that they otherwise might not have made at the expense of farmers. Secondly, saved seed acts as a secondary market, providing competition to the seed dealers, and its loss renders the market captive and allows for the artificial raising of prices. Given that the same technology royalty could be paid to Monsanto whether for new or for saved seed, a vast majority of farmers (in Mississippi particularly) have consequently been economically disadvantaged as a result of a decision by the company that has had no known direct effect on its profits, albeit there are likely loyalty benefits that are yet to be exposed.

Perhaps the ultimate level of control for such proprietary technologies results from the infringement suits that Monsanto has brought against farmers. As we already saw, by 2004 Monsanto had filed 90 infringement suits in the United States (CFS, 2005). Given the questions surrounding the patentability of life in Canada, the low number of suits—*Schmeiser* is the only case to have entered the Canadian court system so far—in contrast to the United States is understandable. Post-*Schmeiser*, such cases are likely to

increase. Even without further details, infringement lawsuits over self-reproducing technology in themselves require delicate consideration. Fighting lawsuits is high risk, and many farmers can't pay for adequate representation to sustain a lengthy (often out of state) legal battle. That is not to say that such lawsuits should not exist. Certainly technology developers need a means by which to protect their investment and ensure the adequate returns to develop new technology. Given the huge economic and power disadvantage farmers have to biotechnology companies, however, these cases need to be pursued in a context of exceedingly clear and balanced standards for assessing violators, preferably with a neutral institutional arbitrator. While developers are unlikely to wantonly pursue their customers, it is problematic for farmers to have no recourse when such actions are taken at the discretion of the company—particularly when any evidence in defence of the farmer will have been harvested the year—if not years—before.

Considering the sometimes ruthlessness or comprehensiveness (depending on your perspective) with which Monsanto pursues those whom it believes have infringed, the discretion the company is afforded with respect to sampling, to what percentage of GM presence constitutes infringement, and to whether or not to remove volunteers is somewhat problematic. While it is expected that technology developers would go to some lengths to retain their rights, these rights have to be balanced with the rights of farmers. The few tales of surveillance, signature forgery, letters to seed dealers, and the like are highly troubling in the context of the power imbalance between the two parties. More so, given the context of the forced non-disclosure around settlements and even of the removal of volunteers. In a context where biotechnology has become the new reality of

farming, withdrawal of permission to use the technology can become a punishment in itself.¹⁶⁹

Lastly, the legal decisions to date in both countries have favoured the technology developers. In Saskatchewan, we see how liability is increasingly disassociated from ownership, such that the benefits of the technology accrue to its developers, but the costs (e.g. contamination, volunteer removal) are borne by its detractors, such as organic farmers and non-adopters. In Mississippi, we see that control issues are exacerbated by Monsanto's near monopoly, and that case law has only affirmed shifts away from producer control.

In sum, the empirical evidence suggests that there is indeed support for a re-conceptualization of political economy of agriculture literature, whereby legal means have become a new strategy for capital accumulation in agricultural production. Certainly biotechnology provides a continuation and a strengthening of the accumulation strategies already familiar in the political economy of agriculture literatures. For example, we can see that RR crops appropriate many of the cultivation and weed management activities, while Bt crops appropriate the application of pesticides and the need for budworm and bollworm infestation screening. Biotechnology has also introduced new elements into the relationship between capital and agricultural producers, however. The evidence here would suggest that the use of legal means to shift control from agricultural producers is a significant trend that cannot be accounted for by the concepts of appropriationism and

¹⁶⁹ The Nelson Farm case in North Dakota (see Chapter 6 and footnote 100) is illustrative of this. In the course of their dispute Monsanto sent approximately 290 letters to seed dealers notifying them that Monsanto did not authorize anyone associated with Nelson Farm to "possess, make, use or transfer" any of their technology. Ultimately this resulted in the termination of a contract to produce 600 acres of RR soybeans for Mycogen Seeds. (Letters available on NelsonFarm.Net)

substitutionism, and that the new concept of expropriationism would be a worthwhile addition to explain this new capital accumulation strategy in agriculture.

