



EcoLOMIC POLICY AND LAW

Journal of Trade and Environment Studies

Issue
2004-6

Published by EcoLomics International
16, bd des Philosophes, 6th floor
1205 Geneva, Switzerland
www.EcoLomics-International.org
trade.env@EcoLomics-International.org

All rights reserved. This publication may be reproduced in whole or in part in any form for educational or nonprofit uses, without special permission, provided acknowledgement of the source is made.

October 2004

NO SMALL POTATOES: INTELLECTUAL PROPERTY RIGHTS AND GENETICALLY MODIFIED ORGANISMS

*GLORIA LAM**

* Gloria Lam, student, Department of Political Science, University of British Columbia (UBC), Vancouver; glohoiye@interchange.ubc.ca, glorialam@canada.com. Substantive and editorial comments by Urs P. Thomas, PhD, have been helpful in the conclusion of this research.

Abstract

This paper addresses the controversy over intellectual property rights covering genetically modified foods through analyzing the effects of patenting in three areas: world food production; biotechnological research and development; national food safety regulations and corporate social responsibility. Through examining the conflicts that emerge when intellectual property rights are included in the debate over genetically modified foods, we see how the imposition of patents contributes to making satisfactory outcomes inaccessible to those populations most desperately in need of help. This article highlights how intellectual property rights can harm global food security.

Introduction

Genetically modified foods are no small potatoes in the field of biotechnology. Although genetically modified (GM) crops have only been on the market for approximately a decade, the growth of this industry has been staggering. An executive summary given to the World Trade Organization (WTO) reports that between 1996 and 1998 transgenic crop areas have increased globally by fifteen-fold, to almost 28 million hectares.¹ In 1999, the largest global plantings of GM crops occurred with 73 million acres planted in the United States (US) and 26 million around the world.² In just these four years alone, worldwide sales in GM foods have risen from 75 million dollars to 2.3 billion dollars.³ The most recent figures indicate a global surface area of land cultivated with GMOs of 167 million acres world-wide (700,000 square kilometers).⁴ And the political stakes continue to climb.

In what has been dubbed “one of the most bitter trade battles in years,” the Bush administration has publicly and legally protested against the European Union’s (EU) reluctance to import GM products from any country cultivating GM crops.⁵ The EU moratorium, which in 2003 blocked approximately \$300 million in bioengineered corn alone,⁶ has been openly delineated by President Bush as based on “unfounded, unscientific fear.”⁷ After the European ban influenced the decision of developing countries to refuse GM food aid,⁸ the EU now stands accused of hindering what has been hailed by the US as “the great cause of ending hunger in Africa.”⁹ Rapid advancements in this giant industry combined with serious political contention have

¹ See Nelson et al. 1999.

² Lambrecht 2002, 221.

³ Tyson 2001.

⁴ The polarized GM food debate, NAFTA/CEC

http://www.cec.org/files/pdf/ECONOMY/food-fight-10-questions_EN.pdf

⁵ King 2003.

⁶ *Ibid.*.

⁷ BBC News Report 2003.

⁸ ICTSD 2004.

⁹ Cowan 2003.

brought intellectual property laws covering genetically modified organisms (GMOs) to the forefront of international discussions.

This paper will proceed to show that intellectual property rights actually negate the potentially positive aspects of GM technology. I argue that three core claims posed by supporters of GM foods do not hold out in reality due to the effects of intellectual property rights and the imposition of patents. This is evidenced through essentially three assertions: (i) GM foods will not offer a real solution to world hunger, (ii) intellectual property rights hinder the research and development process and (iii) national regulatory and administrative bodies may be unable to prevent abuses of GMO monopoly rights. The basic structure of each discussion will begin with an argument from the pro-GMO side followed by an analysis of the ways in which intellectual property rights refute such an argument. Each section will then conclude that GM foods are detrimental to the livelihood and health of citizens in both developed and developing countries.

Before beginning, it is important to define some key terms referred to throughout this piece. A genetically modified food is created when a foreign gene is inserted directly into the chromosome of an organism producing a desired trait not traditionally exhibited by that plant or animal.¹⁰ GM crops thus are foods (we shall limit our analysis to edible plants) which are grown from seeds which contain the genes of a different species.¹¹ Corporations, as the primary producers of GMOs, are quick to assert their intellectual property rights in this area. The intellectual property rights primarily of interest here will be defined as the obligation of a state to grant the inventor of a new product an exclusive patent for a set period of time during which the inventor has sole rights or privileges on the sale or the conditions of use of his or her invention. After this set period, the product will be released into the public domain and the inventor will no longer have sole rights on the conditions of its production, sale and usage.

