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A Multidimensional International Examination of the Impacts of GMOs

A Biological, Economic, International Trade,
Intellectual Property, and Geopolitical View

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A Multidimensional International Examination of the Impacts of Genetically Modified
Organisms:

A Biological, Economic, International Trade, Intellectual Property, and Geopolitical View

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Abstract

This paper includes working papers, UN official documents, corporate internal memos, scientific studies, international agreements, and interviews conducted with prominent persons or experts in the fields of biotechnology, the environment, trade, economics, sustainable development, intellectual property law, and international policy. Interviews were conducted in both English and French, and printed sources appeared in both languages as well.

The thesis of this paper strives to consider the various components of genetically modified organisms in their development, use, and ownership on a global scale, examining the biological and scientific backgrounds of them, the multi-national corporations who claim to own them, and the smaller countries and populations that deal with them on a daily basis.

The differences in opinion between scientists, industry, and some of the complications with international trade and environmental sustainability will be shown, and through examination and comparison of different aspects of the arguments over genetically modified organisms (GMOs), recommendations will be advised based on a thorough synthesis of the information available from extensive multidimensional research.

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Preface

It is often said that we are what we eat. So what are we eating?

I have been studying and researching various aspects and impacts of genetically modified organisms for over two years, and I have found no end to the ever-continuing and ever-more-complex debate surrounding their use, natural development, and introduction to commercial markets and the natural environment.

Living in an industrialized, capitalistic, share-holder-driven western economy, I am always leery of trusting its large corporations and multi-national corporations due to their enormous economic and political influence. Seeing then a debate as constant and vocal both for and against the introduction of GMOs by the multi-billion dollar biotechnology industry into the ecosystem, agricultural system, and the crops destined for our dinner plates, I gave pause to consider just what it was that was being argued for and against. I began the quest for additional knowledge rather ignorant of the entire subject, and quickly found its myriad aspects dizzying. Nonetheless, the more I learned, the more I was intrigued, and now, two years later, this report is being issued as an analysis of the complex issues at hand.

This project was conducted in a very short and very busy one-month period at the end of a semester abroad, based in Geneva, Switzerland. Despite the brief amount of time available, the research contained within is thorough, the interviews conducted were of a professional nature, and the citations are all respected and worthy sources of information. Although some sources are indeed controversial, in this report I have considered their accuracy and noted an explanation at the conclusion of the report.

I have traveled around Europe collecting information, interviews, and learning the opinions of scientists, industry insiders, and locals alike, and from their response I have been

inspired to only further continue my research and delve more deeply into the subject.

This report will be officialized, published, and stored in a library of research material – my hope is that it may at some points inform and influence others, and ignite within others the curiosity to explore these issues for themselves.

Introduction

Genetically Modified Organisms have since their introduction to society created no end of controversy in their role in biodiversity, human health, and even the morality of the scientific processes used to create them. This report is an attempt to examine and critically analyze the controversy and determine the true effects of GMOs in terms of their use, both on biological, economic, and geopolitical terms and in relation to intellectual property law.

There are so many parties involved in the controversy and the subject touches on so many complex sub-contexts (US Supreme Court law, international trade agreements, corporate responsibility, sovereignty of states, moral aspects, just to name a few) that there is no end of parties voicing opinions. Entire books could be and have been written on subjects contained within.

In constructing this analysis, it was difficult to narrow down the parties to interview and the resources to cite in the following exercise, given the extreme time constraints on a project this large and this in-depth. However, after sorting through literally hundreds of papers, journal entries, and news and opinion articles, I found that the majority of references on either side of the argument seemed to be referencing the same major players in industry, the same anti-GM protests, and the same scientists on both sides of the debate. I then set out to set up interviews with those parties, and in most cases, succeeded. After conducting weeks of interviews, I sought to determine the main arguments from either side of the argument and compare and contrast them against each other in an exercise to determine which arguments stood up well against argumentation, and which, if any, quickly unraveled. I also independently considered the references used by different parties in support of their arguments in the hopes to understand the context in which their statements were made.

In addition to conducting research on the controversy, from the interviews and the various documents that I evaluated, I also gained knowledge of differing opinions and information relating to additional aspects that are not commonly addressed within the normal GMO debates.

This report will show that the situation surrounding GMOs is extremely complex and multi-faceted, and that it requires a holistic understand of many different dimensions of the biotechnology industry, international economics, environmental sustainability, and the interaction between different state parties and each's individual legislation, resulting in geopolitical implications and regional power plays. In addition, contradictions will be demonstrated and explained and downright deceptions will be outlined.

At the conclusion of this report, I will include policy recommendations for the use and distribution of GMOs as well as considerations on their introduction to developing countries, and a few comments on international trade and intellectual property issues in regards to GMOs.

Most importantly, every comment will be substantiated with references, so that regardless of the recommendations given at the conclusion of the paper, all information can be independently viewed and evaluated by the reader of this report. The author believes that the audience of this report will doubtlessly reach the same conclusion, given the evidence provided, but all topics, references, comments, and considerations are available for individual observation and analysis.

Historical Background

In order to understand the current discussion in regards to GMOs, one must understand the development and history of their creation, including that of humankind's modification of plants through history. Over the past three decades, genetically modified organisms (GMOs)

have slowly moved their way into the mainstream -- they are available around the world and are prominent in the American diet. In the same amount of time, the biotechnology industry has globalized and undergone a massive spread through the agricultural industries of countries across the world. Yet despite their relative distributional success, few topics remain as thoroughly controversial as GMOs -- some countries have even gone so far as to ban or restrict them, such as France, Germany, Greece, Italy, et al. ¹

Agriculture itself has long played a prominent role in human history, and was the key factor in assisting the change in human existence from hunter-gatherer nomads to settlers growing their own food.² There are numerous theories as to the exact evolution of this practice by early man, but across the different theories, evidence exists to support the theory that “agriculture” has existed for as many as 12,000 years, and originated from the human settlements in the “fertile crescent” area of what is now recognized as the Middle East.³ The establishment of this artificial means of producing food in large quantities in a set place allowed for the settlement of man in that set place; this establishment of man allowed for greater stability in human life, the compartmentalization of roles (different members of the community choosing an “occupation” relevant to that era), the acceleration in the development of culture, an increase in human population size, the increase in length of human life, as well as the eventual increased footprint on the surrounding environment.⁴ The concept of “agriculture” was not “natural” – not only was man repeatedly using the same land to grow food dedicated to his use, but over time “domesticated” crops by selecting which had preferable traits and replanting the offspring

¹ See Berthou, Charlotte. GE cultivation bans in Europe

Retrieved from <http://www.gmo-free-regions.org/gmo-free-regions/bans.html>

² See Guns, Germs, and Steel. National Geographic Video. Jared Diamond. 2005.

³ See "Agriculture." Microsoft® Student 2008 [DVD]. Redmond, WA: Microsoft Corporation, 2007. , and "Fertile Crescent." Microsoft® Student 2008 [DVD]. Redmond, WA: Microsoft Corporation, 2007.

⁴ See Guns, Germs, and Steel. National Geographic Video. Jared Diamond. 2005.

(seeds) of those plants. Our human ancestors greatly impacted the evolution of those species, helping to select for, promote, and push through the natural evolutionary process those traits that were preferable to man's use. Humankind gradually changed the crops grown through selective evolution, though it was human themselves doing much of the "selecting."⁵ Eventually, they also recognized that cross-breeding different types of plants through natural sexual processes allowed for the transference and combination of genes into differing and new varieties of plants and organisms.⁶

Today in our modern society, mankind is applying the new technology and modern-day knowledge of genetics to change plants and other organisms, both selecting for preferred traits and also manipulating existing organisms into hybrids. The modern-day creation of what are called genetically-modified-organisms (GMOs for short) is similar in theory to the usual ways of choosing which organisms suit humankind's uses the best, but the techniques through which the selecting is performed is by no means even remotely similar.⁷ Despite the claims of many including some within the biotechnology industry that the techniques are not really different, this paper argues that in light of scientific evidence and the testimony of experts in the field of genetics, such a statement is a scientific fallacy and is to be disregarded.⁸ This topic will be explored in more detail in later sections of this paper.

The study of genetics can be tied back to the Austrian monk Gregor Mendel who identified the process of genetic inheritance in what is now referenced as "Mendelian

⁵ See Denham TP, Haberle SG, Lentfer C, Fullagar R, Field J, Therin M, Porch N, Winsborough B. Origins of agriculture at Kuk Swamp in the highlands of New Guinea. *Science*. 2003 Jul 11;301(5630):180-1. <<http://www.ncbi.nlm.nih.gov/pubmed/12817084>>

⁶ See Rindos, David (1987). *The Origins of Agriculture: An Evolutionary Perspective*. Academic Press.

⁷ Antoniou, Michael. Personal Interview. November 12, 2009.

⁸ See Monsanto Company. (2009). *For the Record*

http://www.monsanto.com/monsanto_today/for_the_record/default.asp; and Antoniou, Michael. Personal Interview. November 12, 2009.

inheritance,” which viewed in tandem with the theory of evolution famously put forth by Charles Darwin, sets the basis for the current system of genetic inheritance and natural adaptation (or in the case of GMOs, clarifies the difference between the “natural” and “artificial” methods).⁹

American scientists James Watson and Francis Crick described the DNA double helix in 1953, and in 1973, the first man-made successful recombinant DNA organism was created by Herbert Boyer and Stanley Cohen.¹⁰ In the late 1970s, the American company Genetech produced Humulin – a form of human insulin produced by bacteria (which was later approved by the United States Department of Agriculture for commercial use), and throughout the 1980s and 1990, various institutions experimented on and reproduced in various “modified” forms bacteria, plants, and animals.¹¹ Finally, in 1990, the first genetically engineered plants intended for sale were grown under the supervision of the United States Department of Agriculture (USDA).¹² Although tests, studies, and research was conducted in Europe as well as the United States, the US was the first country to allow commercial use of GMOs and their subsequent introduction into the environment as well.¹³

Over the years, the entire process was conducted amidst the growing partnership among technology, biology, and the perceived need to adjust agricultural practices in light of changing demands placed on the industry by growing populations, widening markets, and changing

⁹ See Mendel, Gregor. (1996). Experiments in Plant Hybridization (1865). Retrieved from Electronic Scholarly Publishing Project. <http://www.esp.org/foundations/genetics/classical/gm-65.pdf>

¹⁰ See Watson, James, Crick, Francis, (1953). A structure for Deoxyribose Nucleic Acid. Retrieved from <http://faculty.fullerton.edu/kkantardjieff/C340/DH-Paper.pdf>.

Biochemists Stanley Cohen and Herbert Boyer were able to “rejoin different fragments, and insert the new genes into *E. coli* bacteria, which then reproduced.” See “Genetic Engineering.” Encyclopedia Britannica Online. Chicago: Encyclopedia Britannica, Inc. Retrieved from <http://www.britannica.com/EBchecked/topic/228897/genetic-engineering>

¹¹ See American Public Media. (2001). History of GMOs. *The Global Politics of Food*. Retrieved from http://americanradioworks.publicradio.org/features/gmos_india/history.html;

¹² See Teitel, Martin and Wilon, Kimberly. (1999). Genetically Engineered Food - Changing the Nature of Nature. Rochester : Park Street Press. (page 17)

¹³ Le Monde Selon Monsanto. Réal. Marie-Monique Robin. 2008.

environmental conditions.¹⁴ After much trial and error, the companies involved in the developing sector of biotechnology began to see that their experiments showed promise of actually producing something more or less akin to what they had been hoping for, and quickly moved to market their new findings.