While the progression of the control aspects of the technology are much more pronounced in Mississippi than in Saskatchewan, there is little doubt that there has been a progressive shift of rights from farmers to technology developers through legal means in both regions. The evidence provided here is sufficient to indicate that this use of legal means in agricultural production is not a trivial matter, but is a fundamental component of the new regime of agricultural production. Patents are the latest and most thorough of trends to commodify the seed already seen in hybrid technology, plant breeders' rights, and specialty production on contract. The institutional support for the proprietary changes brought by agricultural biotechnology provides the ultimate 'social' solution (in the manner conceptualized by Kloppenburg, 2004) to the commodification problem of the seed. These changes are not just limited to the commodification of the seed, however, but affect numerous other control issues, as we have seen, leading to a progressive loss of producer's control over their production.

There are those who will maintain that as long as farmers are voluntarily adopting the technology, their ownership and control is not really being expropriated, but is freely traded for the benefits they gain. I believe the evidence points otherwise. For all but a select few alternative farmers, the technological treadmill is a reality to which farmers must comply if they are to survive. Consequently, the concept of expropriationism is strongest in application to the legal aspects of agricultural biotechnology in the context of its technological aspects. Whether genetically engineered crops are in fact 'better' for agricultural production is not to be debated here—and there is significant evidence that

short-term benefits may turn into long-term disadvantages—however they increasingly are seen as being more competitive in the short term. Therefore, those who do not adopt suffer some competitive disadvantage, with respect to time, labour, and acres they are able to farm. In this context, the degree of adoption of the technology has become very high, and many would argue, has become the basis of a new form of agricultural production. At least within the crops investigated here, agricultural biotechnology represents a clear step in the classic technological treadmill. Therefore it is in the interaction between legal and technological, between the prohibition on seed saving for genetically engineered seeds and the economically driven adoption of the technology, that expropriationism as a concept is most compelling.

Evidence for the Emerging Third Regime

In the manner of Gouveia (1997), this research intends to both document difference and identify broader patterns. From the two case studies here, we can indeed see that while there are some differences between these countries, there are also some clearly discernable patterns that make it possible to hypothesize future developments. As farmers transition to the new technology, viable conventional varieties will become increasingly difficult to obtain, and technological dependence on genetically engineered varieties will increase. This is the nature of technological change. If the shift to private GM technologies were to continue rather than face some sort of reversal, however—for example such as through a reinvigoration of the public plant breeding programs to provide viable alternatives—expropriationism will deepen. The research here lends some support to concerns that farmers will ultimately be rendered contract labourers or glorified sharecroppers, as under such efficiency and mass production enhancing

technologies, consolidation will continue. The trend would seem to support an interpretation where an agricultural manager would oversee vast tracts of land. Whether this manager would own the land or not would likely become irrelevant as the 'right to farm' would be a matter of production contracts with designated crops and production methods, pre-destined for particular purchasers.

Barring some major disruption of the transition of global agriculture to the corporate biotechnology paradigm—and given market volatility, liability concerns, and the rush to commercialize politically contentious, high risk crops such as pharmaceuticals, this is not impossible in part, albeit unlikely in whole—the concerns raised here are indubitably going to increase as biotechnological traits are introduced into more crops. If the shift to corporate GM technologies continues, then the repercussions extend beyond expropriationism to impact society more broadly. Where agricultural production is dictated by a limited number of companies, profits will over-ride health, environmental and other social concerns. As articulated by food regime proponents, corporate dominance in food production is increasing the power of such companies to determine what farmers produce and consumers eat.

Government regulation could be the solution to many of these perceived problems, although many farmers cringe at the thought of any more regulations. Regulations could be developed in Canada and the United States, similar to those developed in Denmark or Germany, that would remove the grey areas around liability and infringement, and provide more support for farmers, while sorting out many of the social issues around the technology. Consequently, the next theoretical consideration is whether the evolution of a third food regime—characterized by international regulation,

corporate domination, and globally organized production and processing—renders states incapable of regulating their own agricultural sectors and setting their own national agendas. Is the expropriationism evident here becoming ‘expropriationism writ large,’ in a globally replicated, corporate biotechnology, third food regime?