Alleviating Hunger World-Wide through Patented GM Seeds?

The first claim I will delve into is the one that states GMO technology will eliminate present and future world hunger. Life science companies and some academics have suggested that with the world population set to further increase very substantially over the 21st century, GM crops will help solve the problem of world hunger. Nobel Prize winner Norman Borlaug states that GM crops engineered to be resistant to viral and fungal diseases or those which have greater tolerance for soil alkalinity will be necessary to feed the 8.3 billion people predicted to be on this Earth by 2025.¹² Along a similar stream, researcher Peter Lacy argues that with 840 million people currently underfed and future world hunger on the rise, the ability of GM crops, such as Sygenta Corp.'s vitamin-A enriched "Golden Rice"TM and Monsanto's insect-resistant *Bacillus thuringiensis* (*Bt*) corn, to promote greater crop yields in the developing world cannot be ignored.¹³ While GM crops introduced to developing nations may indeed benefit farmers working under difficult climates and soil conditions, these pro-GM positions assume that the transfer of expensive

¹⁰ Groleau 2001.

¹¹ Borlaug 2000, 489.

¹² *Ibid.* 487.

¹³ Lacy 2003, 190.

technology will occur freely and easily. Such viewpoints do not take into account the constraints on the industry put in place by intellectual property rights.

What Borlaug and Lacy fail to recognize is that biotechnology is driven by the private sector which is ultimately concerned about profit margins. The constraint of intellectual property rights on biotechnology means that developing nations will not reap the benefits suggested by GM advocates. Specifically, GM foods will not help developing countries due to the higher seed prices created by patenting and other forms of intellectual property rights. The price of GM seeds has become unaffordable for farmers in developing nations. In 2001, the technology fee for a 50-pound bag of Monsanto's glyphosate herbicide-resistant (GR) Roundup Ready™ soybeans in the United States was \$6.50 and for the company's borer-resistant *Bt* corn the patenting fees ranged from \$117 to \$138.30 per bag.¹⁴ The cost to enforce seed contracts for Monsanto is great, but the penalty for a failure to honor GM contracts is greater. Such a failure would mean the infringer is liable up to 120 times the applicable technology fees in addition to all legal fees.¹⁵

If substantially greater yields were possible, then the high price of GM seeds driven up by intellectual property rights might be justified. However, there is no evidence that GM seeds will produce the crop yields suggested. Gerald C. Nelson and his collaborators at the Universities of Illinois, Stanford and the International Food Policy Research Institute have concluded that even assuming a world-wide adoption of *Bt* corn and GR soybeans without any political constraints, the effects of these technologies would be minimal relative to the size of the global market. The most optimistic estimates would be a 4.9 percent decline in the price of corn and a 1.7 percent drop in prices for soybeans. For corn, world production would increase by less than 2 percent and soybeans would increase by a fractional 0.5 percent.¹⁶ Farmers would not see a substantial difference in crop growth despite paying more money for GM seeds.

The aforementioned evidence serves to test the current US claim that the EC GMO moratorium is preventing developing countries from making use of biotechnology, "notwithstanding the fact that scientists from the region have insisted that the technology is crucial to boosting food production in Africa and breaking the cycle of malnutrition and starvation."¹⁷ While it may be true that scientists from local communities could fare better at creating plant genes that would meet the needs of their people, the fees being applied by corporations on seed production alone suggest that the transferring fees of biotechnology may be too expensive for developing world farmers. Furthermore, as noted in the previous paragraph, to eliminate the hunger that poorer nations are experiencing would require a much greater yield than the current biotechnology available from the US is capable of producing. The US stance also does not fully acknowledge that the benefits of GM foods hinge upon the good governance of developing countries much more than on the availability of biotechnology. Even advancements in crop modification cannot provide a solution for obstacles such as a lack of political willingness to create viable institutions and infrastructure necessary for agriculture.¹⁸ Consequently, the argument that the EU moratorium is preventing the easing of hunger does not take into account constraints upon the use of biotechnology in the developing world.

