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"Enemies of Life in the Name of Life": Seed Patents, GM Crops, and the Global South

Patricia Arenson
Connecticut College, patricia.arenson@conncoll.edu

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Table of Contents

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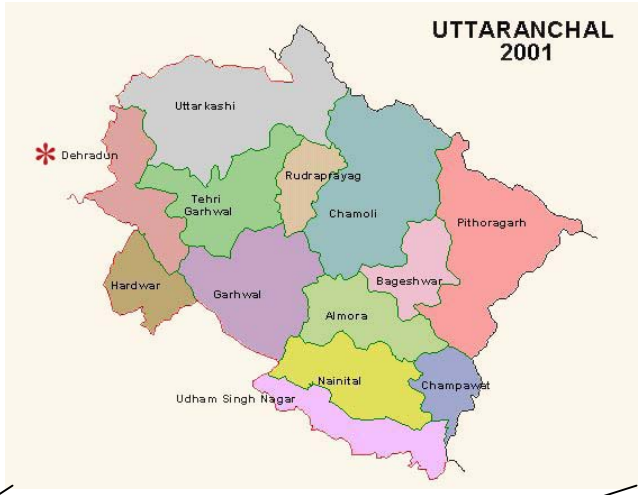
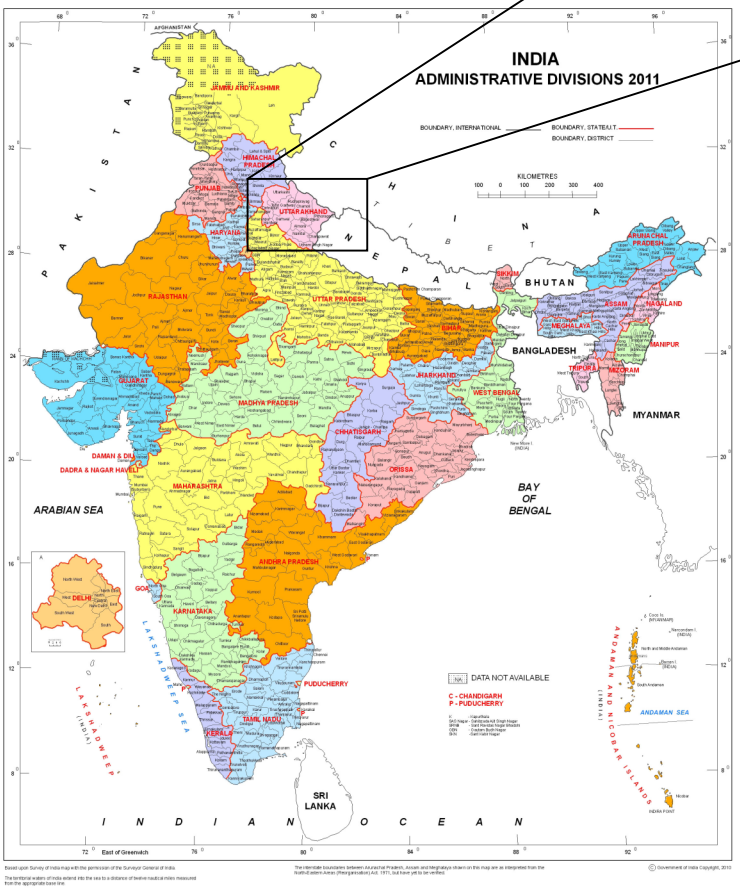
Title quotation from Chatterjee, 1993

Abstract

In the past few decades agribusiness in the global North has developed a booming industry in genetically modified (GM) crops; industry giants have secured patents and aggressively protected them to maximize profits. This new technology has been exported to the Global south, where its introduction has caused a cascade of horrific problems for farmers and non-farmers alike. GM crops and seed patents have exacerbated poverty, accelerated the loss of indigenous knowledge, and threatened to destroy ecosystems through the loss of biodiversity. This honors thesis explores these issues with a focus on the situation in India, where Vandana Shiva has led the fight for seed sovereignty, biodiversity, and farmers' rights.