While intellectual property protection is indeed a necessary component of compliance with international regulatory bodies such as the WTO, the application of this protection to plants is not. Nonetheless, in Canada and the United States there has been a progressive transition away from the farmers’ exemption evident in UPOV 1978 and towards proprietary seeds, despite the evidence here that international regulation is not significantly constraining regulatory ability with respect to agricultural biotechnology within these countries. The United States, in fact, appears to be a driving force behind the internationalization of its perspectives on a variety of issues relevant to the development of agricultural biotechnology, such as on intellectual property. While it is not always successful in promoting its perspective, there is little evidence that international law has offered significant hindrance to its regulatory goals. Canada does not have the ‘world power’ stature of its neighbour. Nonetheless, its regulatory framework similarly appears to be the result of predisposition rather than constraint; and the predisposition is to replicate the pro-development stance of the United States through strong intellectual property protection and de-regulation in other areas relevant to the technology. While Canada’s intellectual property protection for plants initially lagged behind that of the United States, there are indications that this is changing. Overall, if globalization and the food regime are indeed contested projects, which there is every indication that they are,

the contestation is not coming from within the governmental structures of the United States or Canada.

Despite the interest in providing intellectual property protection, neither the United States nor Canada have shown any inclination to address the issues that arise out of providing these protections to self-reproducing inventions. This is in direct contrast to the European Union, where regulations regarding liability for genetic contamination are increasingly being developed. Consequently, a significant number of issues remain unresolved in these countries regarding liability and infringement. The growing number of lawsuits are indicative of the need for legislation, and yet regulators on both sides of the border appear reluctant to address the issues. Even the courts themselves have raised questions about the suitability of their forum for addressing the broader social issues of biotechnology. In Canada, for example, both the written decisions in the *Harvard College* and *Schmeiser* Supreme Court cases acknowledged the existence of unresolved social issues in the cases—such as the patentability of life and the risks of biotechnology—that were the purview of Parliament. Barring such input, the Courts are restricted to the legalities of the Patent Act.

Therefore, while there is evidence that the Canadian and American governments could regulate biotechnology's associated social aspects, there is little evidence of this intention. Obviously the 'intentions' of any state are not homogenous and various actors and domestic pressures affect a government's (sometimes equally heterogenous) policy positions. Particularly in the United States, but also in Canada, there are early indications that corporate lobbying around biotechnology is significant. In any case, the overall policy thrust in these regions appears pro-biotechnology development. Biotechnology as

a globalization 'project'—in the manner conceptualized by Gouveia—would appear to be progressing with some success. Consequently, while global regulation and integration of food and fibre production are not inevitable, they are nonetheless making much progress—progress in which biotechnology plays a large part. The contours of the third food regime would indeed seem to be constituted by a state-supported international structure of intellectual property rights, that facilitate local level expropriationism, and agricultural production based on biotechnological 'packages' produced by a highly concentrated corporate sector: a corporate biotechnology food regime.

Of course, agricultural biotechnologies have not come without opposition. As noted by Friedmann and McMichael, such opposition movements can be effective at the local level, but in order for them to ultimately impact on the shape of the food regime, they need to be institutionalized at a higher level. As we saw in many of the case studies that critiqued the perspective, local level activities that ultimately found their way into the legal or regulatory were the most effective at instituting differentiation from globalization trends. It would appear that food regime still depends on national buy-in, in order to create an environment that fosters the adoption and perhaps even development of the technology in the region. Opposition activities can affect this environment.

Some important differences in the opposition evident in the Canadian and American case studies stem from the particularities of the crops at issue (for example, canola has small seeds that can blow far and the potential for the dissemination of GM canola is high, whereas cotton and soybeans have relatively large seeds), and of the nature of the regions' agricultural sectors (organic farming is a significant presence in Saskatchewan but not in Mississippi). In this context, it is no surprise that the involuntary

presence of GM crops is a far greater issue in Saskatchewan than in Mississippi. This issue of potential liability for unwanted genetic presence is also a much more sympathetic issue than that of deliberate seed saving. Further, RR wheat garnered widespread opposition from many sectors in Saskatchewan, and this was phenomenally important to the local politics of GM agriculture. With the further influence of the natural alliance between organic farmers and environmental organizations, it is not surprising that Saskatchewan supported a much broader base of public debate over the technology, and even a certain degree of public support for those who were legally embroiled with its developers.