Conveniently, coinciding with the development of the biotechnology industry was a growing sense that “deregulation” in the American economy and within many industries would be beneficial for markets and the economy as a whole. With the development of GMOs still in the pipelines during the late 1980s, the bioagriculture industry lobbied the US Government relentlessly to acquire favorable legislation or regulation (or lack thereof). When President Ronald Reagan strongly promoted the process of deregulating business to stimulate economic growth and increase America worldwide hegemony and the movement only grew. Later, President George H.W. Bush and Vice-President Dan Quayle worked hard to further the biotechnology industry, and further deregulated the checks and balances put into place to ensure proper procedures were upheld -- all in the name of the economy and increasing American prestige and influence. On May 26, 1992, Vice-President Dan Quayle announced that the administration was:

taking the step as part of the President’s “Regulatory Relief Initiative” now in its second phase. The United States is already the world leader in biotechnology, and we want to keep it that way. In 1991 alone, it was a 4 billion dollar industry. It should reach at least 50 billion dollars by the year 2000 as long as we resist the spread of unnecessary regulation.¹⁵

¹⁴ *Ibid.*

¹⁵ *Ibid.* Quotation from direct video footage.

The process of supporting biotechnology was continued by the Clinton administration and later that of George W. Bush.¹⁶ Dan Glickman, United States Secretary of Agriculture from 1995-2001, was quoted in an interview on the subject as saying:

...I found in the early years I was involved in the regulation of biotechnology that there was a general feeling in ag[ricultural] business and inside our government in the US that if you weren't marching lock-step forward in favor of the rapid approvals of biotech products ... [and] GMO crops that you were somehow anti-science and anti-progress. ...I think that frankly ... there were a lot of folks in industrial agriculture that didn't want as much analysis as we probably should have had because they had made a huge amount of investments in the product.¹⁷

This idea of non-regulation or deregulation was strongly promoted by the American economist Alan Greenspan, who was appointed to be the Chairman of the United States Federal Reserve in 1987, and held the extremely influential post until 2006. He was in turn heavily influenced by the ideas of author Ayn Rand – a believer in a more extreme version of laissez-faire economics to the point of “free market” economics. This “hands-off” form of economic governance has wavered in popularity throughout American history, but the modern-day version really started during the administration of Richard Nixon and took off under the guidance of Ronald Reagan in the late 1980s. Such policies had far-reaching effects, mainly on the banking industry (where the effects of deregulation finally came to light in the world-wide economic crisis of the late 2000s), but continuing into other sectors. The idea was that the markets and, expanding on that, industry would regulate themselves through its respective failure or success, and the formula was seen as an economic booster that could be applied across industries. One could argue that the financial and banking system within the United States was the core pillar

¹⁶ *Ibid.*; Also see Nova/Frontline. Interviews. Jim Maryanski. (Harvest of Fear). Retrieved from <http://www.pbs.org/wgbh/harvest/interviews/maryanski.html>; also see Rothbard, Murray. *Free Market. Library of Economics and Liberty*. (The Concise Encyclopedia of Economics). Retrieved from <http://www.econlib.org/library/Enc/FreeMarket.html>

¹⁷ See *Le Monde Selon Monsanto*. Réal. Marie-Monique Robin. 2008 ; Quotation from interview within

supporting the US economy and thus in most need of regulation, let alone the manufacturing and technology industries. Even within that, however, Greenspan's policies had such a relaxed oversight position that "he didn't believe that fraud was something regulators should worry about" or even be enforced, according to Michael Greenberger, director of the US Division of Trading and Markets at the Commodity Futures Trading Commission from 1997 to 1999.¹⁸

Distressingly, if one considers the current worldwide economic crises, much of the root cause of the problem stems from the fact that markets do not regulate themselves with enough precision that outside regulatory influence is not necessary. In fact, despite having supported such a free market economic policy for his entire career of over 40 years, on October 23, 2008, Alan Greenspan testified in front of the United States Congress Committee of Oversight and Reform that he had indeed found a "flaw" in his promoted "free market:"

Rep. HENRY WAXMAN (D), California: [*October 23, 2008*] You have been a staunch advocate for letting markets regulate themselves. And my question for you is simple.

Were you wrong?

ALAN GREENSPAN: Yes. I found a flaw, but I've been very distressed by that fact.

Rep. HENRY WAXMAN: You found a flaw in the reality.

ALAN GREENSPAN: A flaw in the model that I perceived is the critical functioning structure that defines how the world works, so to speak.

¹⁸ See The Warning. Frontline. Michael Kirk. 2009; Rothbard, Murray. Free Market. *Library of Economics and Liberty*. (The Concise Encyclopedia of Economics). Retrieved from <http://www.econlib.org/library/Enc/FreeMarket.html>

Rep. HENRY WAXMAN: In other words, you found that your view of the world, your ideology, was not right.

ALAN GREENSPAN: Precisely. No, that's precisely the reason I was shocked because I've been going for 40 years or more with very considerable evidence that it was working exceptionally well.¹⁹

And so in this environment started the deregulation of the biotechnology sector, making it easier for new developments and new technologies and products to be “approved” by the American “regulatory” agencies yielding increasingly waning power.

Further Development

Not only were the regulatory agencies in the United States having less power to wield, but they were pushed to design their policy based on political pressures being placed upon them. Being the home country of Monsanto Corporation and other major biochemical and biotechnology corporations, the United States “embraced GM technology more than any other country,” and, in addition to the belief in the policies of deregulation, neither the process nor the product were truly regulated.²⁰

According to Dr. James Maryanski, the Biotechnology Coordinator for the US FDA from 1985-2006, the policies set in place by the FDA in the early 1990s in regards to the safety regulation of GMOs were “a political decision” and not based on scientific data, applying to “not

¹⁹ *Ibid.*

²⁰ See Drezner, Daniel. (2007). All Politics is Global - Explaining International Regulatory Regimes. Princeton : Princeton University Press. (page 157)

just foods but all of biotechnology.”²¹ That policy in question is the key legislation from which much of the controversy originates, as the FDA’s official policy is one commonly referred to as one of “substantial equivalence,”²² entitling biotechnology food items as “equivalent” to non-GM food and thus not needing additional or different regulation. In the still-current 1992 FDA policy on the regulation of biotechnology, it is stated that “the substances expected to become components of food as a result of genetic modification of a plant will be the same as or substantially similar to substances commonly found in food.”²³

Furthermore, the FDA recognizes GMOs as GRAS (Generally Recognized As Safe), a term used by the FDA in the realm of food-use regulation, used to designate items as “widely recognized as safe for use in foods,”²⁴ either through specific scientific testing procedures or through recognizing a products general safety through its use and note of no noticeable problems. Unfortunately, many scientific studies have produced evidence to the contrary, noting that GMOs are indeed genetically different from their “root organism,” as well as producing evidence that questions their level of safety. Also, the techniques used to create genetically modified food are indeed different from past cultivation and even plant domestication techniques.

Interestingly, when compared to US patent law and related court cases, the entire basis for GMOs being recognized as GRAS and “substantially equivalent” comes into doubt. In a 1980

²¹ See *Le Monde Selon Monsanto*. Réal. Marie-Monique Robin. 2008.

²² Maryanski noted that the term “substantial equivalence” is a reference phrase and not an actual legal term within the United States. Please see his interview with the US Public Broadcasting Service: *Nova/Frontline. Interviews. Jim Maryanski. (Harvest of Fear)*. Retrieved from <http://www.pbs.org/wgbh/harvest/interviews/maryanski.html>

²³ See USFDA. (1992). *Guidance to Industry for Foods Derived from New Plant Varieties. FDA Federal Register, volume 57 – 1992*. Retrieved from <http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/Biotechnology/ucm096095.htm>

²⁴ See Goldberg, Israel. (2007). *Biotechnology and Food Ingredients*. New York: Springer-Verlag. (pg 548)

case regarding the patentability of a new bioengineered bacterium, the US Supreme Court ruled in *Diamond, Commissioner of Patents v. Chakrabarty* that life forms could indeed be patented under US Patent Law. As appeared in the Court's decision and as noted by biotechnology expert Dr. Luigi Palombi in his doctoral thesis,²⁵ the Supreme Court highlighted that

... the patentee has produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility. His discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter.²⁶

Furthermore, the court determined that the organism in question did indeed constitute a "manufacture" or "composition of matter" that was "artificial," "within the meaning" of US patent law. Also, the opinion showed that according to the held definition of the organism being "manufactured," under set precedent it would hold "new forms, qualities, properties, or combinations."²⁷

Because of the 5-4 decision of the 9-member US Supreme Court, US patent law has since accepted the patenting of genetically modified organisms and the processes used to produce them, allowing all GMOs used by the biotechnology industry to be protected intellectual property. However, upon examination of the Court's decision in reference to the FDA's granting of "substantial equivalence," it appears that the Court sees biotechnology creations as having "markedly different characteristics from any found in nature,"²⁸ and that they have "new forms, qualities, properties, or combinations" and are thus patentable. Following, one can easily reach

²⁵ See Palombi, Luigi. (2004). The Patenting of Biological Materials In the Context of the Agreement on Trade-Related Aspects of Intellectual Property Rights. *Doctoral Dissertation, University of New South Wales*. (pg 28)

²⁶ *Diamond, the Commissioner of Patents v Chakrabarty* (1980) 447 U.S. 303, 309 (US Supreme Court).

²⁷ The determination of "manufactured" was decided in *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1931), although the general opinion mentioned is from *Diamond, the Commissioner of Patents v Chakrabarty* (1980) 447 U.S. 303, 309 (US Supreme Court).

²⁸ *Ibid. See Diamond*.

through the process of logical determination that the organism is not “substantially equivalent.” Though the FDA’s regulation has not been legally challenged in light of the conflict in definition, the outcome of which is undeterminable, such inconsistency amongst is common throughout differing realms of legislation, both national and international particularly ones in which private industry, trade, and environmental concerns are involved.

Because the industry and regulatory bodies within the United States do not recognize a difference between genetically modified organisms and non-genetically modified organisms, there is no required labeling of GM products within the country, and as such, consumers are generally unaware of whether or not they are consuming GM products. The majority of Americans know very little about GM foods, especially when it comes to whether or not they are being consumed in the average American diet. Many individuals and organizations arguing in favor of labeling are citing the consumer’s “right to know.”²⁹ Still, the industry maintains that the labeling schemes simply diminish the successfulness of their products (studies have shown that people are reluctant to purchase or consume GM foods if they have knowledge that what they are eating),³⁰ and as biotechnology products are viewed as “equivalent” to non-GM products in the US,³¹ they cite the lack of stringent legislation as evidence that there is no real reason to label foods or organisms that are “the same.”³² Citing the problem as an excuse for not having a solution, however, is a blatant contradiction in logic.

²⁹ See Greenpeace, Intl. (2003). Behind the Label: Stay Informed. Retrieved from <http://www.greenpeace.org/usa/news/behind-the-label-stay-informe>

³⁰ As noted in Plastina, Alejandro, Giannakas, Konstantinos. (2007). Market and Welfare Effects of GMO Introduction in Small Open Economies. *AgBioForum*, 10(2): 104-123, “The only case of consumers stating their willingness to purchase a GM product when offered at the same price with its non-GM counterpart was reported by Li, Curtis, McCluskey, and Wahl (2002) in their study of consumer preferences for soybean oil in Beijing, China. It is important to note, however, that 99% of the respondents reported little or no knowledge about biotechnology.”

³¹ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

³² *Ibid.*

With a more permissive regulatory environment, GMO use in the United States expanded dramatically after 1996.³³ As the industry established itself in the American economy and then hitched itself to the “globalization” wagon train, the influence of the American biotechnology industries greatly increased, and the full potential of GMOs and their use became evident. With the gaining of power, the bioagriculture industry (especially Monsanto Corporation) made sure to introduce its products to the American agriculture system, meaning that local agriculture in America (and other countries to which the bioagriculture industry began exporting goods, such as Brazil, Canada, and China) that had “carefully adapted to local ecology and tastes over hundreds and thousands of years, must [suddenly] yield to a planetary monoculture enforced by intricate trade agreements and laws,” according to Teitel and Wilson.³⁴ Once the biotechnology industry movement hit Europe, and subsequently the European Union, Europe worked to establish its own legislation and regulatory policies.