Map of Uttaranchal, India





✻ = location of Bija Vidyapeeth Organic Farm, Navdanya

Source: Government of India, Ministry of Home Affairs, Office of the Registrar and Census Commission

Chapter 1: Introduction

Agriculture is an immeasurably significant phenomenon not only because it provides our food, but also because it accounts for approximately between 38 and 45 percent of the world's labor force (Jacobs 2009). Perhaps more importantly, it was the first practice that drew humans out of equality with nature and placed them in an extraordinary position of power over it. This manufactured an anthropomorphic worldview and jumpstarted subsequent analogous practices, such as the destruction of the environment to build civilizations. Now, at the present time, we have reached a place wherein the existence of agriculture is largely taken for granted and only vaguely considered by most consumers. Thus, the way that agriculture has altered the way we orient ourselves within nature and the simple fact that it is responsible for our food production are two realities curiously and dangerously absent from the minds of many. Through reading and learning from those who have not forgotten the central significance of agriculture, I have become convinced that this subject is one of the most important of our time. Contemporary phenomena such as seed patents and genetically modified (GM) crops are of particular significance and will be crucial in determining the future of our planet.

Agriculture constitutes the livelihood of hundreds of millions in the Third World and therefore contemporary issues of agriculture affect these countries most profoundly. The Third World also contains the majority of the coveted biodiversity on the planet and, because these countries are undeveloped, they are easily exploited by developed nations. My particular interest in agricultural issues in India stems from a deep affinity I feel for the country, the fact that it has been affected most harshly, and because of my experience working for an organization called Navdanya that fights seed patents and GM plants in India.

Even as many today have lost touch with the significance of agriculture, anthropologists have made it their business to do the opposite – to gather information and answers and make them available to the masses. While multidisciplinary food studies have flourished just in the past decade and a half (Nestle and McIntosh 2010), anthropologists have been studying aspects of agriculture since the birth of the field. Hunter-gatherer cultures (Lee and DeVore 1963), agrarian societies (Richards 1939), the domestication of plants and animals (Fernández-Armesto 2004), the way that humans interact with their natural environments (Steward 1936), and the vast significance of food across time and space (Mintz 1986; Kahn 1994; Counihan 2004; Sutton 2006; Caldwell et. al 2009) are all topics that have been intensively studied across the globe. Fieldwork and subsequent ethnographies available to the public have been particularly instrumental for informing the world of these topics. Anthropology has long played a role in bringing attention to marginalized people simply through the understanding and information gleaned from participant observation fieldwork methods. In this sense, anthropology has a great responsibility to continue its study of agriculture in the present in order to shed light on the exploitation of the Third World and the threats to food sovereignty and national food security.

As a biology and anthropology double major, this topic combines my two areas of interest very intimately. This thesis serves to bring certain cultural issues to light as well as draw conclusions from my own experiences in the field. I also bring to the topics at hand my knowledge of biology, which informs my opinions of patents on life and allows me to understand both the scientific aspect of genetic modification as well as the perspectives of the scientific community.

This thesis is primarily a research paper that pulls together the essential information required to understand how GM seeds and the patents placed on them and other plant varieties are harming agricultural practices across the planet, particularly in the Third World. I use many primary resources but I also occasionally draw on materials published by Navdanya and personal interviews with Vandana Shiva, the founder of Navdanya, that were conducted while I was working in India in 2010. The first chapter discusses how I became interested in the topic, what I feel to be the basis for agricultural issues facing the world today, and my experience working for Navdanya. The second chapter explores seed patents, the World Trade Organization and international property right policies, the loss of biodiversity and indigenous knowledge from the Third World due to the imposition of industrial agriculture, and the possible environmental and health dangers of GM plants. The third chapter examines how seed patents and GM seeds are specifically impacting India through discussion of the Green Revolution, the patent on Basmati Rice, and Mustard Seed Oil crisis. Finally, the concluding chapter discusses necessary steps for combating these issues and cites a few contemporary movements fighting for change.

Chapter 2: My story

It was only recently, when attempting to explain the origins of my deepest passions to someone I am very close with, that I realized it all began with *Ishmael* by Daniel Quinn. And because it started there, and because my life will be devoted to the plant that has grown from the seed that was planted there, reading *Ishmael* may be the most significant thing I have ever done. Through a Socratic dialogue between a gorilla and young man, Quinn very thoroughly and coherently makes the argument that agriculture was and will be the fall of humanity. By defying the laws of nature and harnessing its power to carry out our will, we have essentially propelled ourselves onto a trajectory towards our own extinction, a trajectory that is littered with just about every problem the human race has ever faced: poverty, overpopulation, the destruction of the environment, health epidemics, global warming (Quinn 1995). Though *Ishmael* has been criticized on many accounts, primarily for offering gross generalizations without factual evidence, nothing has ever made more sense to me than Quinn's argument and I stand by him unwaveringly.