The legal action organized by the SOD is certainly one of the most aggressive forms of opposition to the industry. Given the economic and power disadvantage of farmers compared to technology developers, however, such offensive action is rare and likely to remain so. Consequently, it is in the counterclaims that we see the most signs of struggle for control and resistance to the proprietary paradigm occurring. As with much socio-legal analysis, the words of litigants and others involved in court cases need to be viewed critically as there is a strong impediment to frank talk, and those involved usually have a greater agenda than simply presenting the issues. Consequently, there will be facts about which those outside the event can never be certain. What is certain, however, is that however they got there, these farmers have cast themselves in a broader context, one in which they see their role as defending broader rights of farmers.

There have been some successes in these defences. McFarling struck a blow to the contractual 120-multiplier for damages. Schmeiser struck a blow to damages based on profit. Both of these affect the threat that biotechnology developers yield when

negotiating out-of-court settlements. Of course, such acts of resistance in the legal forum can also strengthen rather than weaken the rights of technology developers. For example, *Schmeiser* ultimately upheld Monsanto's patent, perhaps motivating Bayer's subsequent move to affirm its patent rights.

Ultimately, the two regions investigated here demonstrated that the issues that can be tried in suits between technology developers and farmers can be very significant for the biotechnology sector. For example, if the 5-4 Supreme Court of Canada *Schmeiser* decision had been one vote different and had invalidated patents on plants in Canada, there is little doubt the decision would have radically affected the attractiveness of Canada for the research, development and production of agricultural biotechnologies. Similarly, biotechnology development could be very negatively affected in the unlikely event of a finding of corporate liability for GM contamination of organics. While the odds are against such an outcome, class action certification itself would undoubtedly send a chill through the biotechnology sector and development could slow for the duration of the trial and beyond, with increased pressure for government regulation around liability issues.

In Mississippi, both *McFarling* and *Scruggs* used the PVPA to launch a serious challenge to patents on plants. Again, should their argument have found some purchase, national development of the technology might have suffered. Farmers could still be controlled through technology agreements, but an invalidation of plant patents could open more doors for research and development, and ultimately increase competition in input suppliers. Most immediately significant for farmers is the potential of the *Scruggs*' ongoing antitrust counterclaim. This claim challenges the whole structure of technology

dissemination that is supported by the proprietary framework of the technology. Should such a claim find judicial support, it would likely return a certain degree of the control farmers have lost in having to obtain their technology from one company.

In sum, the expropriationism evident in Canada and the United States, in conjunction with the corporate concentration and global sourcing strategies already evident in agriculture, are quite consistent with the characteristics of the third food regime postulated by Friedmann and McMichael. However, as we saw, widespread public opposition—or even agricultural sector opposition, as in the case of RR wheat—can have significant repercussions for the technology. Consequently it appears that national regulation does matter, and that activities both within and without the legal forum can have an impact on the development of the technology. Stated briefly: the corporate biotechnology food regime is imminent but not inevitable.

The EU provides a powerful example of opposition to the US style biotechnology regime. In itself, this is unlikely to be sufficient to challenge the regime without further support from both within and without the EU. As we have seen in the two case studies here, such opposition is evident sometimes with respect to particular aspects of the technology, and sometimes with respect to the technology in itself. The case of RR wheat was a powerful example of the force of opposition required to overcome corporate dictates in the evolving regime, however. Even with the involvement of organic farmers and environmentalists, orchestrating such a mass of opposition is often extremely difficult. While consumers can exert tremendous power when acting in concert, this power is limited by the alternatives for which they can cast their economic vote.

It would appear that the greatest potential for impact lies in institutionalized opposition, as occurs in the legal forum. Such actions have the potential for broader and longer term influence. Further, whatever the national ideologies, in the legal forum there remains room for judicial decisions counter to those that would facilitate the predicted evolution of the regime. Consequently, incorporating such institutionalization may provide a means of strengthening the predictive capacity of the food regime perspective.