¹⁴ Nottenburg et al. 2001, 103.

¹⁵ *Ibid.*

¹⁶ Nelson 1999, 6.

¹⁷ ICTSD 2004.

¹⁸ Diouf 2004.

The combination of high seed prices and low crop yields suggest that the assumed redistribution of food and biotech will not happen. Multinational corporations (MNCs) guard their products jealously because of the great costs of research and development. Even when a crop enjoys a high level of priority, the development process consisting of synthesis, production and registration takes from 5 to 7 years from start to finish.¹⁹ The high price of capital and the length of time needed to develop GM crops are strong motivators for companies to obtain patent protection for their research investments.

Investor confidence is another large factor in the push for intellectual property protection, ultimately hindering an equitable distribution of GM products. For instance, when Monsanto's patent for its Roundup Ready™ crops was due to expire in 2000, stock prices declined as shareholders anticipated the loss of patent protection and became wary of new competition entering the field, thereby taking away Monsanto's monopoly on the market.²⁰ In order to recoup the enormous investments from developing a GM crop, companies require users of GM seedlings to sign agreements stating that they will not re-use the seeds in the following season.²¹ Such practices come into conflict with the deep-rooted and time-honored tradition of farmers saving, sharing and reproducing seeds²² and do not allow them to continually cultivate much-needed self-reproducing crops. The high price of GM seeds suggests that aid will not come to the developing world's farmers in the form of GM crops.

IPRs: Are they Really Favoring Research and Development?

The second claim to be discussed is the notion that biotechnology companies will make increasingly faster advancements in GM foods if encouraged to patent their products. Basic economics suggests that corporations will invest more in research and development if they know they will profit from such innovations for a pre-determined time period. This is the basic premise on which the WTO's Agreement for the Trade-Related Aspects of Intellectual Property Rights (TRIPS) is built. The TRIPS Agreement, which entered into force in 1995 as part of the WTO Agreement, is the first global intellectual property regime to extend effectively into state regulatory bodies.²³ Susan Sell, a political scientist at George Washington University, notes that TRIPS conveniently caters to GMO corporations. That is, the agreement extends the rights of patent holders who already hold monopolistic privileges while reducing "the options available to future industrializers by effectively blocking the route that the earlier industrializers followed."²⁴ TRIPS raises the price of information for nations who lack such technology putting much of the developing world at a fundamental disadvantage, since developing countries require imports covered by intellectual property rights the most.²⁵

While it is true that if companies have absolutely no profit-incentive they may not invest in innovation at all, patent claims under the current intellectual property structures actually limit the use of new genes for research and development.

¹⁹ Lappé and Bailey 1999, 141.

²⁰ Newell 2003, 58.

²¹ *Ibid.*

²² Alteri and Rosset 1999, 155-162.

²³ Sell 2003, 1.

²⁴ *Ibid.* 9.

²⁵ *Ibid.*

Although property rights are not a new phenomenon, the patenting activity has increased substantially. Peter Phillips and Dan Dierker note that the sheer volume of GM patents places a very heavy stress on patent systems in many states around the world:

There were 299 400 patent applications in the United States in 2000, in addition to the more than 2.7 million patents already granted. With only 4 900 patent examiners, on average each examiner has only about 30 hours to review and decide upon each patent...If you have ever looked at some of the patent claims, you will immediately see the problem. Even relatively straightforward patent applications often involve 20 to 30 claims, cite 50 to 100 sources acknowledging prior art, and in cases involving genes can stretch to more than 200 pages.²⁶

Due to the large amount of work necessary and the short amount of time available, patent offices are unable to do justice to the request and this has resulted in unsubstantiated claims and overlapping rights. Where intellectual property rights are weak, it is difficult to clearly specify the boundaries of the knowledge being contracted upon.²⁷ Dispute resolution over which company owns the right to which gene is ultimately left up to the marketplace and the courts to decide.²⁸ Problems caused by the large number of patents and the legal battles over intellectual property have raised the cost of marketing new GM foods. The overall result is a delay in using new biotechnology.