GMO Regulation Policies

The EU also has more stringent policies when it comes to the regulation of GMOs in contrast to the US and it does recognize them as different from non-GMOs. The EU even prohibits some kinds of GM products, turning away entire shipments of foods from GM-producing regions when they arrive at EU ports.³⁵ What the primary difference is between the US and EU is that the US

³³ Dreznier, Daniel. All Politics is Global - Explaining International Regulatory Regimes. Princeton : Princeton University Press, 2007. (pg 157)

³⁴ Teitel, Martin and Wilson, Kimberly. Genetically Engineered Food - Changing the Nature of Nature. Rochester : Park Street Press, 1999.(pg 4)

³⁵ See Hogan, Michael. (2009). *GMO approvals won't unblock EU soybean imports-trade*. Retrieved from <http://www.reuters.com/article/companyNews/idUSL273306620091102>

follows the policy of “substantial equivalence” whereas the EU follows the “precautionary principle,” which is explained by the Austrian Environmental Agency as:³⁶

...An attempt to take into account explicitly the lack of certainty about the nature and extent of potential negative effects. It is based on the realization that a great deal of environmental damage caused by innovative technologies was not noticed until decades later. It thus expresses the need for learning from previous mistakes so as to prevent irreversible risks.³⁷

By the EU generally following such a theory, they in essence grant that GMOs are inherently new and untested in the world arena. The European Food and Safety Administration is in charge over the acceptance of new food and agriculture products within the EU, and as such, is in charge of the acceptance or dismissal of GMOs from the greater EU community.³⁸ It grants GMO acceptance into the union on an individual basis, but it should be noted that it allows each EU member to ban or accept them per the wishes of each individual state, allowing each member state to maintain its sovereignty in regards to that decision.³⁹ Many EU members have partial bans or restrictions on different types of GMO products, and the EU as a whole bans on non-approved GM varieties and all other foods contaminated with even trace levels of those non-approved varieties.⁴⁰

When examining various political theories of industry development and the establishment of regulatory systems and attempting to fit one on the results of the conflict between two similar industries on opposite sides of the Atlantic Ocean, it is evident that none are appropriately

³⁶ Austria is a member of the EU

³⁷ See Umweltbundesamt. (2009). *Precautionary Principle and GMO-Regulation*. Retrieved from <http://www.umweltbundesamt.at/en/umweltschutz/gentechnik/risikoabschaetzung/vorsorgeprinzip/>

³⁸ From Antoniou, Michael. Personal Interview. November 12, 2009.

³⁹ *Ibid.*

⁴⁰ *Ibid.*

applicable -- the process or regulation and topic of GMOs is too complex to easily conform to one single model:

A realist approach that assumes American hegemony would predict the global regulatory outcome to mirror American preferences on GMOs. A California effect model would assume convergence toward the upper bound of the regulatory spectrum – that is, more stringent handling of GMOs. Scholars emphasizing the importance of regulatory networks would predict European preferences to trump the American position on GMOs. Neoliberal institutionalists would predict that the rewards from regulatory coordination should lead to an accommodation between the United States and the European Union...[But] none of these models accurately predicts the outcome ... The result has been a rival standards outcome between the American preference for “substantial equivalence” and the European preference for the “precautionary principle.” The lack of a bargaining core has created an intense competition between the two great powers to bolster their position in friendly international forays, and to recruit as many allies from among the smaller states as possible.⁴¹

In fact, according to Dr. Joost Pauwelyn at the Geneva Graduate Institute, professor of International Economic Law, the GMO trade issues have created a “Cold War type battle of influence between the GMO-producing nations and the EU, in regards to the developing world. The United States, Canada, and Argentina are pushing for GMO acceptance into the European Union markets and simultaneously trying to insert their industry’s products into African countries, China, middle-European countries not yet part of the EU and other areas. The EU, meanwhile, is at least in theory opposed to the open-market acceptance of GMOs, and supports the rights of individual countries to oppose their internal use or importation – even if that means going counter to the general policy of the EU as a whole.⁴²

⁴¹ Drezner, Daniel. All Politics is Global - Explaining International Regulatory Regimes. Princeton : Princeton University Press, 2007. (pages 149-151)

⁴² From Arcand, Jean-Louis Personal Interview. November 3, 2009; also Pauwelyn, Joost. Personal Interview. November 2, 2009.

International Trade and Intellectual Property

There are many extremely complex aspects of the GMO controversy, but an integral aspect to their implementation is the aspect of the patent system and intellectual property. The main factors of intellectual property law (IPL) are the World Trade Organization and the agreements that exist within that body in regards to Intellectual property protection and product distribution and trade, the WTO “TRIPs” agreement, and the patent and IPL policies of each individual country. Within the TRIPs agreement it is stipulated that “patents shall be available for any inventions...in all fields of technology,” regardless of whether they are produced locally or imported.⁴³ One of the difficulties for multi-national corporations (MNCs) is that each individual country has differing extents of and levels of protection and the wording within the existing TRIPs agreement is not precise, leading to ambiguity as to what exactly the standards are for each country to meet. Although “patent systems” are more or less defined within later sections of the TRIPs agreement, and although signing countries of the Paris Convention in 1883 (which was itself amended frequently, as recently as 1976) agreed on a standard of patent law legislation, patent rights still remain “territorial” in that each state can execute its own details and enforcement.⁴⁴

Of the over 190 world countries,⁴⁵ 153 are members of the World Trade Organization, and by their membership, are obligated to recognize the stipulations laid forth within the WTO

⁴³ See World Trade Organization. (1994). Agreement on Trade-Related Aspects of Intellectual Property Rights.

⁴⁴ From Dolotbaeva, Aida. Personal Interview. November 13, 2009. See also Paris Convention for the Protection of Industrial Property. (1979). Paris.

⁴⁵ The exact number of countries depends on which source is used, but for the purposes of this paper, the number is compiled based on the definition of a “state” as was decided in the 1933 Montevideo Convention on the Rights and Duties of States, as well as the official membership in the United Nations. Information from Arcand, Jean-Louis Personal Interview. November 3, 2009. Also, see Convention on Rights and Duties of States. (1933). Montevideo

“Agreement on Trade-Related Aspects of Intellectual Property Rights” or TRIPs agreement.⁴⁶

According to Article 27 of the TRIPs agreement regarding “patentable subject matter,

1. Subject to the provisions of paragraphs 2 and 3, patents shall 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. ...Patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.

There remains complications to be explained, however. In the second and third section of the article, provisions are made that allows for items to be excluded from an individual country’s patent system according to certain criteria. In section 2, if the “commercial exploitation” of the inventions are deemed by a country a danger to “ordre public,” a sense of morality, or in protection of “human, animal, or plant life or health” or “the environment,” then they can legally not enforce patent laws on those entities. However, “exploitation” is not defined, nor are any other key terms within the section, leaving the section vague and open to interpretation. As such, the difficulties in negotiation of trade and modern adaptation of older trade laws to new technological advancements becomes clear.

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.

Furthermore, in relation to the aspects of the section that apply to the GMO situation,

3. Members may also exclude from patentability:

⁴⁶ See World Trade Organization. (2008). Members and Observers. (Understanding the WTO: The Organization). Retrieved from http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm.

(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.⁴⁷

Regardless of all the ambiguity in the exacting definition of words and terms used within article 27, the greatest difficulty stems from the allowance of members to “provide for the protection of plant varieties either by patents or by an effective *sui generis* system or any combination thereof.” As many genetically modified organisms can fall under both the patent system as a form of technology AND a *sui generis* system specifically protecting plant varieties, the protection parameters for this newer type of technology is not clear-cut.⁴⁸

Additionally troublesome is that developing countries in particular tend to adopt *sui generis* systems of protection, whereas developed countries tend to prefer patent protection for GMOs, and many policy makers and the GM industry is attempting to enter the markets of developing countries. For those companies to then retain patent rights and thus glean a profit from their activities, it would be necessary for the country’s protection systems to be adapted to the “typical” patent system as is seen in the economic North. Although it is commonly viewed that patent systems are a key tool to economic development, dissolving the *sui generis* systems or allowing patent systems that could infringe on traditional knowledge could yes, lead to economic development, but could also contribute to the dissolution of traditional culture in the country or region – a serious risk in the ever-globalizing world.

⁴⁷ See World Trade Organization. (1994). Agreement on Trade-Related Aspects of Intellectual Property Rights.

⁴⁸ From Dolotbaeva, Aida. Personal Interview. November 13, 2009.

The TRIPs agreement was published after the Uruguay Round of the GATT –General Agreement on Trade and Tariffs (the precursor to the WTO) in 1994. In 1999, however, article 27 came under renegotiation as stipulated in section 3b of article 27, and the discussions are still ongoing.⁴⁹

One of the issues is that when article 27 was originally created, the concept of GMOs was not in the foreground of issues that would be covered by the agreement, and as they are becoming more and more prominent in international discussions, it is difficult to reach an agreement. “In relation to biotech inventions, just until recently many countries were limiting protection by patent only to mechanical or chemical inventions. It was thought that living matters were not patentable subject matter because it is very difficult to describe the process,”⁵⁰ stated Aida Dolotbaeva from the World Intellectual Property Organization (WIPO).

Less developed countries (LDCs) – as labeled by the WTO – have until 2016 to fulfill the TRIPs agreement as a whole, and as such, are not held accountable to article 27. This provides some leeway for the LDC countries to essentially do as they wish until then, but once that date is reached, they need to fulfill their obligations as a member of the WTO and thus need to fulfill the obligations signed-to in the TRIPs agreement.⁵¹ This provides the LDCs time to adapt or create existing laws and evaluate the difference systems of IP governance.

Conflicts Between TRIPs and CBD

The Convention on Biological Diversity (CBD) was signed and came into effect on 29 December 1993, and has three main goals: “to conserve biological diversity, to use biological diversity in a sustainable fashion, and to share the benefits of biological diversity fairly and

⁴⁹ From Dolotbaeva, Aida. Personal Interview. November 13, 2009.

⁵⁰ *Ibid.*

⁵¹ *Ibid.*

equitably.”⁵² Because of the wording of the international agreement as well as its broad objectives, it runs into conflict with the TRIPs agreement. In regards to the treatments of resources under IP and patent governance, the CBD agreement is long and covers a plethora of subjects and details, multiple of which could very well apply to biodiversity and the subject of GMOs. Most notable is Article 16, Section 5 which notes that patent rights may “have an influence” on the accomplishment of the objectives of the convention and demands the cooperation of the signees of the treaty to ensure that the treaties objectives are indeed accomplished:

The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation and international law to ensure that such rights are supportive of and do not run counter to its objectives.⁵³

Noted by the Third World Network (TWN),⁵⁴ there are a number of issues that arise between TRIPs and CBD that have important implications in regards to intellectual property legislation, the regulation of biotechnology products such as GMOs, and international trade. One should note, however, that the TRIPs agreement is a legal trade framework undertaken by the WTO, which is equipped with its own enforcement mechanisms.⁵⁵ However the CBD is more of an ideological environmental treaty – a type that major players on the world market are reluctant

⁵² See Convention on Biological Diversity. (2009). About the Convention. Retrieved from <http://www.cbd.int/convention/about.shtml>

⁵³ See Convention on Biological Diversity. (1992). Rio de Janeiro.