Future Research

While this research makes some headway, simply not enough is known about the social reorganization of agriculture that is occurring in developed countries as a result of the new technology. More case studies are necessary to dispense with the specificities of these cases—such as the particularities of certain crops, regions or farming cultures—and allow for more generalizability. While the selection of Saskatchewan and Mississippi provided good insight into the evolution of case law around agricultural biotechnology, these case study regions were less well matched in terms of those variables that might affect producer attitudes towards the technology, such as the crops under production, the economic prospects of the region, or any cultural peculiarities. A better understanding of the agricultural reorganization could be gained by researching stakeholder perspectives with more comparable variables—such as both regions growing canola and wheat, or two soybean growing regions—in order to account for the differences in perspective that might be specific to the crop being produced. For another example, there were significant control issues raised in Mississippi—pricing by the seed, technology fee increases, and the like—that were not evident in Saskatchewan. More research would be required to

untangle how much of this was from crop or regional differences, and how much was the result of monopoly control in the region or other factors.

There is a need for more empirical evidence of many kinds. While there is a body of research with regard to technological adoption, more analysis of the structural changes specific to agricultural biotechnologies is needed: How are the demographics of the farm changing as a result of the technology's adoption? How are non-adopters fairing economically versus adopters? Have adopters increased their acreage at the expense of non-adopters? How have the profit margins for adopters changed over time? While the basis of this research is economic, at its heart are structural changes regarding technology adoption. The assumption here is that the technology will not improve the economic well being of farmers over the long term, but that it will help a smaller number of farmers increase their acreage and thus gain sufficient profit even with small profit margins. While there appears to be a suggestion of that trend here, more research would be needed to support such a conclusion.

The above types of research would greatly enhance the generalizability of conclusions regarding the introduction of agricultural biotechnologies in developed countries. In particular, maintaining a comparative aspect to such research projects allows for the identification of patterns that are consistent regardless of regional dynamics, and reveals more about the manner in which agricultural biotechnologies are reorganizing agriculture in developed countries. Linking such studies with similar research in developing countries could allow for further insight into the different forms expropriationism takes in different regions. Ultimately, it is through this kind of work that the rough geopolitical mapping of the third food regime can be empirically tested,

and key variables for national differentiation interpreted for the ultimate strengthening of the theory.

With respect to the lawsuits between farmers and technology developers, once again, far more empirical research is required, both regionally and in number of cases. While biotechnology has brought many changes already, it has also raised a number of issues that are still pending resolution: for example, in Canada, what is required to rebut the presumption that possession constitutes use, what percentage of genetic presence constitutes infringement, and the scope of liability over unwanted GM presence; in Mississippi, where the definitional boundaries of antitrust will be drawn in the arm's length control Monsanto maintains through its seed dealers. Further, the legal issues addressed in these jurisdictions arose from the particularities of the suits: consequently, issues have been tried in one jurisdiction (e.g. unwanted GM presence) that were not in the other, and vice versa (e.g. antitrust).

An example of this impending case law is a Canadian suit involving the TUA. Given that the only infringement lawsuit to proceed through the courts in Canada was one where the accused had not signed a TUA, its provisions have not been the subject of legal scrutiny in the manner they have in the United States. There is little indication of significant jurisdictional differences between the Canadian and American contracts—the forum selection clause being a case in point¹⁷⁰—and it can be assumed that any Canadian

¹⁷⁰While not relevant to the Saskatchewan case studies, the forum selection clause is similarly present in the Canadian contract:

GOVERNING LAW AND FORUM SELECTION: This Agreement and the parties' relationship shall be governed by the laws of the Province of Manitoba, Canada (without regard to the choice of law rules). The parties consent to the sole and exclusive jurisdiction and venue of the Court of Queen's Bench for the Province of Manitoba for all claims and disputes arising out of or connected in any way with this agreement and the

case involving a TUA could be subject to similar objections around ‘take-it-or-leave-it’ contracts over ‘necessary goods’. Of course, differences between the technology’s application in the two jurisdictions could affect the relative ‘fairness’ of the contracts—notably, the fact that there is some choice with respect to which herbicide tolerant canola Saskatchewan farmers use leaves them under significantly less pressure to accept unfair contracts. While speculations as to the nature and extent of such objections are better left to those in the legal profession, the results of such a challenge would provide good insight into the extent of expropriationism in Canada. As the number of cases and case studies grow on either side of the border, they will be revealing of expropriationism trends in Canada and the United States. Once again, such research can assist in charting the shape of the evolving third food regime.