Another hindrance to the research and development process, by no means specific to the field of GMOs, is the desire of researchers working for private corporations to act in their own self-protection. This particular problem stems from the researcher's leverage once he or she has finished researching the technology needed to create the GM product. Upon acquiring pertinent knowledge in the company's production and commercialization phase, the researcher's bargaining power is in the possibility that he or she may decide to leave and develop the product for another company.²⁹ Conversely, if an inventor does not have the financial resources to put a product on the market, he or she must partner with a corporation to do so. In this case, the lack of property rights for the inventor coupled with the strong patenting rights of the corporation would make it possible for the company to steal the invention either outright or through reverse engineering. To avoid theft, the inventor may negotiate a lengthy contract before revealing their research to any firm, causing yet another delay in using the potential technology available.³⁰

Intellectual property rights have also influenced the public sector. While gene knowledge has been originally concentrated in universities and public research institutes, both faculty and other public researchers are now demanding patents and non-disclosure agreements from corporations who promise a share of the financial returns.³¹ As an added incentive, if academics focus on patentable work, they are more likely to garner outside fiscal support from companies and the extra funding

²⁶ Phillips and Dierker 2001, 133-134.

²⁷ Anand and Galetovic 2000, 618.

²⁸ Phillips and Dierker 2001, 134.

²⁹ Anton and Yao 1995, 191.

³⁰ *Ibid.*

³¹ Phillips 2001, 114.

could be rewarded with advancement and promotions within the department.³² In a controversial decision at the University of California, Berkeley, nearly the entire Department of Plant and Microbial Biology agreed to sell confidential information to corporate giant Novartis in exchange for \$5 million dollars over the span of a 5 year period.³³ For Canadian institutions working on GM canola, such as the University of Calgary and the University of Manitoba, deals with corporations take the form of becoming project partners with companies such as Dow AgroSciences³⁴ and Rhône-Poulenc³⁵ respectively. Unfortunately, the push for patenting rights has caused academics to publish breakthroughs in GM foods less often and, in fact, the quality of work being produced has fallen. The lack of quality in publications is evidenced in the lower than average citation rates seen in five key Canadian universities after they began to work in collaboration with large biotechnology corporations.³⁶ Moreover, researchers may be forced to postpone informing the public of their findings until a patent has been issued for the results.³⁷ The decreased amount of academic research available widely means the knowledge that furthers the understanding of GM foods is not available to those without the rights to see it. A reluctance to cooperate in the sphere of universities not only slows the distribution of information, but also the ability of academics to produce ground-breaking research in the area of biotechnology.

Legal disputes over the ownership of GM patents show that intellectual property rights actually impede the process of innovation in biotechnology. According to data from the United States Patent and Trademark Office, a total of 388 patents are held by 81 separate research organizations for the rights to develop the (*Bt*) gene in GM corn. This ambiguity over *Bt* gene ownership has resulted in three major lawsuits between four large MNCs. To date, these litigation proceedings have led to over 175 million dollars in settlements and destroyed more than 1 billion dollars in shareholder value.³⁸ In another lengthy case, Swiss developers trying to commercialize their vitamin-A enhanced "Golden Rice"TM discovered they needed to first acquire 70 patents, 40 of which were owned by private organizations or individuals. A study done later showed that many of the original 70 patents were duplicates and that only 12 real patents actually existed.³⁹ As the corporations embroiled in the above legal battles can readily attest to, the expensive effect of patenting GM foods counteract the claim that intellectual property rights will encourage the research and development.

National Food Safety Regulations, Corporate Responsibility and IPRs

The final claim to be addressed is the conception that national food regulation is sufficient to effectively ensure that GM foods will be safe to eat. In 2001, The Food and Drug Administration (FDA) in the United States, with a worldwide reputation for

³² *Ibid.*

³³ Pringle 2003, 92.

³⁴ UTI 2004.

³⁵ Government of Manitoba 2004.

³⁶ Phillips 2001, 115.

³⁷ Boyens 1999, 199.

³⁸ Phillips and Dierker 2001, 134.