⁵⁴ In a statement issued to the Expert Panel on Access to Genetic Resources and Benefit-sharing (Montreal, Canada March 19 - 22, 2001). See Third World Network. (2001). Statement Issued. Expert Panel on Access to Genetic Resources and Benefit-sharing. Montreal. Retrieved from <http://www.twinside.org.sg/title/benefit.htm>

⁵⁵ The WTO is equipped with the Dispute Settlement Body and the Appellate Settlement Body. For more information, see World Trade Organization. (2009). Dispute Settlement. Retrieved from http://www.wto.org/english/tratop_e/dispu_e/dispu_e.htm

to sign to, and even more loathe to ratify and then effectually enforce.⁵⁶ The issues raised between the two are numerous,⁵⁷ such as the conflict between national sovereignty and the rights of IPR holders to resources available within a sovereign state, the conflict between communal rights and private rights, the failure of TRIPs to incorporate any benefit-sharing arrangement between IPR holders and states as is noted in the CBD, and the moral issue of patents on life forms.⁵⁸

National Sovereignty is a very large issue, and one that this paper argues is key to the international trade aspect of the GMO issue. The CBD has incorporated a high level of respect of individual determinism and the rights of states over the natural resources within their country. However, also according to TWN, TRIPs “facilitates the conditions for misappropriation of ownership or rights” and essentially “enables persons or institutions to patent a country’s biological resources in countries outside the country of origin” of the said patented resources through its reliance on patent law and non-inclusion of alternative measures of resource governance.⁵⁹ Thus the rights of individual states are compromised by the specifications of TRIPs, and as recognition of its specifications are necessary for introduction into the WTO,⁶⁰ countries are pressured to conform in the name of development and yield to its requirements first and those of the CBD second.

So too is the issue of the communal and private rights to resources at issue, as well as the sharing of benefits between right-holders of resources and the community or state in which the

⁵⁶ As evidenced by the varying degree of signing or ratification of UN Environmental Treaties by the international community, especially that of the United States.

⁵⁷ From Tuncak, Baskut. Personal Interview. October 29, 2009; Pauwelyn, Joost. Personal Interview. November 2, 2009; also Dolotbaeva, Aida. Personal Interview. November 13, 2009.

⁵⁸ See Third World Network. (2001). Statement Issued. Expert Panel on Access to Genetic Resources and Benefit-sharing. Montreal. Retrieved from <http://www.twinside.org.sg/title/benefit.htm>

⁵⁹ *Ibid.*

⁶⁰ From Dolotbaeva, Aida. Personal Interview. November 13, 2009.

resources are located. Following the IPR recommendations along patent law regulation within the TRIPs agreement, it is clear that private interests can indeed hold a patent over a biological resource within another state,⁶¹ without the state whose resource is patented having knowledge of or recourse to defend the exploitation of that said resource. This le of states or communities not receiving adequate compensation for the use or exploitation of their resources.

The main issue is that there are so many international treaties that often have conflicting or mutual exclusive regulations, advisements, or agreements, and also that so many different countries do or do not sign or ratify the treaties that incorporate a universal standard of communal resource protection in the midst of booming international trade and the influence of multinational corporations which creates an intricate mess.

Another important issue is that the numerous trade agreements and environmental agreements are completely separate and their points are not incorporated into one another. As was stated by Dr. Pauwelyn, the WTO “knows nothing about science – they are a trade organization,”⁶² and additionally, agreements within the WTO are meant to deal only with trade and in fact are purposely not designed to incorporate anything other than specifically trade-related issues, setting aside all human rights, environmental, etc. issues for other parties and outside negotiations.⁶³ In order for states to have the incentive and legal ability to simultaneously promote economic advancement and environmental responsibility, aspects of both need to be jointly considered and agreed upon, especially within the realm of GMOs and biotechnology.

⁶¹ Although that patent would be applied for, approved, issued, and valid in another country.

⁶² From Pauwelyn, Joost. Personal Interview. November 2, 2009.

⁶³ From Dolotbaeva, Aida. Personal Interview. November 13, 2009. This statement is not meant to be harshly critical of the WTO in that aspect. By serving to address only specifically trade-related issues, the organization actually functions much more smoothly than if they were to incorporate political, scientific, and ideological issues into their trade negotiation sessions.

GMO Safety Called Into Doubt

Perhaps the most significant and common argument put forth by GMO proponents is that there is no scientific evidence supporting the idea that GMOs could have harmful effects on human health, animal health, and even environmental health. Because countless studies do indeed exist, one might be tempted to state that there is a disagreement within the scientific community as to whether or not this technology is dangerous. That statement has inaccuracies in and of itself, however perhaps the most accurate description of the situation is that the studies that are issued, peer reviewed, and published regarding the harm or potential harm of GMOs to the natural environment or in regards to consumption are ignored or dismissed – often with strange excuses.⁶⁴ Perhaps a better conclusion is that there is a lack of consensus on the genetic stability, environmental safety, safety for animal and human consumption of, and the usefulness of GMOs as a whole.

The real controversy over GMOs stems not over the spread of genetically modified plants through the environment, nor over the moral question of artificially creating and then patenting life – instead, the controversy is over the inherent safety of the technology, and the reliability and trustworthiness of the biotechnology companies.

Monsanto Company, based in St. Louis, Missouri, is the self-professed world leader in biotechnology and were the main innovators in developing the technology that is now used throughout the industry to used to genetically modify organismal DNA.⁶⁵ Founded in 1901, Monsanto Corporation has throughout the 20th century played a major role in United States

⁶⁴ Monsanto and other industry labels the study as flawed. From Ramsay, Johnathan. Personal Interview. November 9, 2009.

⁶⁵ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

industry. Primarily described as a chemical company, they developed techniques, research, and products that were used around the world, many of which have since then proved extremely controversial in their own right; examples include the sweetener saccharin, DDT,⁶⁶ conducting uranium research for the Manhattan Project,⁶⁷ Agent Orange,⁶⁸ PCBS,⁶⁹ aspartame,⁷⁰ and other products, other plastics, synthetic fibers, rGBH,⁷¹ RoundUp herbicide,⁷² and now GMOs.⁷³

Although Monsanto was not the sole producer of many of the before-listed items, their prominent role as industry leaders in the development or production of them has granted the company a giant-like status. Furthermore, their less-than-impressive record on environmental safety and the surfacing of many internal documents from whistle-blowers or in class-action lawsuits, some titled “Confidential” or “Read and Destroy,” has documented a consistent history of misleading public trust, corporate greed, manipulation of scientific findings, and the covering-up of findings showing their products exhibiting extremely toxic effects.⁷⁴

In all fairness, “Monsanto Corporation” as it exists today is a much smaller “agricultural company” from the chemical giant it once was.⁷⁵ Although it is now one of three individual and separate companies that once existed as “Monsanto,” “the indemnification obligations such as ‘environmental obligations’ and ‘liabilities of the Chemicals Business’ exist among the

⁶⁶ Profiled in Rachel Carson’s *Silent Spring*.

⁶⁷ The infamous US military project credited for creating the first atomic bomb

⁶⁸ It was successfully used by the US military as a defoliant in the Vietnam war but was proven to be extremely toxic

⁶⁹ Monsanto knew they were toxic and still proceeded in improper burial procedures in Anniston, Alabama, causing deaths and sickness to countless individuals

⁷⁰ An artificial sweetener that is accused of being unsafe. From Antoniou, Michael. Personal Interview. November 12, 2009.

⁷¹ It was marketed as Posilac. See *Le Monde Selon Monsanto*. Réal. Marie-Monique Robin. 2008.

⁷² It was also targeted for its safety record

⁷³ See *Selon Monsanto*. Réal. Marie-Monique Robin. 2008 ; also see Gillam, Carey. (2009).

CORRECTED – TIMELINE: History of Monsanto Co. Retrieved from <http://www.reuters.com/article/Genentech/idUSN1032100920091111>

⁷⁴ See *Le Monde Selon Monsanto*. Réal. Marie-Monique Robin. 2008

⁷⁵ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

companies and certain service and supply agreements [between the three] are ongoing,” according to Monsanto’s corporate website and its official public security disclosures.⁷⁶ As a result of their history and the liabilities remaining, their objectivity towards their products is called into question; ergo the question remains as to whether or not Monsanto should be believed when it states that its products are perfectly safe for consumption and release. And as the majority of the biotechnology industry uses techniques and processes licensed from Monsanto, the safety of their biotechnology products should be questioned as well – regardless of whether or not they have been “approved” by “regulatory” agencies or “proven” safe from less-than-objective industry-funded research.

Biotechnology’s Revolving Door

Additionally concerning is that so many individuals involved in regulatory or policy positions are so heavily influenced by the biotechnology industry – the reach of Monsanto and other biotechnology or agricultural groups is renowned.⁷⁷ Numerous sources point out that the biotechnology and indeed “Big Agriculture” industries have strong connections with many working in the regulatory system that is supposed to be the enforcement mechanism for those industries. There is a history of officials leaving industry for the regulatory system, as well as officials leaving the regulatory system for industry. Within the United States, there are many instances of industry-regulatory system involvement, the most recent of which is President Obama’s appointment of Michael Taylor, former biotechnology lobbyist and Monsanto employee, to an advisor role in the US Food and Drug Administration (FDA). In the EU, Suzy Renckens, a member of the European Food Safety Authority (EFSA) vacated her chair heading

⁷⁶ See Monsanto Company. (2009). *For the Record*
http://www.monsanto.com/monsanto_today/for_the_record/default.asp

⁷⁷ From Bardocz, Susan. Personal Interview. November 10+11, 2009.

the panel in charge of establishing risk assessment regulation for GM plants,⁷⁸ in favor of employment at Syngenta, another large biotechnology firm. This “revolving door” system of industry-government “cooperation” adds just one more reason as to why the decisions by the regulatory systems can be called into question.

When considering the motivation of individuals to “switch sides” so frequently, many suspiciously close to situations resulting in personal reward, a simple graph of the financial gains made by the industry examples should be sufficient to demonstrate available finances. The following graph pulled from Google’s finance page illustrates the performance of the stock prices of three large biotechnology companies over a ten year period, Monsanto (MON), Syngenta (SYT), and Bayer (OCT: BAYRY), against the performance of the US Dow Jones Industrial Average , the US Nasdaq Composite, and the US S&P 500.



⁷⁸ For more information on Michael Taylor or Suzy Renckens, see Institute for Independent Impact Assessment in Biotechnology. (2009). Leading European Food Safety Authority Staff Member Moves into Industry. Retrieved from <http://www.testbiotech.org/en/node/260>.

As can be seen, the biotechnology stocks consistently outperform the markets at astoundingly uncommon levels – Monsanto in 2008 reaching a 1000 percent price increase over its 2001 value, while the rest of the market struggled to break even. It must be considered that regulatory officials may benefit financially from their regulatory decisions.

Scientific Concerns – Are \ Techniques Fully Developed?

According to Jeffrey Smith, the well-known author and anti-GMO activist, more or less everything that was known to be “true” a decade ago regarding genetic manipulation is now wrong.⁷⁹ As such, he argues, why should these new GMO products be trusted as safe, if in another 10 years, everything known will appear just as wrong? He stresses that the science of genetic manipulation is imprecise and still in the infantile stages. Adding to that consensus are numerous scientists, policy-makers, and others in the know who have all encountered the inner-workings of the process of GMO approval or of the inner workings of the biotechnology industry an Monsanto itself (and its many subsidiaries and fellow GMO producers). Says Dr. Charles Benbrook, formerly an agricultural staff expert on the Council for Environmental Quality under the Carter administration in the US,

... They have no control over where in that cell or where in that plant's genome the new genetic material gets lodged and expressed. Because they don't have control over that, they have absolutely no basis to predict how that trans-gene, the new genetic material, is going to behave in the future as that plant deals with stresses in its environment, whether it's drought, too much water, pest pressures, imbalances in the soil, or any other source of stress. They just don't know how it's going to behave. They don't know how stable that expression is going to be, or whether the third generation of the plant is going to behave just like other generations. They don't know whether the promoter gene, which has been moved into the plant to turn on the new piece of genetic material, will influence some other biosynthetic pathway that's in the plant, turning on some natural process of the plant

⁷⁹ See Smith, Jeffrey. (2006). You're eating WHAT? [Audio Recording] The GMO Trilogy. Institute for Responsible Technology.

when it shouldn't be turned on, or turning it off too soon. There are all sorts of things that they don't know.⁸⁰

Additionally, as could be expected, with relaxed environmental and safety regulations, Monsanto and other biotechnology companies could produce more quickly without all the meddling tests and inspectors.⁸¹ What happened in addition to rising profits, greater market share, and increased world presence by the now international biotech industry, however, was the creation of many different types of hybridized species of plants and bacteria and viruses -- some successful in attaining their goals, and some being monstrous failures as a result of imprecise technology used in their creation:

The whole operation is performed thousands of times, largely because there is so much uncertainty about the outcome. There's no way of telling where in the genome the new DNA will land, and if it winds up in the wrong place, the new gene won't be expressed, or it will be poorly expressed, or the plant might be a freak. I was struck by how the technology could be astoundingly sophisticated while also being a shot in the genetic dark,⁸²

wrote author Michael Pollen, after visiting a "GMO facility" owned by the biotechnology and chemical manufacturing giant Monsanto.