In addition to further empirical studies similar to that conducted here, there is also a need for more socio-legal analysis of these trends. Much research is needed on the processes of legal decision-making around these issues. For example, as we saw in Mississippi, whether the gene and the trait were separate or unified inventions, and whether the second generation of seeds was ‘sold’ and therefore exhausted the patent appeared highly subjective. While the interpretation of case law is not a whimsical process, such high levels of abstraction, in conjunction with the novelty of both the technology and the issues, likely renders the outcome more amenable to social and political influences. Socio-legal analysis could be useful in a context where these

use of the seed or the Monsanto Technologies. (Monsanto Canada Inc. “2005-2006 Roundup Ready Canola Technology Use Agreement”). According to Trish Jordan, from Monsanto Canada, there has not been any case in Canada where Monsanto has exercised this right. Of course, outside of *Schmeiser*, no other such case has yet proceeded through the court system. Further, if the infringement case involves a farmer who did not sign a TUA, as it did in *Schmeiser*, then Monsanto cannot enforce this clause in the course of its litigation.

outcomes have consistently been in favour of technology developers over farmers. Socio-legal analysis is also needed on the social processes of law creation around biotechnology, particularly prior to the emergence of its legal framework (and resultant lawsuits). Specifically, investigations into the relative lobby powers of various actors that helped determine the legislation on plant technology would be required to disentangle the influences behind state support of the technology.

Lastly, and relatedly, further research is required on the technology from a social movements perspective. If biotechnology is indeed a contested globalization 'project,' as conceptualized here, then research into movements around the technology can be revealing both for the technology itself, and for globalization theories more generally. Such research could also be conducted comparatively, through investigations of social movement successes and failures across nations in contrasting legal regimes. Ultimately, such research can help assist in unravelling the dynamics that are behind the creation of the international food regime, and establishing where and how its shaping might be amenable to influence by such actors.

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APPENDICES

Appendix A: Key International Agreements

COUNTRY AND AGREEMENT	SIGNED	RATIFIED/PARTY/ MEMBER
WORLD TRADE ORGANIZATION MEMBERSHIP*		
CANADA	January, 1995	
EUROPEAN COMMUNITY	January, 1995	
UNITED STATES	January, 1995	
CONVENTION ON BIOLOGICAL DIVERSITY**		
CANADA	June 11, 1992	Ratified: December 4, 2001
EUROPEAN COMMUNITY	June 13, 1992	Approved: December 21, 1993
UNITED STATES	June 4, 1993	---
BIOSAFETY PROTOCOL OF THE CBD**		
CANADA	April 19, 2001	---
EUROPEAN COMMUNITY	May 24, 2000	Approved: September 11, 2003
UNITED STATES	---	---
INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES***		
CANADA	June 10, 2002	June 10, 2002
EUROPEAN COMMUNITY	June 6, 2001	---
UNITED STATES	November 1, 2002	---

Sources:

*World Trade Organization Website. "Members and Observers." Available at: http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm Accessed April 21, 2007.

**Convention on Biological Diversity Website. "Parties to the Convention on Biological Diversity." Available at: <http://www.biodiv.org/world/parties.asp> Accessed April 21, 2007.

***Food and Agriculture Organization Website. "International Treaty On Plant Genetic Resources For Food And Agriculture." Available at: <http://www.fao.org/Legal/TREATIES/033s-e.htm> Accessed April 21, 2007.