³⁹ *Ibid.*

the thorough testing of the North American pharmaceutical supply, updated and strengthened their 1992 policy guidelines for bio-engineered foods to provide a comprehensive guide for the industry at large.⁴⁰ The new rules require full food safety evaluations and a mandatory 120-day pre-market notification for new agricultural products. The FDA places the onus on the patent applicant to determine that the new plant variety does not contain dangerous levels of allergens or toxins and reserves the right to perform unannounced inspections as it sees fit.⁴¹ Additional prominent regulatory bodies include the United States Department of Agriculture (USDA) which is mandated to ensure GM plants do not spread unintended genes to native vegetation, and the Environmental Protection Agency (EPA) mandated to ensure that GM foods do not harm the vegetation or wildlife.⁴² With these large regulatory branches in place, the North American public is assured by the government that GM foods pose no risk to the environment or to their foods supply.

The majority of civil society and non-governmental organizations (NGOs) have responded negatively with regards to the abuse of monopoly property rights and the lack of social corporate responsibility in manufacturing and distributing GM foods. There is evidence to suggest that corporations who currently retain the monopoly on the genes needed to create transgenic crops have misjudged and ignored the possible dangers of GMOs in a rush to put their products on the market. There is the need for MNCs to act quickly and aggressively before their patents, and thus their control over that industry, expire. As a result, examples of government and regulatory errors in GM foods abound. The now famous monarch butterfly incident reveals that the EPA approved Monsanto's *Bt* corn without first validating the studies Monsanto performed on insects and other organisms. When a study found that the toxins from the pollen in *Bt* corn unintentionally killed monarch caterpillars, EPA officials admitted that they did not require Monsanto and other biotech corporations to prove there would not be any ecological effects from the GM corn.⁴³ In the highly publicized Posilac[®] case against Monsanto, it was determined that cows injected with the bovine growth hormone (rBGH) produced milk that increased drinkers' chances of contracting breast and colon cancer.⁴⁴ The FDA and Monsanto continue to maintain that Posilac[®] induced milk is "perfectly safe and virtually identical to normal milk."⁴⁵ The growth hormone has been used in the United States since 1993, but has been banned by Canadian health authorities after findings from the Canadian Veterinary Medicine Association determined that the hormone may harm the well-being of animals injected with it.⁴⁶ One has to assume that some national regulatory bodies still knowingly refuse to protect the public from products that are unsafe.

In part due to controversies like these and other problems with food safety, the majority opinion around the world is against GM foods or wary of the lack of regulation and labelling. According to a comprehensive poll done by the Consumers' Association of Canada, 91% of the respondents said they believed a label should be placed on GM ingredients. In the same study, 80% of Canadian respondents said the government was not providing them with enough information to make an informed

⁴⁰ International Food Information Council 2002.

⁴¹ *Ibid.*

⁴² Hart 2003, 63.

⁴³ *Ibid.*

⁴⁴ Hart 2003, 42.

⁴⁵ *Ibid.* 43.

⁴⁶ The Globe and Mail, January 14, 1999.

decision about GM foods.⁴⁷ This reluctance to accept biotechnology is also seen for instance in Hong Kong as 75% of those surveyed agreed they would like to see labelling on GM foods.⁴⁸ The majority of the EU members have made their stance against GM products clear internationally. Even in the US where the government continues to be extremely forceful in advancing GM foods globally, 93% of respondents deemed the labelling of GM foods necessary or desired.⁴⁹ As labelling is still not required by law in some countries, it is clear that these governments have not been responsive to the concerns their citizens raise over GM foods.

Conclusion

The conclusion drawn here is that national rules are not effective enough to control corporate conduct in light of the fact that the biotechnology industry remains in the hands of a few powerful corporations. Even more worrisome is the above-mentioned observation that MNCs may be monetarily and practically linked to governmental entities. University of Sussex researcher Peter Newell states that the state-business relationship is crucial to understanding how the government itself defines its national interests.⁵⁰ The profits of MNCs are part of the knowledge economy and seen as drivers of major economic growth whether in the form of taxes payable or job and capital creation. More unsettling still is evidence which suggests that there is a revolving door for scientists between the biotechnology industry and the government. FDA deputy commissioner Michael Taylor, for instance, placed in charge of drafting the guidelines on the bovine growth hormone used to produce Posilac[®] was an attorney for Monsanto for seven years.⁵¹ Unfortunately, irresponsible corporate or state conduct has made current national regulations insufficient to guarantee the safety of GM foods.