Safety of GMO Consumption

Although GMOs have been approved by regulatory agencies in the United States, Europe, and other countries and have been consumed for over a decade by millions of people,

⁸⁰ See Benbrook, Charles. (2009). Genetic Engineering Retrieved from <http://www.bioneers.org/node/1499>>

⁸¹ Smith, Jeffrey. (2003). Seeds of Deception. Iowa : Yes ! Books, 2003 (pg 129)

⁸² See Teitel, Martin and Wilon, Kimberly. (1999). Genetically Engineered Food - Changing the Nature of Nature. Rochester : Park Street Press.

definitive scientific studies proving their safety or risk for human consumption are lacking.⁸³ Industry provided studies that, if well designed and well-executed, provided definitive answers should still risk the skepticism of conflict-of-interest doubters. Unfortunately, those industry-provided studies that do exist have come under extreme criticism for poor design, non-disclosure of true findings, and even tampering with evidence and analysis, all the while being accepted by regulatory agencies as valid. Because the focus of the GMO debate rests on ideological and moral grounds over the artificial creation and patenting of life, the vast majority of academics are unaware of the scientific studies beginning to surface indicating not minor but extreme risks to animal and thus human consumption.⁸⁴ Although the industry still labels these studies as “flawed” or “not accepted,” or simply dismisses them for other reasons,⁸⁵ the simple existence of large and significant doubt to the safety of biotechnology products should cause pause in any consumer of food.

Studies from academics and laboratories around the world and even within the industry itself have indicated effects such as immunological effects,⁸⁶ changes in cell structure and functioning of the liver, pancreas, and testes,⁸⁷ the natural development of blood, generational

⁸³ See Antoniou, Michael. [Brief] Scientific evidence documenting the negative impacts of genetically modified (GM) foods on human and animal health and the environment.

⁸⁴ Although this statement has been repeated by Jeffrey Smith, Michael Antoniou, Susan Bardocz, Stanley Ewen, this became evident through my interviews with officials at the Geneva Graduate Institute as well.

⁸⁵ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

⁸⁶ "Transgenic Expression of Bean -Amylase Inhibitor in Peas Results in Altered Structure and Immunogenicity", Prescott et al, *Journal of Agricultural and Food Chemistry*, 53 (23), 9023 -9030, 2005

⁸⁷ Organic Soil Association Study, Malatesta M., Biggiogera M., Manuali E., Rocchi M.B.L., Baldelli B., Gazzanelli G.: Fine structural analyses of pancreatic acinar cell nuclei from mice fed on GM soybean. *Eur. J. Histochem.*, 47:385-388, 2003; Malatesta M., Caporaloni C., Gavaudan S., Rocchi M.B.L., Tiberi C., Gazzanelli G.: Ultrastructural morphometrical and immunocytochemical analyses of hepatocyte nuclei from mice fed on genetically modified soybean. *Cell Struct. Funct.*, 27: 173-180, 2002; Malatesta M., Caporaloni C., Rossi L., Battistelli S., Rocchi M.B.L., Tonucci F., Gazzanelli G.: Ultrastructural analysis of pancreatic acinar cells from mice fed on genetically modified soybean. *J. Anat.*, 201:409-416, 2002; Malatesta M., Tiberi C., Baldelli B., Battistelli S., Manuali E., Biggiogera B.: Reversibility of hepatocyte nuclear modifications in mice fed on genetically modified soybean. *Eur. J. Histochem.*, 49:237-242, 2005;

effects (meaning that ill effects are biologically transferred to the offspring of test subjects),⁸⁸ random genetic changes,⁸⁹ and even unexplained deaths within test animals having consumed GMO products.⁹⁰

Another important factor to consider is that although the biotechnology industry claims to have full knowledge of their actions and a complete understanding of genetics (or at least sufficient enough to create organisms that self-replicate and are eventually consumed),⁹¹ the emergent science of epigenetics suggests that mankind has only an elementary understanding of genetics as a whole:

It has long been known by scientists that the artificial insertion of genes physically disrupts other genes through the damage caused by the uncontrolled insertion process ('positional effects'). In addition, the chemical functioning of the new gene interacts with the activity of the plants' existing genes and biochemical pathways, and so disrupts the metabolism in unpredictable ways. However, research into the new science of "epigenetics" (meaning 'above genetics') is also now showing that genes account for only a part of the control of the biochemistry of organisms, and organisms have a level of control above genes that interact with genes. The exact details of this interaction between the rest of the organism and its genes are still far from known. However, this more complete understanding explains why genetic engineering is so unpredictable, with different results produced by each attempt and why the products are often unstable.⁹²

Biological Concerns

Vecchio L., Cisterna B., Malatesta M., Martin T.E., Biggiogera B.: Ultrastructural analysis of testes from mice fed on genetically modified soybean. *Eur. J. Histochem.*, 48: 449-453, 2004.

⁸⁸ Ermakova IV, "Genetically modified soy leads to the decrease of weight and high mortality of rat pups of the first generation", preliminary studies. *EcosInform* 2006, 1, 4-9 (in Russian). A more intricate version is available: Ermakova IV, Genetics and ecology, in: *Actual problems of science*, Moscow, 2005, pp.53-59 (in Russian).

⁸⁹ See Organic Standard Soil Association. *New research on the impact of GMOs on health.*

⁹⁰ *Ibid.*

⁹¹ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

⁹² See Organic Standard Soil Association. *New research on the impact of GMOs on health.*

A few distinct features set bioengineered food apart from naturally originating organisms. First, the genetic alterations that scientists have performed could never occur in nature. The techniques used by science today, despite the opinions of some “experts,” are not natural in that they could never occur without the actions taken by modern man armed with advanced specific genetic manipulation instruments.⁹³ The two main techniques are the introduction of DNA through either a gene gun or an agrobacterium, itself containing foreign DNA.⁹⁴ The gene gun technique shoots DNA sections with a desired external trait into the individual cells of the target organism, and the DNA then inserts itself into the existing DNA or the target organism.⁹⁵ This is not always successful, as once fired, the new DNA can incorporate fully, incorporate partially, or not incorporate at all. Also, if it does incorporate, there is no way of knowing where in the DNA code it will incorporate, thus creating extreme variance in the possibility of its expression and possibly changing the expression of the existing DNA traits.⁹⁶

When the artificial genetic manipulation process takes place, the normal natural balance created through millennia of evolution against strange genetic anomalies are bypassed -- genetic and organismal replication were perfected over those thousands of years, and human

⁹³ Although this is the position of this paper, the statement is promoted by Susan Bardocz, Stanley Ewen, and Michael Antoniou.

⁹⁴ The agrobacterium technique was developed by Mary Dell Chilton from Washington University in the early 1980s, some of whose research was funded by Monsanto Corporation. (For more information see Vanderkam, Laura. (2008). “What Amuses Me:” Mary-Dell Chilton. Retrieved from <http://www.scientificamerican.com/article.cfm?id=what-amuses-me-mary-dell-chilton&page=2>.

According to experts in the field, the technique is still used today as one of the main forms of genetic manipulation in the biotechnology industry and biotechnology research. Obviously, the current trend of its use is expected as a 2008 US patent request with Monsanto Technology LLC listed as the assignee uses agrobacterium introduction of genes into other organisms. For more information, see United States Patent Office. (2007). *Methods for Producing Transgenic Plants*. (Patent application US 2008/0118981 A1). Washington, DC: US Government Printing Office.

⁹⁵ From Bardocz, Susan. Personal Interview. November 10+11, 2009.

⁹⁶ *Ibid.*

manipulation of those genetics undoes all guarantee of what may result.⁹⁷ As such, it is not impossible to comprehend the arrival of strange, never-before-seen genotype or phenotype mutations. What comes as a result of genetic manipulation is never certain, even in the labs.⁹⁸ As these genetically modified organisms (GMOs) are released into the environment and breed with naturally originating organisms, the “man-made” DNA becomes incorporated into the DNA or naturally occurring plants -- spreading the possible effects of the scientific-alteration resulting “adjustments.”⁹⁹

One could draw parallels between the development of the new biotechnology industry and an essence of colonization -- both of the markets of other less-dominant countries through establishing seed-providing monopolies for the local farmers, and the entire food chain itself, through the gradual contamination of the natural organisms by the DNA of GMOs.¹⁰⁰ It is well established, even by organizations such as the World Health Organization, that the effect of GMOs on the natural population of a species (if it exists) could be detrimental, harming the existing populations and the general biodiversity of the area. This is aside from the notations that GMOs can exhibit harmful results to humans.¹⁰¹ Also, according to J. Craig Ventor, the discoverer of the human genome, a release – either accidental or purposeful – of bioengineered algae (near the basis of the world-wide food chain) could be “disastrous” to the environment.¹⁰²

⁹⁷ Although this is the view taken by this paper with an understanding of evolution, sexual and asexual reproduction, genetic manipulation, and basic overall biology, it is substantiated by Michael Antoniou.

⁹⁸ There were 270 failed “Dollys” before Dolly the sheep was successfully cloned. They all died -- some did so deformed and pained. For more information see Teitel and Wilson.

⁹⁹ Teitel, Martin and Wilson, Kimberly. (1999). Genetically Engineered Food - Changing the Nature of Nature. Rochester : Park Street Press.

¹⁰⁰ Drezner, Daniel. (2007). All Politics is Global - Explaining International Regulatory Regimes. Princeton : Princeton University Press.

¹⁰¹ Food Safety Department, WHO Modern food biotechnology, human health and development : an evidence-based study. Geneva: WHO Press, 2005. (pages 14-21)

¹⁰² Dr. Ventor also stated that there are no scientific studies supporting the idea that GMOs currently on the market destined for the food supply have the risk of ill-effect. However, his research institute is also partially funded by Monsanto. Therefore, this paper argues that his objectivity is biased.

For humans, there have been health scares inside the United States, although they were not widely publicized. One of the more recent situations involved accidental exposure to a GMO created “not for human consumption.” Monsanto’s StarLink variety of corn was genetically modified to contain the toxin *bacillus thuringiensis* (Bt) to help its resistance against insects, but the human digestive system is not capable of breaking down the toxin -- thus yielding it inedible. Eventually, however, the StarLink corn managed to contaminate some of the corn used in Kraft taco shells, resulting in its recall.¹⁰³ Such situations do not necessarily speak well for the possibility of a wide-array of GMO foods, as cross-contamination is all but impossible to avoid.¹⁰⁴

This process is not limited solely to agriculture, however. Scientists have developed a GMO salmon that is faster growing than the naturally occurring kind -- maturing much faster. However, should they be released or escape into the wild, the natural fish populations could be in jeopardy.¹⁰⁵

GMOs and Environmental Safety

Because the seeds of GM crops can float with the wind, it is difficult to contain the spread of GMOs in an ecosystem, and animals and plants alike breed with their own species (GMO animals and plants are not conscious of the fact that they are, oddly enough, genetically different from their own species).¹⁰⁶ Such crossbreeding allows for the possibility of super-organisms, be they weeds, insects, animals, or even bacteria and viruses. These organisms

¹⁰³ Drezner, Daniel. (2007). All Politics is Global - Explaining International Regulatory Regimes. Princeton : Princeton University Press. (pg 152)

¹⁰⁴ Le Monde Selon Monsanto. Réal. Marie-Monique Robin. 2008.