Appendix B: Log of Interviews

Personal Interviews, Saskatchewan, Canada

INTERVIEW NUMBER	INTERVIEWEE NAME OR DESCRIPTOR	INTERVIEW DATE
SK1.	TERRY ZAKRESKI, LAWYER: SCHMEISER, HOFFMAN.	March 16, 2005 and August 3, 2005
SK2.	ACADEMIC- CROP DEVELOPMENT	March 17, 2005
SK3.	SEED DEALER/PRODUCER-GMO	March 17, 2005
SK4.	CANOLA COUNCIL OF CANADA	March 18, 2005
SK5.	PRESIDENT, BACK TO THE FARM RESEARCH FOUNDATION (ORGANIC)	March 20, 2005
SK6.	ARNOLD TAYLOR, PRESIDENT SK ORGANIC DIRECTORATE, CHAIR ORGANIC AG. PROTECTION FUND	March 20, 2005 and August 12, 2005
SK7.	PRODUCERS-ORGANIC (FARM SPOUSES: SK7A AND SK7B)	March 20, 2005
SK8.	PRODUCERS-ORGANIC (FARM SPOUSES: SK8A AND SK8B)	March 20, 2005
SK9.	PERCY SCHMEISER, LITIGANT- PRODUCER	March 22, 2005 and August 3, 2005
SK10.	HIRED HAND OF SCHMEISER, PRODUCER- CONVENTIONAL	March 22, 2005
SK11.	PRODUCER-GMO	March 23, 2005
SK12.	PRODUCER-ORGANIC	March 23, 2005
SK13.	PRODUCER-ORGANIC	March 24, 2005
SK14.	PRODUCER-GMO	March 24, 2005
SK15.	PRODUCER/RETAILER-ORGANIC	March 25, 2005
SK16.	PETER PHILLIPS, ACADEMIC, AGRICULTURAL ECONOMIST	August 3, 2005
SK17.	SASKATCHEWAN WHEAT POOL	August 3, 2005
SK18A.	SASKATCHEWAN ASSOC. OF RURAL MUNICIPALITIES [SARM]	August 4, 2005
SK18B.	SARM REPRESENTATIVE	
SK19.	PRODUCER- CONVENTIONAL	August 4, 2005
SK20.	PRODUCER/SEED DEALER- GM	August 4, 2005
SK21.	SASKATCH. CANOLA GROWERS ASSOC [SCGA]	
SK22.	AGRICULTURAL CONSULTANT/MEDIA	August 6, 2005
SK23.	PRODUCER-ORGANIC	August 6, 2005
SK24.	CANADIAN WHEAT BOARD	August 8, 2005
SK25.	PRODUCER-GMO	August 8, 2005
SK26.	PRODUCER-GMO	August 8, 2005
SK27A.	AG-WEST BIO INC.	August 9, 2005
SK27B.	AG-WEST BIO INC.	August 9, 2005
SK28.	SK CANOLA DEVELOPMENT COMMISSION [SCDC]	August 9, 2005

INTERVIEW NUMBER	INTERVIEWEE NAME OR DESCRIPTOR	INTERVIEW DATE
SK29.	PRODUCER-GM	August 9, 2005
SK30A.	PRESIDENT, AGRICULTURAL PRODUCERS ASSOCIATION OF SASKATCHEWAN [APAS]	August 9, 2005
SK30B.	REGIONAL AGRICULTURE ORGANIZATION	August 9, 2005
SK31.	COMMUNICATION/RESEARCH DIR., ORGANIC AGRICULTURAL PROTECTION FUND [OAPF], SK ORGANIC DIRECTORATE [SOD]	August 10, 2005
SK32A.	SK AGRICULTURE AND FOOD [SAF]	August 11, 2005
SK32B.	SK AGRICULTURE AND FOOD [SAF]	August 11, 2005
SK33.	PRODUCER-CONVENTIONAL (unaffected crops)	August 11, 2005
SK34.	VICE PRESIDENT, NATIONAL FARMER'S UNION [NFU]	August 12, 2005

Personal Interviews, Kelowna, British Columbia, Canada

INTERVIEW NUMBER	INTERVIEWEE NAME OR DESCRIPTOR	INTERVIEW DATE
K1	PRODUCER-GMO (SK PRODUCER)	November 22, 2004
K2	PERCY SCHMEISER, LITIGANT-PRODUCER	November 23, 2004

Other Interviews re Saskatchewan

	TYPE	
SK35	TRISH JORDAN, COMMUNICATIONS DIRECTOR, MONSANTO CANADA	October 17, 2005. Winnipeg, Manitoba. Telephone Interview.