The reality of intellectual property rights refutes three major arguments used for the advancement of GM foods. This paper has shown that intellectual property rights on GM food products eliminate the possibility that GM crops can provide a real solution to world hunger. I have also shown that patenting rights do not increase the capacity for public and private research in the biotechnology sector, and that abuses of GM monopoly rights occur due to the insufficient regulation of GM foods.

Although this essay contends that current obstacles remain for those who believe GM foods exist for the global good, I do not mean to suggest that it is impossible for these barriers to be overcome. For instance the ratification of the Cartagena Protocol on Biosafety last year which operationalizes the precautionary principle indicates the movement of many states towards valuing biodiversity and human health over possible gains from trade. Furthermore, on June 29, 2004, the FAO's International Treaty on Plant Genetic Resources for Food and Agriculture has entered into force. In this landmark multilateral agreement, the 55 countries that ratified it so far agree to adhere to a so-called Multilateral System which covers about sixty food and feed crops, and for which a general framework of principles providing access to plant genetic resources in exchange for the sharing of benefits accruing

⁴⁷ Consumers' Association of Canada 2003.

⁴⁸ South China Morning Post 2003.

⁴⁹ Lappé and Bailey 1999, 119.

⁵⁰ Newell 2003, 61.

⁵¹ *Ibid.*

from this access has been negotiated (access and benefit sharing or ABS).⁵² While NGOs criticize the treaty for its relatively short list of agreed upon crops, its lack of international protection for farmers' rights and its closed-door negotiations dominated by richer nations,⁵³ such a significant step towards a worldwide commitment to responsible governance of germplasm may yet prove to be a platform off which subsequent more detailed and specific protocols or other agreements will emerge. It is the hope of this young scholar that further acknowledgement of an environmental ethic will come to fruition alongside biotechnological advancement in the present century.

References

- Alteri, Miguel and Peter Rosset. 1999. Ten Reasons why Biotechnology will not Ensure Food Security, Protect the Environment and Reduce Poverty in the Developing World. *AgBioForum* 2 (3): 155-162.
- Anand, Bharat N. and Alexander Galetovic. 2000. Weak Property Rights and Hold up in R&D. *Journal of Economics and Management Strategy* 9 (4): 615-642.
- Anderson, Kym and Chantal Pohl Nielsen. 2000. GMOs, Food Safety and the Environment: What Role for Trade Policy and the WTO? *Centre for International Economic Studies*. September. Available at <http://www.adelaide.edu.au/cies/0034.pdf>.
- Andree, Peter. 2002. The Biopolitics of Genetically Modified Organisms in Canada. *Journal of Canadian Studies* 37 (3):162-188.
- Anton, James J. and Dennis A. Yao. 1995. Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights. *The American Economic Review* 84 (1):190-209.
- BBC News, UK Edition. 2003. Bush: Africa hostage to GM fears, 22 May. Available at <http://news.bbc.co.uk/1/hi/world/americas/3050855.stm>.
- Borlaug, Norman E. 2000. Ending World Hunger: The Promise of Biotechnology and the Threat of Antiscience Zealotry. *Plant Physiology* 124 (October): 487-490.
- Boyens, Ingeborg. 1999. *Unnatural Harvest: How Corporate Science is Secretly Altering Our Food*. Toronto: Doubleday Canada Limited.
- Consumers' Association of Canada. October 2003. Decima Poll. Available at http://www.consumer.ca/pdfs/2003.12.03-press_conference_slides.pdf.
- Cowan, Richard. 2003. Biotech not the Answer for Africa. *Reuters*. November. Available at <http://www.organicconsumers.org/ge/africa111103.cfm>.
- Diouf, Jacques (Director-General). 2004. *Biotechnology: FAO response to open letter from NGOs*. Rome. 16 June. Available at http://www.fao.org/newsroom/en/news/2004/46429/print_friendly_version.html.
- ETC group. 2001. The Law of the Seed! *Translator* 3 (1). Available at http://www.etcgroup.org/documents/trans_treaty_dec2001.pdf.
- Food and Agriculture Organization of the United Nations. 2004. International Plant Genetic Resources Treaty Enters into Force. *FAO Newsroom*. Available at <http://www.fao.org/newsroom/en/news/2004/47027/index.html>.

⁵² FAO 2004.

⁵³ ETC group 2001.