What happened next was that I became acquainted with evolution. The theory of natural selection is one of those things that seems very simple but is often very much misunderstood. When I took Ecology my sophomore year of college, we studied it very carefully and very repetitively for several weeks and we did not move on until everyone had demonstrated mastery. Like *Ishmael*, natural selection as a concept fits into the contours of my brain like a key in a lock – that is, it is so wonderfully and satisfyingly intuitive to my mind. To me it is beautifully flawless, exquisitely immaculate, and explains everything. Our genomes are diverse and that is why each of us – all of us, every organism – is different. The genomes we possess are the result of the changing

environments and subsequent adaptations that all of our ancestors have undergone before us. When our environments inevitably change, some organisms will possess traits that are more advantageous for adaptation. These traits provide fitness, and in the animal kingdom fitness is the measure of an organism's ability to survive and reproduce. Therefore, those organisms with advantageous traits are more likely to reproduce, propagating those traits within future generations. If a trait allows for survival, it will continue to exist in the gene pool. The loss or gain of traits from populations due to natural selection is called *evolution*. Evolution occurs every single day in every corner of the globe, and it occurs simultaneously, and therefore just as frequently, as birth and as death.

Finally, and most relevant to this thesis, I read *The Omnivore's Dilemma* by Michael Pollan, and this quite fiercely jumpstarted my interest in the topic. I hungrily devoured several other similar books, such as *Animal, Vegetable, Miracle* by Barbara Kingsolver. This was how I came to learn about the attempts of very self-interested, very wealthy members of the developed world to gain legal ownership of life. Like reading *Ishmael,* learning this information felt incomparably significant because the multitudes of issues and controversies attached to agriculture are so horrifyingly overlooked relative to how vital they are to the human race. This information shook my world and rattled around loudly in my brain, compelling me to spread it to others.

I'm not really sure when it happened, or how, but one day there was a firestorm inside of my brain during which all of these things – *Ishmael*, natural selection, and contemporary issues of agriculture – culminated to form one single, all-encompassing entity. I realized it was *all* related. And that what I thought were separate interests was

really just one large phenomenon that I could plausibly devote my life to studying, bringing into the public eye, and challenging.

What it all really comes down to is that the human race has acquired an extraordinary amnesia that is so omnipresent and exists to such a great extent that even the era before the amnesia set in has been forgotten. We have forgotten that we are members of Planet Earth; that we are a part of nature, that in order to survive we must work *with* nature, not against it. As Daniel Quinn says, we have "taken the power of the gods into our own hands"; we have given ourselves the power to decide "who shall live and who shall die" (Quinn 1995: 181). We have completely removed ourselves from the natural context in which we first arrived on this planet and placed ourselves on a pedestal so far removed from the rest of the natural world that we cannot even see the ground. We have reimagined evolution as something that occurs only among members of the animal kingdom, of which we are somehow not a member. Millions of people in the world blindly hold the absurd notion that humans have stopped evolving, that our journey from primitive primate to human being followed a predetermined and progressive trajectory that culminated in the species that we exist as today. Even more absurd still are the multitudes of people who do not "believe" in evolution at all. And in the haze of our own blindness and misunderstanding, and in the wonder of our own remarkable technologies, and in the greed for the money we can make in using them, we have begun to take control of natural selection and evolution ourselves in ways that drastically surpass the modest act of breeding – we have begun artificially tinkering with genes in laboratories. And, ultimately, this has led us to the dangerously misguided belief that life can be owned. The

resulting impact on agriculture, particularly in the Third World, is too detrimental to go unchallenged.

So I found an organization that was challenging it. Navdanya is an organization founded by world-renowned activist Vandana Shiva that works to combat the forces threatening sustainable agriculture in India today. It grew from Shiva's Research Foundation for Science, Technology and Ecology (RFSTE) founded in India in 1987. According to the website,

> Navdanya is a network of seed keepers and organic producers spread across 16 states in India. Navdanya has helped set up 54 community seed banks across the country, trained over 500,000 farmers in seed sovereignty, food sovereignty and sustainable agriculture over the past two decades, and helped setup the largest direct marketing, fair trade organic network in the country…Navdanya is actively involved in the rejuvenation of indigenous knowledge and culture. It has created awareness on the hazards of genetic engineering, defended people's knowledge from biopiracy and food rights in the face of globalization and climate change. Navdanya is a women centered movement for the protection of biological and cultural diversity. (Navdanya Trust)