Personal Interviews, Mississippi, United States

INTERVIEW NUMBER	INTERVIEWEE OR DESCRIPTOR	INTERVIEW DATE
MS1.	JAMES ROBERTSON, LAWYER: RALPH, SCRUGGS, ETC.	May 23, 2005
MS2.	AGRICULTURAL EXPERT, MARKETING	May 23, 2005
MS3.	PRODUCER-GMO	May 24, 2005
MS4.	PRODUCER-GMO	May 24, 2005
MS5.	FARM BUREAU	May 24, 2005
MS6.	PRODUCER-GMO	May 25, 2005
MS7.	AGRICULTURAL CONSULTANT	May 25 and 26, 2005
MS8.	GRAIN ELEVATOR MANAGER	May 25, 2005
MS9.	AGRICULTURAL EXPERT (HILLS REGION)	May 26, 2005
MS10.	PRODUCER-GMO	May 26, 2005
MS11.	P/T ORGANIC MARKET PRODUCERS AND ENVIRONMENTALISTS	May 26, 2005
MS12.	PRODUCER- CONVENTIONAL	May 26, 2005
MS13.	PRODUCER-GMO	May 27, 2005
MS14.	PRODUCER-GMO	May 27, 2005
MS15.	MITCHELL SCRUGGS, LITIGANT- PRODUCER	May 28, 2005
MS16.	HOMAN MCFARLING, LITIGANT- PRODUCER	May 28, 2005
MS17.	SEED DEALER	May 31, 2005
MS18.	JERRY YOUNG, PARALEGAL: MCFARLING, SCRUGGS, ETC.	May 31, 2005
MS19.	AGRICULTURAL EXPERT, COTTON	June 1, 2005
MS20.	AGRICULTURAL EXPERT, SOY	June 1, 2005
MS21.	AGRICULTURAL EXPERT, CORN	June 1, 2005
MS22.	JIM WAIDE, LAWYER: MCFARLING, SCRUGGS, ETC.	June 2, 2005
MS23.	P/T SMALL ORGANIC PRODUCER/MEDIA	June 2, 2005
MS24.	PRODUCER-GMO	June 3, 2005
MS25.	AG. CONSULTANT: COTTON	June 4, 2005
MS26.	PRODUCER-GMO	June 4, 2005
MS27.	ACADEMIC-RURAL SOCIOLOGY	June 6, 2005
MS28.	PRODUCER-ORGANIC	June 6, 2005

INTERVIEW NUMBER	INTERVIEWEE OR DESCRIPTOR	INTERVIEW DATE
MS29A.	CONSULTANT/PRODUCER	June 7, 2005
MS29B.	CONSULTANT/PRODUCER	June 7, 2005
MS30.	MS STATE DEPARTMENT OF AG AND COMMERCE	June 8, 2005
MS31.	PRODUCER-GMO	June 8, 2005
MS32.	EDITOR, LOCAL FARM NEWS	June 9, 2005
MS33.	SEED DEALER	June 9, 2005
MS34.	PRODUCER-GMO	June 9, 2005
MS35.	AGRICULTURAL EXPERT, ECONOMICS	June 9, 2005
MS36A.	BIOTECH SCIENTIST/ENVIRO	June 11, 2005
MS36B.	ENTYMOLOGIST/ENVIRO	June 11, 2005
MS37.	LITIGANT- PRODUCER	June 12, 2005
MS38.	KEM RALPH, LITIGANT- PRODUCER	June 12, 2005
MS39.	KEM RALPH AND INFORMED ASSOCIATES (EG ACOUNT.)	June 12, 2005

Other Interviews re Mississippi

MS40.	SCOTT BAUCUM, TRAIT STEWARDSHIP MGR, LITIGANT- MONSANTO CO.	February 5, 2007. St. Louis, Missouri. Email Interview.
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