- Government of Manitoba. 2004. ARDI Research Project 98-022 Summary. Available at <http://www.gov.mb.ca/agriculture/research/ardi/projects/98-022.html>.
- Groleau, Rick. 2001. *PBS Online: Engineer a Crop*. Available at <http://www.pbs.org/wgbh/harvest/engineer/>.
- Hart, Kathleen. 2003. *Eating in the Dark: America's Experiment with Genetically Engineered Food*. United States: First Vintage Books ed.
- ICTSD. 2004. US Argues EU GMO Moratorium Hurts Developing Countries. *Bridges Weekly Trade News Digest* 8 (15). Available at <http://www.ictsd.org/weekly/04-04-28/story4.htm>.
- International Food Information Council. March 2002. *Food Biotechnology*. Available at <http://www.ific.org/food/biotechnology/index.cfm>.
- King Jr., Neil. 2003. EU ban on Biotech Products to Face Challenge from the U.S. *Wall Street Journal*. May. Available at <http://www.organicconsumers.org/ge/euban051203.cfm>.
- Lacy, Peter. 2003. Deploying the Full Arsenal: Fighting hunger with Biotechnology. *SAIS Review* 23 (1): 181-202.
- Lambrech, Bill. 2002. *Dinner at the New Gene Café*. New York: St. Martin's Griffin.
- Lappé, Marc and Britt Bailey. 1999. *Against the Grain*. United Kingdom: Earthscan Publications Ltd.
- Letourneau, Deborah K. and Beth Elpern Burrows, eds. 2002. *Genetically Engineered Organisms*. United States: CRC CRC Press LLC.
- Levin, Morris A. and Eitan Israeli, eds. 1996. *Engineered Organisms in Environmental Settings: Biotechnological and Agricultural Applications*. United States: CRC CRC Press LLC.
- McIroy, Anne. 1999. Ottawa Refuses to Approve Bovine Growth Hormone. *The Globe and Mail*, January 14, A1.
- Nelson, Gerald C. et al. 1999. The Economics and Politics of Genetically Modified Organisms in Agriculture: Report on the Implications for WTO 2000, Executive Summary. Bulletin 809, November. Available at <http://web.aces.uiuc.edu/wf/GMO/execSummary.html>.
- Newell, Peter. 2003. Globalization and the Governance of Biotechnology. *Global Environmental Politics* 3 (2): 56-71.
- Nottenburg, Carol et al. 2001. Addressing Freedom-to-Operate Questions for International Agricultural R&D. In *The Future of Food*, edited by Phillip G. Pardey, 99-127. Washington: International Food Policy Research Institute.
- Phillips, Peter W.B. and Dan Dierker. 2001. Public Good and Private Greed: realizing Public Benefits from Privatized Global Agrifood Research. In *The Future of Food*, edited by Phillip G. Pardey, 129-148. Washington: International Food Policy Research Institute.
- Phillips, Peter W.B. and George G. Khachatourians, eds. 2001. *The Biotechnology Revolution in Global Agriculture: Innovation, Invention and Investment in the Canola Industry*. United Kingdom: CABI Publishing.
- Pringle, Peter. 2003. *Food, Inc.: Mendel to Monsanto - The Promises and Perils of the Biotech Harvest*. United States: Simon and Schuster, Inc.
- Sell, Susan K. 2003. *Private Power; Public Law: The Globalization of Intellectual Property Rights*. United Kingdom: Cambridge University Press.
- South China Morning Post*. 2003. See: The Campaign to Label GE Foods. "Most want GM labels: Survey." 28 May. Available at <http://www.thecampaign.org/newsupdates/may01r.htm#Most>.

Subramanian, Arvind. 1999. TRIPs and Developing Countries: The Seattle Round and Beyond. Paper Presented to the Conference on Developing Countries and the New Multilateral Round of Trade Negotiations, Harvard University. November. Available at

http://www.tradeobservatory.org/library/uploadedfiles/TRIPs_and_Developing_Countries_The_Seattle_Rou.pdf.

Tyson, Peter. 2001. *PBS Online: Should We Grow GM Crops?* Available at <http://www.pbs.org/wgbh/harvest/exist/>.

University Technologies International Inc. 2004. E-Ink News Electronic News from UTI Inc. Available at <http://www.uti.ca/e-ink-23.htm>;
<http://www.uti.ca/semmedia.htm>; <http://www.uti.ca/herald.htm>.