Shiva was compelled to found RFSTE following the Punjab Violence and Bhopal tragedy of 1984. The Green Revolution came to India in the 80s and, though crop yields did ultimately increase, disasters ensued that completely overshadowed them. In 1984 a major leak occurred at the Union Carbide India Limited pesticide plant in Madhya

Pradesh. Tens of thousands of people were exposed to the chemicals and several thousand died. Other effects of the Revolution, such as the debt caused by the high costs of pesticides, arguably led to the riots in the Punjab that same year. According to a Navdanya pamphlet, "The violence demanded a paradigm shift in the practice of agriculture" (Navdanya/RFSTE). Shiva recognized this demand and decided to devote her life to it. Her exploration began by visiting farms in her native North India and collecting seeds, and eventually she began fundraising. She was not sure how to proceed, so it was a discovery every step (Shiva 2010).

Navdanya fights patents and genetically modified organisms (GMOs) in several ways. First, they have created seed banks across India. Seed banks are community locations where farmers can bring seed they have saved from the harvest for storage and further use by themselves and other farmers. Seed banks are the hub for the storage of a community's entire agricultural biodiversity. This is vitally important in India today because of the threat to seed sovereignty posed by large seed and agricultural corporations. Seed banks facilitate "rejuvenation of agricultural biodiversity, farmer's self-reliance in seed locally and nationally, and farmer's rights" (Navdanya/RFSTE).

Secondly, Navdanya spreads awareness of the issues affecting India not only to Indians but also to people around the world. Information has been transmitted internationally through Navdanya's numerous publications, most written by Shiva herself. Navdanya also holds lectures and other informative events across the country and, as her fame has grown, Shiva and her cohorts have occasionally traveled to speak in other countries. Through their membership with Navdanya, thousands of farmers across India have been trained in sustainable and organic agricultural practices (Navdanya

Trust). So far, Navdanya has "trained above 200,000 men and women farmers, students, government officials, representatives of national as well as international NGOs, Voluntary Organizations on biodiversity conservation and organic farming" (Navdanya/RFSTE).

Thirdly, Navdanya peacefully refuses to recognize seed patents. This method of protest echoes Gandhi's philosophy of *satyagraha* (translated literally as *truth force*), or non-violent protest. Gandhi's famous *satyagraha* salt march can be easily compared to Navdanya's philosophy: Gandhi protested the British salt tax non-violently by leading a 240-mile walk to the ocean to collect his own salt in 1930. Gandhi and his followers thereby refused to observe the tax on salt ("Gandhi Opens Drive" 1930). Similarly, Navdanya refuses to observe the restrictions on seeds set forth by companies who have been granted legal ownership of them; Navdanya does not believe life can be patented, and therefore they ignore the patents altogether. Shiva also compares Gandhi's spinning wheel to the seed in the context of Navdanya and its work. Gandhi spun his own cloth as a protest of the British textile industry. As Shiva writes, the spinning wheel was "decentered and labor generating, not labor displacing. It needed people's hands and minds, instead of treating them as surplus, or as mere inputs into an industrial process" (Navdanya/RFSTE 2007: 6). In India today, the seed is increasingly becoming industrialized and Navdanya's work saving seeds and ignoring patent laws parallels Gandhi's use of the spinning wheel to protest the British textiles industry. To put this in the context of Navdanya, Shiva says, "As seeds are genetically engineered and patented, a crisis is being engineered for farmers and farming. And the seed becomes the charkha [spinning wheel] of today. That is why I started Navdanya" (Navdanya/RFSTE 2007: 7).

Finally, Navdanya is political. Shiva and her associates have attempted to influence the government for years through democratic methods of protest and petition. She has worked closely with the Indian government to create reform and new policy and has also worked with many international organizations. Navdanya has partners and networks in India and abroad and together they engage in conferences, summits, and the like to combat global issues (Navdanya/RFSTE).

Alongside its main office in Delhi and its many seed banks, Navdanya has several other important hubs. The slow food café in Delhi "connects farmers to co-producers" (Navdanya/RFSTE). According to Shiva, "One of our seminal contributions to Fair Trade practices has been the marketing of organic agricultural products directly from farmers to the consumers, who through their consumption patterns become the co-producers of agriculture" (Navdanya/RFSTE). The café serves food from local farms to "complete the seed-to-table experience" and includes items that are slowly disappearing from India because of the loss of biodiversity caused by industrial agriculture (Navdanya/RFSTE).