¹⁰⁵ A.A. Snow, D.A. Andow, P. Gepts, et al. « Genetically Engineered Organisms and the Environment : Current Status and Recommendations. » *Ecological Applications* 15.2 (2005): 377-404. (pg 378)

¹⁰⁶ Le Monde Selon Monsanto. Réal. Marie-Monique Robin. 2008; Drezner, Daniel. (2007). All Politics is Global - Explaining International Regulatory Regimes. Princeton : Princeton University Press. (pg 352)

capable of withstanding even the deadly chemicals created by humans would surely enable them to threaten other forms of wildlife, possibly resulting in the native species' crowding out and even extinction, due to the abnormal Darwinian "fitness" of the mutant species.¹⁰⁷

Biotechnology has advanced to the point where it is possible for DNA from almost any organism to be paired with that from any other organism: plants can be engineered to use genes from bacteria, animals, and even humans. As is noted by the Institute for Responsible Technology:

Spider genes were inserted into goat DNA (in hopes that the goat milk would contain spider web protein for use in bulletproof vests), cow genes were used to turn pigskins into cowhides, jellyfish genes were used to make pigs' noses glow in the dark... arctic fish genes gave tomatoes and strawberries tolerance to frost, potatoes [were created] that glowed in the dark when they needed watering, and human genes were inserted into corn to produce spermicide.¹⁰⁸

What is the Controversy?

As if there is not enough confusing information in regards to the GMO "situation," there is not even a consensus on what aspect of the GMO controversy is under discussion. Frequently, the argument is made that the GMO controversy is simply ideological, with dissenting parties arguing mainly on the morality (or immorality) of mankind influencing naturally-occurring genetics.¹⁰⁹

Although some may state that there is a lack of consensus amongst the scientific community as to the safety and stability of GMOs, that statement appears to be a bit of a falsehood. Basically, there are three parties – the GMO industry has produced with its own

¹⁰⁷ *Ibid.*

¹⁰⁸ FAQs - Institute for Responsible Technology. (2009). Retrieved from <http://www.seedsofdeception.com/GMFree/AboutGMFoods/FAQs/index.cfm>

¹⁰⁹ From Antoniou, Michael. Personal Interview. November 12, 2009.

scientists evidence supporting the safety of GMOs for consumption,¹¹⁰ whereas the international community of scientists have produced mountains of evidence through international and peer-reviewed studies showing that GMOs produce dangerous effects.¹¹¹

The platform of the GMO industry states that there is no well-constructed scientific study proving any dangerous effects of GMOs, whereas the international scientific community claims that there indeed exists such evidence.¹¹² It has become apparent that the biotechnology industry emphasizes the ideological controversy and arguments, as they can benefit the most from keeping the argument ideological and side-stepping the issue of scientific evidence against their products. And this works, as in keeping the argument ideological, the media capitalizes on the issue and the population as a whole can easily be swept up in the issue. As long as ideological arguments and morality is at the heart of the issue, no-one is being informed of or educated on the highly important scientific information that is available, or on the potentially devastating implications of that science.¹¹³

Man of course has a strong attachment to food – as previously mentioned agriculture is at the heart of the development of culture and many societies and religious have meals and community eating in the center of their traditions. Unfortunately, in today’s modern culture, most of the west (where the biotechnology industry is booming) is ignorant of and detached from their agricultural system. According to an article published in the Agronomy Journal on “The Privatization of food: corporate control of biotechnology,” “the detachment has resulted in the mythologization of the farmer, as well as ... a lack of knowledge about how the food there are eating arrived on their plate.” It goes on to state that “when presented to many consumers, the

¹¹⁰ *Ibid.*

¹¹¹ *Ibid.*

¹¹² *Ibid.*

¹¹³ *Ibid.*

idea that a North American farmer would have his seed controlled by a large corporation is appalling.” Nonetheless, that control is the looming reality, and much of North America is ignorant of that fact.¹¹⁴

It should be noted that despite the size and influence of many of the corporations, they do not yet have the kind of influence over the food chain that many other corporations do, and in perspective, the giant agriculture corporations are much larger in size.¹¹⁵ However, it is the precedent that is set by their owning the majority of seeds, combined with the ability of their patented technology to spread to other regions that is unsettling – under existing laws, those corporations would then control those items contaminated by their products. Also, as the industry grows larger, seed companies will be bought through mergers and acquisitions. “This can be seen with hybrid corn and cotton in the USA, where smaller seed companies have been bought by large multinational corporations.”

Additionally, because the industry is run by private firms (which is highly unlikely to change), the work that is performed is meant to turn a profit, mainly to the shareholders. And as the stock prices “depend on its portfolio of intellectual property,” no company is going to turn over to other products or processes it has developed. As companies seek to find the largest-grossing project, smaller less broadly-applicable products will be ignored – even if the technology or processes are developed to a usable level in less-than-prime markets like niche-markets in the economic South.

Essentially, the system is inherently flawed. It remains clear that the main reason for the creation of these products – in fact the entire biotechnology industry – is profit, despite the possible ideological intentions of the companies’ founders. Considering the different

¹¹⁴ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

¹¹⁵ *Ibid.*

environments and agricultural practices around the world, no set few crops will work as a one-size-fits-all solution to any crisis (draught, pests, weeds, hunger, etc) -- it is necessary to develop all sorts of types for different regions. However, the industry doesn't – steered by the company stakeholders – the shareholders. Additionally problematic is that “enforcement of intellectual property rights by corporations could lead to the breakdown of intellectual property protection in many developing countries.”

Because of this process, this paper argues for maintaining transparent public-private partnerships. What needs to be ensured, however, should such practices be put into place, is strong transparency and a clear delegation of accountability. Doing such is no small task – and yet, doing so is easier said than done. Given the current level of revolving-door employment between policy-makers, regulators, and industry employees, though doing so will be difficult.

The Biotechnology Industry's Vicious Cycle

One of the criticisms of GMO development is that the majority of development and production, in addition to the majority of individuals in regulatory positions, all stem from the same company or few companies. In fact, there are only a few companies throughout the world that hold the majority of patents on GMO production technology in their intellectual property portfolio.¹¹⁶

Because most if not all organisms that fall under the “GMO” category are owned and placed under patent, and as there are only a few companies that hold said patents, only a few companies hold the rights over the majority of organisms. This has created what can be described as a dangerous monopoly, and a situation that needs alternatives. Developing one, however, can

¹¹⁶ From Bardocz, Susan. Personal Interview. November 10+11, 2009.

prove difficult. According to a study that placed the development of GMOs into a mathematical “game theory” model, there exists a vicious circle in relation to the existence of many GMO-producing organizations. Because such complicated techniques involving expensive technology and advanced techniques are involved in the process, only larger companies with considerable capital are able to expend the resources involved in creating GMOs, thus making it difficult for smaller companies to become involved. In the game theory study, it was proven that, even if smaller companies were able to start up, they would sooner or later conglomerate into a few larger corporations, proving that the distribution of GMO production among smaller companies is impossible without stronger control from regulatory bodies.

In addition, the study showed that even if the bioagricultural industry were publically funded at its origin (existing as a public-private cooperation), the development would become dominated by private funds. This is not to portray private investment as a negative thing, however – the use of this example is simply to illustrate that the private consolidation is inevitable. Using the example of the canola crop, the analysis showed how over a 30 year span concluding in 1999, the bioagricultural development of canola grew from a (majority) public-funded \$18 million industry to a (majority) privately funded exercise using over seven times the original capital:

Significant increases in private investment research shifted a modest public research program to a large research industry dominated by private sector participation. In 1970, 83% of the total spending on canola research (\$18 million) was public investment, while 17% was private investment. By 1999, the private sector's share had grown to 70% of the total \$149 million expenditure (Canola Research Survey). This funding shift is also evident in the registration of new varieties.¹¹⁷

¹¹⁷ Ibid

What is most serious is that as has been demonstrated, regardless of the starting point, the biotechnology industry will conglomerate, and as is indicated below, with the passage of new patent allowances on biotechnology products (i.e. life forms), not only is the industry controlled by few, but the vast majority of GM crops are controlled by the few patent holders. This control of large parts of the food chain (or at least large parts of the agricultural industry by the biotechnology industry) creates a new sense of “monopolistic rights, stemming from the “rapid consolidation of the agricultural biotech industry, primarily through acquisitions and mergers.”¹¹⁸

Conclusion

In addressing the controversy of GMOs, one must adopt a logical and methodological approach to evaluating the situation, due to the sheer amount of information, scientific studies with conflicting results, misinformation, propaganda, and rhetoric, one must be very careful in choosing the opinions one heeds.

The overflow of information does not negate the clarity with which some information shines through, however. It is established that Monsanto owns the overwhelming majority of GMO trademarks (upwards of 80%), and thus controls an overwhelming monopoly over the GMO industry.¹¹⁹ As such, it is clearly to their benefit that GMOs continue to spread around the world as fast as possible -- the more widespread across the ecosystem they are, the larger the profits are for Monsanto. That, combined with the leakage of internal memos indicating that their primary goal is to make money (over say, produce something worthy of feeding the world) should raise warnings over the trustworthiness of their statements in favor of GMOs.

¹¹⁸ Ibid

¹¹⁹ Le Monde Selon Monsanto. Réal. Marie-Monique Robin. 2008.

Additionally, and incriminatingly, it is well established that Monsanto has previously manufactured toxic (indeed lethal) products and billed them as safe while simultaneously suppressing evidence that the products were indeed deadly.¹²⁰

Furthermore, Monsanto, Syngenta, and other biotechnology corporations and interests have a huge influence inside governments in the United States, Europe, and elsewhere, with a strong “revolving door” situation. Because of the conflict of interests present, there is no acceptable or trustworthy stopgap measure that would act as a clarifier or litmus test against transgressions or other issues related to the biotechnology industry.

Given all the available information, the best-case scenario for the environment is that GMO effects are as yet not established as harmful or harmless. In the worst-case scenario, GMOs pose a toxic risk to human health and the environment, and regardless, they will continue to spread amongst the existing environment and food supply as long as they are cultivated and used.

It is irresponsible for any government authority to approve products with such potential dangers -- proven or not. There is no proven direct benefit of GMOs that could possibly outweigh any of the demonstrated or theorized dangers.

Even if the hundreds if not thousands of studies performed showing toxic effects from the use of GMO or their related products are indeed flawed or incorrect, the mere existence of doubt in regards to the safety of the foods, in light of their potential to mix with the rest of the biological ecosystem including humans, should set off a warning signal. Although the “precautionary principle” is dismissed as luddite-like or some form of technology-phobia, it should be strongly heeded as a wise dogma.

¹²⁰ Ibid

Analysis Recommendations

The patent system as a whole was in part created as an economic stimulus – as inventors would be able to accrue profit from their ideas and as such, would be encouraged to develop ideas in the hopes of generating personal wealth – which would then be spent, stimulating the economy. In regards to genetic manipulation and the development and ownership of DNA and beings as a whole, in patent systems in countries throughout the world, this analysis agrees with the conclusion put forth by the Nuffield Council on Bioethics that although the patent system has proven itself to be a worthwhile economic generator as well as leading to the general benefit of societies, the patenting of DNA and ownership of life forms under patent law just might be a step too far. This paper also holds that continuing to patent new life forms sets a dangerous precedent towards owning higher life forms – reasonably, there is no real limit to which organisms can be patented.

Although it is doubtful the patent laws set in place around the world will be replaced, the biotechnology industry and international trade systems including the WTO and its subsequent treaties need to be able to respect *sui generis* systems of biodiversity-maintenance like that in TRIPs, and other systems. Also, each state's sovereignty and the culture of the local peoples needs to be respected and allowed to import only that which it chooses, regardless of pressure from neighboring states or communities.