Most important to my experience with Navdanya is the organic farm at Bija Vidyapeeth. This farm is located in Dehradun, Uttarakhand, India, in a small village called Ramgarh nestled against the Himalayas. Bija Vidyapeeth is a teaching farm where thousands of farmers have been trained in organic farming methods and where many informative events and festivals are held throughout the year. There is a permanent staff and crew who work year-round to grow food for the farm residents, who include cooks, business staff, and other workers, as well as an often-changing group of apprentices from all over the world. I was fortunate enough to be one of those apprentices for two months during the summer of 2010.

Navdanya accepts anyone who is interested to apprentice at Bija Vidyapeeth. While I was there a colorful cast of characters came and went, some staying much longer than others. Some apprentices were recruited to carry out specific tasks for the organization and they tended to stay on longer, but the majority of us arrived either simply desiring a farm experience and wishing to volunteer our services or with specific research projects in mind. During my stay at most there were approximately 15 apprentices on the farm, but the number fluctuated often as people arrived, departed, or went on short trips. I met apprentices from Germany, France, Spain, Italy, South Africa, England, Russia, Slovenia, Korea, and the U.S.

The farm itself consists of a group of buildings that includes dormitories and bathrooms, a kitchen and small dining hall, main office building, a lecture hall, a small library, a soil lab, and living quarters for staff members. Surrounding the compound of buildings are several fields devoted to growing different crops, including rice paddies and an herb garden, and on the edge of this land is the seed bank. The farm is bordered by a small dirt road that leads to a larger dirt road running through the village.

Carrying out projects on the farm proved difficult. There was no single person in charge of apprentices and the language barrier created constant difficulties. Many of us wished to carry out interviews with farmers in the area, and we were able to do this a few times but only after several weeks of negotiating. Because of this difficulty, more often than not apprentices helped carry out tasks on the farm, depending on the specific labor needs of each day. Help was always needed in the kitchen and something always needed to be weeded. There was also work to be done at the seed bank collecting and labeling

seeds from the pervious harvest, and once the rice season began there was transplanting and prepping the rice paddies.

A typical day on the farm began at around 6:30 when we got dressed and had our morning chai. This was followed by an hour of yoga until breakfast at 8. Immediately after breakfast work on the farm began. If activities had not been determined at breakfast, many of us would walk around until we located someone who needed our help. We worked in the hot sun and took regular chai and water breaks until lunchtime at 1 pm. After lunch the heat was at its peak so the farm shut down for a few hours while we retreated under our fans and rested. At around 3 or 4, work recommenced and continued until 8, when dinner was served. Many of us also spent time during the day in the library reading or researching. Formal and informal activities took place in the evenings – oftentimes interns would stay up talking or watching a movie, but other times activities were organized for all farm members to attend.

The incredible experience I had on the farm was due in large part to the relationships I formed with the many people I met and in the simple satisfaction of strenuous and fruitful physical work. There were a few particularly enlightening moments, however, that I will never forget. The day that Vandana Shiva visited the farm was truly magical. She arrived in a black Hummer the likes of which is not often seen in rural India and was taken straight to the dining hall and given a plate of food. We hung around awkwardly, not knowing how exactly to behave, and waited patiently for her to finish eating. She exuded wisdom and power and grace and she was treated like a saint by the farm staff, who practically kissed her feet. Eventually we were told we could have an audience with her in the outdoor classroom gazebo. She sat in a chair in the middle and

we gathered wide-eyed around her. For the next hour she told us the story of her life and we hung on her every word, transfixed. Later, during a taped interview that my friend Tej conducted, she spoke of Gandhi's philosophy of *swaraj*:

> We've really built a mixture of three of Gandhi's core principles and internalized them deep into our work. The first of course is the concept of *swaraj*. *Swaraj* means self-rule, but if you take it also into the context of self-organization it also means that every little bee, every microorganism in the soil, every earth worm, every tree, every plant, every variety of seed has to have self-rule…So for us self-organization is not just a human principle, it's an ecological principle for all beings. And when we talked of *bij swaraj*, we mean *swaraj* of the *bij* itself, of the seed itself—that every one of those seeds that we save on this farm should be able to evolve into the future on their terms. And just because they're not fitting today into a Monsanto agenda, we can't afford to push them to extinction. They have as much a right to a future as we humans have. (Shiva 2010)

Shiva told us that because of her father's job as a forest conservator and her family's devotion to the philosophies of Gandhi, she grew up believing deeply in the concept of self-rule and was never indoctrinated with an anthropomorphic worldview. That is, she was raised under the assumption that humans are on par with the rest of the life on Earth and that "no being is just an instrument for other beings" (Shiva 2010).