With national governments, especially in the North which the biotechnology industry calls home, government and industry need to cooperate to maintain a transparent process of introducing new products, especially those like GMOs, into the environment and the food supply. Because the world-wide public chooses non-GM foods and products over GM version

when informed, it is clear that education of the consumer is extremely important in maintaining a knowledgeable populace in charge of their own future. It is unethical to introduce new organisms into the food chain and in essence conduct an experiment as to their existence in the natural world and the diet of the public.

Important as well is the holistic education of policy makers in fields aside from that in which they specialize, such as science, so that that they are made capable of not being easily swayed by lobbyists and being able to hold for themselves ideas relating to the development of scientific advancements. Also important is that they are able to adequately read through studies and analysis independently if need be. Obviously, the current system is not successfully allowing for this, and without it, policies will remain incomplete in their breadth of coverage, taking into account only specialist's views.

Also pertaining to politicians is the important of limiting revolving door activities – time limits and other restrictions need to be placed on the positions in regulatory or official positions so that officials are prohibited by law from changing between regulator and regulated within a certain time frame. Without reform, individuals will continue to pass from regulator to regulated, taking full advantage of the perks available by the loopholes in the employment scheme.

Safety testing measures need to be revamped as well, especially in regards to the food system. There needs to be no doubt that new technologies and new biotechnology products are not harmful – not just an assumption that they are safe. Because of the mountains of studies indicating that there might not only be some harm, but great harm indicates that the current safety-testing measures in place are inadequate. This paper holds that independent testing agencies need to be able to conduct testing free of pressure from political, monetary, or other influences. Additionally, they need to be able to conduct testing for as long as is deemed

necessary. There needs to be a valid accusation that something is unsafe even after it is approved, the products need to be reevaluated for safety. Most important is the establishment of the precautionary principle as the universal standard, siding on the end of safety rather than the faster recuperation of capital invested in technology that may or may not work.

Finally, trade law and environmental treaties need to be revamped. Although trade laws, especially the key clause in TRIPs, have been undergoing revisions for a lengthy period, there needs to be some incorporation of environmental and responsible trade laws established in recognition of the objectives sought to be established by said agreements. Because idealistic environmental treaties often proposed “unfunded mandates,” the environmental treaties themselves need to be aware of the realities of the other obligations states are held to. It is better to have a realistically-designed environmental treaty that is respected by the signed agreeing states than to have a lofty, ideological agreement that is frequently set aside in favor of economic advancement.

Perhaps in accomplishing these goals the ability of states to accomplish sincere advancements in environmental and trade improvements will be improved, as well as minimizing the continued release of unproven biotechnology into the environment and food supply. So too will anti-corruption legislation, bureaucratic transparency, holistically educated policy makers, and more realistically and purposely designed treaties serve the purpose of allowing for more responsible governance and a world community with somewhat fewer problems.

Author’s Note – In Defense of Sources

Due to the controversial nature of the findings of this paper as well as in regards to the sources used in this paper, it has been deemed necessary to attach a section in defense of some of the more controversial references, demonstrating why they were found acceptable to use in this

academic paper.

Many sources on both sides of the GMO argument are criticized as being biased, including but not limited to the documentary *Le Monde Selon Monsanto*, Dr. Stanley Ewen, Dr. Arpat Puztai, Dr. Susan Bardocz, Monsanto Company, and others.¹²¹ However, after meeting with many of them and hearing their defense in regards to their corresponding criticisms, I came to find that the accusations leveled against them are inaccurate, unfounded, or otherwise satisfactorily defensible.

Dr. Ewen, Puztai, and Bardocz are accused of inaccurate science,¹²² but on every count satisfactorily refuted the accusations leveled against them and explained their actions in context,¹²³ leading this paper to the conclusion that the negative actions taken against them and accusations of bad science levied against them were political in nature. Additionally, due to the nature of their findings and their published conclusion on said findings along with evidence demonstrating as such, it can be concluded that the political pressure originated from the biotechnology industry and passed through the highest levels of government, resulting in the thorough attempts against their reputation.¹²⁴ Not only does their successfully accepted science and extensive knowledge lead them to be good sources, but the political battle in which they were involved simply increases their ability to yield interesting and informative information.

The documentary *Le Monde Selon Monsanto* was created by the French journalist Marie Monique Robin. On the official Monsanto blog,¹²⁵ it is described as “A horribly biased documentary which portrays Monsanto in a very negative light, and an example of “shoddy

¹²¹ From Ramsay, Johnathan. Personal Interview. November 9, 2009.

¹²² *Ibid.*

¹²³ From Bardocz, Susan. Personal Interview. November 10+11, 2009; and Ewen, S. W. B. Personal Interview. November 10+11, 2009.

¹²⁴ *Ibid.*

¹²⁵ See Monsanto Company (2009, February 10) Monsanto according to Monsanto. Message posted to <http://blog.monsantoblog.com/2009/02/10/monsanto-according-to-monsanto/>

journalism.”¹²⁶ On another post, a Monsanto employee with the name of “Chris” belittles the documentary as one “which consists largely of Ms. Robin typing Google searches into her computer.”¹²⁷ In defense of the documentary, there are frequent Google searches performed on-screen by the director – however, they all lead to official government documents, respectable scientific and press articles, and insider Monsanto documents. The film did indeed portray Monsanto very negatively, but every comment was backed up with live expert interviews (many holding doctoral degrees in their field) and hard evidence. As for the accusation of “shoddy journalism,” it should be noted that Ms. Robin has received 20 various international awards for her work as an investigative journalist, including the “Prix Albert Londres,”¹²⁸ the Laurier du Sénat,¹²⁹ FIGRA’s Best Investigative Documentary Award,¹³⁰ and The Award of Merit from the Latin American Studies Association.¹³¹ This report values her reputation as a credible and responsible journalist over the opinions of the Monsanto employee blog.

Monsanto Company, a key player in the biotechnology industry and frequently mentioned in this paper, is described as “evil,” “greedy,” or “arrogant” by some groups criticizing them.¹³² Although I cannot necessarily prove that they are not the aforementioned adjectives, and though they are found responsible in many instances for the problems related to the GMO discussion, through the interview conducted with a Monsanto executive, my view differs from the above. They were found to be not “evil,” but just diametrically opposed to the other side of the GMO issue on an ideological basis, believing that through their sciences they

¹²⁶ *Ibid*

¹²⁷ See Monsanto Company (2009, April 9) Marie-Monique Robin and me. Message posted to <http://blog.monsantoblog.com/2009/04/06/marie-monique-robin-and-me/>

¹²⁸ It is a prestigious award recognized as the French national version of the Pulitzer Prize for journalism in the United States

¹²⁹ Another French national award, it is designated to that year’s best Political Documentary

¹³⁰ From Bardocz, Susan. Personal Interview. November 10+11, 2009.

¹³¹ *Ibid.*

¹³² *Ibid.*

will indeed help the world (and get rich in the process). After concluding my research, this paper came to the determination that Monsanto and its employees could best be described as ideological, extremely capable businesspeople fully competent on ways to further their cause, though they frequently lacked a thorough comprehension of the science behind their promoted technologies and the possible consequences stemming from them.

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ISP Work Log

September 17 – Background Research + Advising Session

Watched film *Le Monde Selon Monsanto* by Marie-Monique Robin (2 hours)

Advising session with Dr. Csurgai (.5 hours)

Approximate Work Time: 2.5 hours

October 10 – Background Research

Watched film *Food, Inc* (2 hours)

Approximate Work Time: 2 hours

October 13 – Interviews + Background Research

Presentation with J. Craig Venter with informal personal interview following (1 hour)(.33 hours)

Approximate Work Time: $1 + .33 \times 4 = 1.33$ hours

October 21 – Background Research + Advising Session

ISP research (6 hours)

Searched Internet for sources and contacts

Advising session with Dr. Lambert (.5 hours)

Approximate Work Time: 6 hours

October 26 – Background Research

ISP research (9 hours)

Searched Internet for sources and contacts

Sent emails to potential contacts

Watched film *Unnatural Selection* (2 hours)

Approximate Work Time: $9 + 2 = 11$ hours

October 27 – Background Research

ISP research (9 hours)

Searched Internet and databases for sources

Sent emails to potential contacts

Read through and annotated sources

Approximate Work Time: 9 hours

October 28 – Background Research

ISP research (5 hours)

Searched internet and databases for sources and contacts

Sent emails to potential contacts

Read through and annotated sources
Approximate Work Time: 5 hours

October 29 – Interviews + Background Research

ISP research (5 hours)
Read through and annotated sources
Personal interview with CIEL (1 hour)
Approximate Work Time: $5 + 1 \times 4 = 9$ hours

October 30 – Background Research

ISP research (8 hours)
Read through and annotated sources
Approximate Work Time: 8 hours

October 31– Background Research

Watched film *Silent Forest* (1 hour)
ISP research (8 hours)
Searched Internet and databases for sources
Read through and annotated sources
Emailed and called contacts
Approximate Work Time: $1 + 8 = 9$ hours

November 1 – Background Research

ISP research (4 hours)
Read through and annotated sources
Emailed and called contacts
Approximate Work Time: (4 hours)

November 2 – Interviews + Research

ISP research (7 hours)
Read through and annotated sources
Prepared notes for interviews
Formal personal interview with Dr. Joost Pauwelyn (Geneva Graduate Institute) (.75 hours)
Approximate Work Time: $7 + .75 \times 4 = 10$ hours

November 3 – Interviews + Writing

Formal personal interview with Dr. Jean-Louis Arcand (Geneva Graduate Institute) (.5 hours)
Approximate Work Time: $.5 \times 4 = 2$ hours

November 4

Approximate Work Time: 0 hours

November 5 – Research

Approximate Work Time: (8 hours)

November 6 – Research

ISP Research (8 hours)

Read through and annotated sources

Emailed and called contacts

Prepared interview questions

Approximate Work Time: 8 hours

November 7 – Travel

Approximate Work Time: 0 hours

November 8 – Travel

Approximate Work Time: 0 hours

November 9 – Travel + Interview

Formal personal interview with Jonathan Ramsey (Monsanto, Brussels, Belgium bureau) (1.5 hours)

Approximate Work Time: $1.5 \times 4 = 6$ hours

November 10 – Travel + Interviews + Research

ISP Research (4 hours)

Read through and annotated sources

Prepared interview questions

Called contacts

Formal personal interview with Dr. Stanley Ewen, Dr. Arpat Puztai, and Dr. Susan Bardocz (3 hours)

Approximate Work Time: $4 + 3 \text{ hours} \times 4 \times 4 \text{ interviews} = 28$ hours

November 11 – Travel + Interviews + Research

ISP Research (2 hours)

Formal personal interview with Dr. Stanley Ewen and Dr. Susan Bardocz (10 hours)

Approximate Work Time: $2 + 10 \text{ hours} \times 4 \times 2 \text{ interviews} = 82$ hours

November 12 – Travel + Interviews + Writing

Travel from Aberdeen, Scotland to London, England

ISP writing (4 hours)

Formal personal interview with Dr. Antoniou (King's College, Department of Nuclear Biology) (1.5 hours)

Confirmed Dr. Antoniou as ISP advisor
Approximate Work Time: $1.5 \times 4 + 4 = 10$ hours

November 13 – Travel + Interviews

Formal personal interview with Aida Dolotbaeva (WIPO)(1 hour)
Approximate Work Time: $1 \times 4 = 4$ hours

November 14 – Travel + Homestay Orientation

Approximate Work Time: 0 hours

November 15 – Homestay Orientation

Approximate Work Time: 0 hours

November 16 – Interviews + Writing

ISP writing (10 hours)
Approximate Work Time: 10 hours

November 17 – Writing

ISP writing (9 hours)
Approximate Work Time: 9 hours

November 18 – Writing

ISP writing (10 hours)
Approximate Work Time: 10 hours

November 19 – Writing

ISP writing (5 hours)
Approximate Work Time: 5 hours

November 20 – Writing

ISP writing (8 hours)
Approximate Work Time: 8 hours

November 21 – Interviews + Travel + Pula, Croatia Orientation

Formal personal interview with Jagoda Munic (Friends of the Earth, Croatia Bureau) (.5 hours)
Travel from Zagreb, Croatia to Pula, Croatia
ISP writing (5 hours)
Approximate Work Time: $5 + .5 \times 2 = 7$ hours

November 22 – Final Writing

ISP writing and draft edited for content and style (11 hours)

Approximate Work Time: 11 hours

November 23 – Final Writing

ISP writing and draft edited for content and style (10 hours)

Approximate Work Time: 10 hours

November 24 – Final Writing

ISP final draft completed and edited (18 hours)

Construction of presentation

Editing of work journal and ISP log

Approximate Work Time: 18 hours

November 25 – ISP Submitted + Presented

Final editing + submission (7 hours)

Approximate Work Time: 7 hours

Total logged ISP interview time: 131.33 hours

Total logged ISP work time: 321.3 hours

ISP Interactive Research Log

Interview Questions

- What is role in respect to the GMO situation?
- What is your opinion of the GMO situation?
- Have you noticed any changes in farming trends? If so, please explain.
- What are implications of or the possible precedent to be set by the Monsanto v. Germany lawsuit going forth? What are the implications for state sovereignty in deciding which food products to allow from the case?
- What are your thoughts on the appearance of scientific evidence showing that GMO could pose a risk to human or environmental health?
- How can the third-world use biotechnology without the capital to acquire it?
- What are the differences between US and EU GMO legislation / approval?
- What are your thoughts on the conglomeration of the biotechnology or agriculture industry corporations and parties?
- Should we trust Monsanto? Please explain.
- Are there problems with the US food-testing policies? What about those in the EU?
- What are your thoughts on the revolving door between the biotechnology industry and the biotechnology regulatory bodies?
- What are your thoughts on patenting life forms, with respect to biotechnology?
- How can intellectual property law be improved?
- How has the arrival of GMOs impacted public policy?
- Why do policy makers and a lot of academia not know about scientific studies showing possible or demonstrated harms of GMOs?
- Have you heard of epigenetic? If so, please explain.

For specific contact information, see the ISP Contact Information List

Who: J. Craig Venter

When : October 13, 2009

Where : University of Geneva, Geneva, Switzerland

Preparation:

- ✓ This interview was unexpected and my attending the presentation was last-minute, so no questions were prepared beforehand.

Outcomes:

- ✓ Although the interview was rather short, I took away some key information from the meeting and I learned much from his presentation
- ✓ A summary of the main points are:
 - GM algae releases would be disastrous
 - No shown harm from GM food currently on market

Who: Baskut Tuncak

When : October 29, 2009

Where : Center for International Environmental Law (CIEL), Geneva, Switzerland

Preparation:

- ✓ I prepared a short list of questions, preparing for a short interview, as he indicated that he was very busy. The results are shown below.

Outcomes:

- ✓ The meeting was insightful, and it was my first “policy” interview, so it yielded a lot of good leads.
- ✓ A summary/highlight of the main points are:
 - See : The Future Control Of Food by Geoff Tansey
 - See: WIPO
 - Research *sui generis* system of intellectual property governance
 - See Convention on Biological Diversity
 - *BT* crops are seen as beneficial and as reducing pests and increasing yields
 - WTO doesn’t deal with environmental issues, only trade
 - Touched on biopiracy issues

Who: Dr. Joost Pauwelyn

When : November 2, 2009

Where : Professor’s Office, Geneva Graduate Institute, Geneva, Switzerland

Preparation:

- ✓ I prepared a list of questions, preparing for a longer interview. I noted that his office was in fact not a part of the main campus where the administration offices and auditoriums are located.

Outcomes:

- ✓ His credentials were extensive and he had extensive knowledge of trade law and was up-to-date on the subject of GMOs. I noted that he did not, however, have knowledge of the scientific

- studies referencing the possible harms of GMOs.
- ✓ A summary/highlight of the main points are:
 - There exists a “Cold War” type battle of trade influence between the Americas and the EU, especially in reference to developing countries
 - EU countries usually not allowed to decide trade decisions, but exceptions made in regards to GMOs
 - WTO knows nothing about science
 - “Sustainable development” is in the eye of the beholder

Who: Dr. Jean-Louis Arcand

When : November 3, 2009

Where : Professor’s Office, Geneva Graduate Institute, Geneva, Switzerland

Preparation:

- ✓ I prepared a list of questions, preparing for a longer interview. I noted that his office was in fact not a part of the main campus where the administration offices and auditoriums are located.

Outcomes:

- ✓ I had to wait for 1.5 hours after our appointment time before being able to speak with him as he was meeting with students. I was told that it was worth the wait as he granted everyone as much time as they needed (and he had). Our interview was cut short by the fact that he had class soon after our meeting began, but I squeezed in some extra time during his smoke break.
- ✓ He was very knowledgeable and spewed forth names, quotes, and figures faster than I could write
- ✓ I noted that he did not, however, have knowledge of the scientific studies referencing the possible harms of GMOs.
- ✓ A summary/highlight of the main points are:
 - “I’m cynical”
 - He gave a basic background of agriculture and the GMO situation
 - See: Hans Binswanger
 - See: Michael Lipton
 - See: Jose Bove
 - France likes burning things
 - GMO discussion is on “Taliban terms” – it’s not a debate on science

Who: Jonathan Ramsey

When : November 9, 2009

Where : Monsanto European Headquarters, Brussels, Belgium

Preparation:

- ✓ I was travelling and visiting family the weekend previous and was granted an interview on Friday evening, 2 days before the interview was to take place. Ergo, I was not fully prepared with hard-hitting questions as I had hoped to be. Nonetheless, I had several special questions on hand.

Outcomes:

- ✓ His secretary Severa Balasea was extremely helpful in setting up an interview and directing me towards the Monsanto office.
- ✓ Mr. Ramsey was a professional public speaker and spoke on “his take” for the vast majority of the interview, severely limiting the number of questions I could send. He did offer to be in

contact over email and put me in contact with other sources, but due to the time constraints, I was unable to capitalize on his offer for this paper.

- ✓ A summary/highlight of the main points are:
 - 1995 was start of GMO movement
 - “Green” movements used to hail GMOs before, now they campaign against
 - Pfizer merged with Monsanto
 - Monsanto now exists as strictly an “agriculture” company
 - The “terminator technology” was developed by Delta Pine Company, not Monsanto
 - See: Eurobarometer Polls
 - See: Monsanto website for PDFs, other information
 - Biotechnology decreases agricultural footprint
 - Monsanto has four main drivers: food, feed, fiber, and fuel
 - Biotechnology works for small landowners
 - See: ASAAA
 - See: Monsanto cooperation with WWF
 - See: Monsanto cooperation with Bill & Melinda Gates Foundation
 - Studies finding harms with GMOs are not really well performed or designed
 - Look for “measurables” in policy

Who: Dr. Stanley Ewen, Dr. Arpat Puztai, and Dr. Susan Bardocz

When : November 10, 2009 and November 11, 2009

Where : The Puztai residence, Dr. Ewen’s office, and the Ewen residence, Aberdeen, Scotland

Preparation:

- ✓ I had been in correspondence with Dr. Ewen for two weeks via email and phone, and it was doubtful that Dr. Bardocz or Dr. Puztai would be available for interview, but I was fortunate in all the pieces coming together to be able to meet with all of them right after my Belgium interview.

Outcomes:

- ✓ I was invited over for dinner, and morning tea, lunch, and dinner the following day
- ✓ Everyone was extremely knowledgeable, kind, informative, helpful, and enthusiastic, and provided me with delicious meals and enough information and stories to fill a book
- ✓ Unfortunately, Dr. Puztai had suffered a stroke and was thus unable to fully participate in the meeting. His recovery is ongoing.
- ✓ A summary/ highlight of the main points are:
 - See: *Science in Society* magazine
 - See: Plant Lectins by A. Puztai
 - See: Handbook of Plant Lectins – Properties and Biomedical Applications by J.M. Van Damme
 - See: Living with the Fluid Genome by Mae Wan Ho
 - See: The Institute for Science in Society
 - Dr. Bardocz’s work was bought and destroyed
 - Dr. Bardocz is gag-ordered so she can’t disclose her findings against common diseases
 - Dr. Puztai’s career was destroyed by the bioagriculture industry and political pressure
 - Dr. Ewen co-authored *Lancet* article so that Dr. Puztai’s findings could be published
 - The biotech industry designs its studies so that the true results are not published
 - Dr. Puztai was the field-leader on plant lectins for decades, and his career was ended in 2 days and his reputation slowly maimed

- Dangers from GMOs may not appear for 4-5 generations
- GMOs are toxic, RoundUp is toxic

Who: Dr. Michael Antoniou

When : November 12, 2009

Where : Department of Nuclear Biology, Kings College London School of Medicine, Guys Hospital, London England

Preparation:

- ✓ I managed to align the week of November 9 – November 13 perfectly so that all my interviews requiring travel would take place during one week, and Dr. Antoniou had just returned from India on a business trip, so our schedules managed to mesh.

Outcomes:

- ✓ I waited a good 1.5 hours for the interview as he was still busy with a previous appointment, but the interview was very productive, very animated, and very informative. He also agreed to be my ISP advisor.
- ✓ A summary/ highlight of the main points are:
 - 3 sources of toxic effects from GMOs: 1) foreign protein and enzyme products, 2) cocktail sprays of different pesticides and herbicides as the GMOs act as sponges, 3) the actual GM transfer process as its highly mutagenic
 - GM disrupts nutritional value
 - GM disruptive effects are clear
 - See: CaMV 35S promoter
 - When RoundUp (glyphosate) breaks down, the end product is more toxic
 - GMOs not helpful, not useful, not usable, not necessary
 - Monsanto has cultivated fear amongst farmers
 - To help solve worldwide agriculture issue and assist third-world countries
 - Current agriculture techniques and processes produce enough to feed 11.5 billion people

Who: Aida Dolotbaeva

When : November 13, 2009

Where : World Intellectual Property Organization (WIPO) Headquarters, Geneva, Switzerland

Preparation:

- ✓ I had to reschedule the interview for later in the late due to my missed flight back from London to Geneva, and she was most gracious to comply.

Outcomes:

- ✓ She has extensive credentials and knows well the trade issues related to biotechnology and GMOs, and was most interested in my research. She requested a copy of this report at its conclusion.
- ✓ A summary of the main points are:
 - Patents protect GMOs
 - Patents are a “territorial” thing
 - See: TRIPS Agreement
 - See: CBD Agreement

- There is no clear definition of terms when it comes to intellectual property resources, especially in regards to GMOs.
- See: sui generis intellectual property governance system
- See: WIPO's PCT system
- Patents have been shown to act as economic stimulators for the economy
- Least Developing Countries (LDCs) have until 2016 to implement the conditions agreed to in the TRIPS agreement
- See more on: IP system

Who: Jagoda Munic

When : November 21, 2009

Where : Friends of the Earth Croatia Bureau – Zagreb, Croatia

Preparation:

- ✓ I was in Zagreb for only one week and had been traveling the week before, so the meeting was scheduled on short notice.

Outcomes:

- ✓ She seemed pressed for time but was willing to meet with me and give me some of her time. However, she seemed as if the topic was a bit passé, as she had little information to give me on the GMO situation in Croatia
- ✓ A summary of the main points are:
 - See: www.gmo-free-regions.org
 - See: British Society study on birds and biodiversity
 - New Croatian law issued on November 19, 2009 regarding GMO and non-GMO coexistence in Croatia
 - Croatian government is trying very hard to enter the EU, and as such, are adapting all legislation to fit the EU standards and EU model.
 - Friends of the Earth has an official policy against GMOs
 - Croatia is full of small farmers, the question remains whether those small farmers will use GMOs.
 - See: Croatia Ministry of Health
 - See: Croatia Ministry of Agriculture

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