This false notion of superiority over all other life forms that human beings hold is a theme I have found running through the literature that opened my mind to the issues that Shiva has devoted her life to fighting. There is no basis but our own skewed

perceptions of the world for believing that our well-being and interests take precedence over those of other organisms. We have bestowed upon ourselves a formidable power the force of which exceeds that of nature itself. Listening to Shiva say these words, I felt all of my scattered interests and passions and the collection of seemingly random facts floating around in my brain coming together. Daniel Quinn had forged within me the realization that the fall of humanity occurred due to a drastic paradigm shift that caused humans to view differently the place they occupy in the world. There I was, listening to Shiva express the same notion, except her notions are tied to real issues that she works to combat. And sitting there in a gazebo in Uttarakhand Province, all I had to do was walk down the street a few meters to find hungry children sitting outside their crumbling homes – the very manifestations of a corrupt and unjust national food system. At the same time that everything came together in my head, the true significance of all I had learned became very clear. Everything I had come to understand was suddenly in a context that rendered it very real, that brought meaning to what I was previously very removed from: that these are global issues, but they are also very local. And most important of all, the state of being informed is also a responsibility to act, to inform others, and to fight for change.

During the same interview, Shiva brought her discussion back to us, the young people sitting around her, and explained why working on the farm is so important:

> Making and creating is the deeper philosophy of *swadeshi*. [It also means] self-reliance of course, but even more [it means] reclaiming our deeply human identity in the act of making. And that's why for us Bija Vidyapeeth is a very important place because it allows all of you to be engaged in the recovery of your own

> potential as producers, makers, creators of food. And you're no more just buyers of food off a supermarket shelf but engaging with the soil, engaging with the seed. You find that – my god – I can grow food. I have that capacity. (Shiva 2010)

Laboring on the farm every day in the hot sun, accumulating permanent stores of dirt under my fingernails and thick calluses on my always-bare feet, truly had this effect on me. It made me realize my own potential in a much more raw and profound way than I ever could learn from a book. And in witnessing the culture of food production in India, all that was at stake because of the export of industrial agriculture to India and elsewhere in the world came into harsh relief. My time on the farm truly instilled within me a firsthand knowledge of food production that is at once conveyable and too abstract to put into words. I learned and grew from my experience and arrived back in the States convinced that my life's work truly lies in reviving in the minds of those who have forgotten the sleeping knowledge of what it means to be a citizen of the earth.

Chapter 3: The Story of Seed Patents and Genetically Modified Crops

I. Intro to patents

[Patenting is] rent collection from life. It is rent collection from being human, and thinking, and knowing.
– Vandana Shiva, 2004

A patent is defined by economist Fritz Machlup as "that which confers the right to secure the enforcement power of the state in excluding unauthorized persons, for a specified number of years, from making commercial use of a clearly defined invention" (quoted in Mgbeoji 2006: 16). The person who receives the patent, then, gains "the right to exclude other persons for a limited time from making commercial use of the invention without his/her consent" (Mgbeoji 2006: 16). Although patents on everything from breakfast cereals to genes exist across the globe today, it must not be taken for granted the patents are universal, that the ideology surrounding the control and ownership of certain aspects of society is normative. Patents are, in fact, "European in origin as well as in ideology" and therefore do not constitute a "global value" (Mgbeoji 2006: 16).

Probably because the concept of patents and the ownership of creativity and intellectual innovation that they grant are largely based in capitalist ideology, the figures of sociopolitical philosophers such as John Locke and Karl Marx often arise during debates concerning patents. It is thought that the rise of patents can be attributed to two socioeconomic factors: "the rise of individualism (and, until recent times, the preeminence of man) and the development of capitalism" (Mgbeoji 2006: 17). It is not difficult to understand, then, how non-capitalist societies or societies that have only recently adopted capitalist systems have subsumed patenting as a result of its transference from Western countries.

The concept of patents was conceived in Florence, Italy, in 1421. A man named Filippo Bruenelleschi invented an "iron-clad sea-craft" that was to be used to transport materials across Lake Arno for the construction of a cathedral. However, he refused to disclose the details of the invention unless he was granted the sole right to use the vessel for commercial exploits, a demand that clashed with the traditional, unspoken policy in Florence of sharing innovations. On June 19, 1421, the city of Florence granted him this right but soon realized they had been hoodwinked into believing the invention was innovative when the ship promptly sank. Although nothing similar came out of Florence for some time, the Venetians passed a patent statute in 1474 that allowed for ownership of up to 10 years on inventions that passed the scrutiny of the General Welfare Board. In addition, the statute called for punishment of any perpetrators of a patent, a policy that holds great significance today (Mgbeoji 2006: 18).

To be granted a patent in the United States today, an applicant must meet the following criteria: adequate specification/disclosure, usefulness, nonobviousness, and novelty. The Constitution states, "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter or any new and useful improvements thereof, may obtain a patent therefore subject to the conditions and requirements of this title" (U.S. Code Title 35 Section 101) (quoted in Wilson 2002: 26). The policy grants the patent holder rights to a product or process for 20 years. Interestingly, while very similar patent policies exist in the United States and Europe, the United States justifies the rights of its people to patent based on its "instrumental power to promote science," while Europe's justification is based on "a basic right to one's own intellectual property" (Wilson 2002: 26).

Overwhelming support for international property rights (IPRs) exists within the scientific community. Mark J Hanson, professor of philosophy and ethics, describes the beliefs of these supporters as such:

> For defenders of the current system, patents represent nothing more than a legal mechanism to ensure protection and just reward for the tremendous investment in research that may yield products of significant medical benefit. That a patent holder or licensee should also have the opportunity for profit is only suitable, given the investment not only of money but of considerable human resources as well. Patents therefore ensure an element of fairness and justice, encouraging and rewarding efforts while protecting the rights of those seeking to invent and develop useful items. (Hanson 2002: 163)

Patent supporters argue that patents provide two incentives to possible applicants: Firstly, there is an incentive to invest time and money into research and development because of the possibility that if a useful invention is successfully created, patent protection will provide continued benefits and royalties. This incentive therefore accelerates the rate of scientific innovations that, proponents of patents argue, will serve to improve the world. Secondly, inventions protected by patents do not have to be kept secret from other scientists, thus creating a more communicative global scientific community (Wilson 2002: 26). However, patent opponents like Vandana Shiva argue the opposite: "Wherever patents have been associated with scientific research, the result has been closure of communication" (Shiva 1997: 14). Emmanuel Epstein of the University of California at Davis agrees: "In the past it was the most natural thing in the world for colleagues to

swap ideas on the spur of the moment, to share the latest findings…No more. Any UCD scientist with a promising new slant…will think twice before talking about it to anyone who is connected with either of the two Davis crop genetic private enterprises…" (quoted in Shiva 1997: 14). The brutal competition of patenting, Shiva and Epstein argue, causes secrecy to abound in the scientific community.

More significant to the subject at hand, however, is the emergence of patenting on life. The first instance of a patent on life occurred during the famous Chakrabarty v. Diamond case of 1980. In a 5-4 decision by the Supreme Court of the United States, Anand Chakrabarty was granted a patent on a microorganism called *Psudomonas aeruginosa*. By tinkering with the genome of the bacterium, Chakrabarty ensured that it would be useful in breaking down each of the main elements found in crude oil. Although the microorganism had already existed in nature for thousands of years and Chakrabarty had simply acted on the organism in much the same way that evolution does, he was considered by the court to have forged a "new technology" and this was sufficiently innovative to warrant the granting of a patent. Because the end result of Chakrabarty's experimentation produced an organism with characteristics that did not exist elsewhere in nature, the bacterium was considered patentable. As with most court cases that bring about previously unconsidered issues, this case lead to much discussion in Washington D.C., particularly at the United States Patent and Trademark Office, which eventually reformed its policies to include the patentability of plants and animals. This provided great incentive for the life sciences, because if innovations could be protected and provide lasting benefits, then large money and time expenditures on research were suddenly deemed sound investments (Dronamraju 2008: xx).

However, the Chakrabarty case caused uproar among scientists and activists alike who found ownership of life a senseless abomination, and the outrage certainly continues to the present day. Key Dismukes, Study Director for the Committee on Vision of the National Academy of Sciences in the United States, said of the case:

> Let us at least get one thing straight: Anand Chakrabarty did not create a new form of life; he merely intervened in the normal processes by which strains of bacteria exchange genetic information, to produce a new strain with an altered metabolic pattern. "His" bacterium lives and reproduces itself under the forces that guide all cellular life…We are incalculably far away from being able to create life de novo, and for that I am profoundly grateful. The argument that the bacterium is Chakrabarty's handiwork and not nature's wildly exaggerates human power and displays the same hubris and ignorance of biology that have had such a devastating impact on the ecology of our planet. (quoted in Shiva 1997: 20)

Chakrabarty himself later claimed that he had simply "shuffled " genes and had not actually invented anything. Still, once the precedent had been set for patenting life, there would be no turning back. The United States attempted to stifle the outrage over the new patent policy by terming modified and therefore patentable organisms "inventions" rather than "discoveries," but this arguably made things worse (Mushita and Thompson 2007: 70).

Philosopher Mark Sagoff states his protest of the outcome of the Chakrabarty case by arguing that biotechnologists are in essence attempting to play God (Wilson 2002: 40).

Conversely, Jack Wilson, professor of Emerging Technologies and Innovation at the University of Massachusetts, states:

> Current organisms have the properties they do because of their evolutionary histories. The apparent design has no real author unless natural selection is reified as an active agent in evolutionary processes. This certainly seems to be true, but should not prevent those who significantly modify those natural givens from protecting that innovation through the use of patents, so long as they do not thereby gain control of the natural given with which they started. (Wilson 2002: 41)

Wilson attempts to argue that simply because natural selection is nature's true author, this should not prevent scientists from asserting authorship over modified organism. However, if the view is held that nature constitutes an intellectual commons, then the discussion of an author is irrelevant, unnecessary, and inappropriate. In addition, his exception for scientists who attempt to take ownership of the original organism from which the modified organism is derived dangerously understates the vigorous control that scientists are able to gain once they receive a patent on an entire organism. Because patents on genes often extend to the entire organism, patent holders often "demand payments for the cultivators to use any of the original materials" (Mushita and Thompson 2007: 22). In addition, "sometimes the patents and royalty demands are made when *no* genetic change has been made by the corporation" (Mushita and Thompson 2007: 22). From this we can clearly see that patent policy has many loopholes that are bound to be

identified and exploited by profit-seeking individuals or companies and which, terrifyingly, allow for the abuse of control of bioresources.

The policies on patenting organisms that arose from the Chakrabarty case set two criteria for patentability: The scientist must first "allege 'distinctiveness' via gene insertion, and second, claim that she or he invented or created a new entity" (Mushita and Thompson 2007: 70). Patentability of an organism, therefore, is based on uniqueness. What render a patentable organism discreet are its genes, which the scientist has modified to serve a certain purpose. However, scientists concur that while an organism would certainly not exist without its genes, genes are nothing unless they can be expressed within an organism. Thus, basing patentability on the innovation of an organism's genotype is seen by many as a form of biological reductionism, and "allowing one gene to redefine a whole organism is not related to the nature of a gene, but to the nature of economic and political power to redefine science" (Mushita and Thompson 2007: 70). With ownership of an organism now possible, "'organic' no longer means holistic and dynamic" (Mushita and Thompson 2007: 71).

When patents on life were just emerging, however, much more controversy surrounded the patentability of seed because it "has inherent qualities that make it even more antithetical to becoming property than abstract knowledge" (Mushita and Thompson 2007: 71) Seed reproduces completely on its own, without the requirement of human intervention, and the value of a seed increases as it breaks down because it becomes a plant. In addition, a single seed propagates to form hundreds of new seeds, all of which can do the same. Thus, because seeds reproduce on their own in large quantities, patents on seeds are much more difficult to enforce. As a result, patent laws on seeds

stipulate that seeds propagated from a patented variety cannot be saved without the payment of royalties (Mushita and Thompson 2007: 71).

Requiring a farmer not to save seeds is like forcing a breast-feeding mother to throw out her breast milk. Not only is it completely antithetical to agriculture itself, but it simply does not follow any kind of reason. Seeds make plants grow. Plants provide food. It is truly an injustice to ask a farmer to rid himself of the source of his own food simply so that a scientist can ensure he reaps the benefits for an invention that is only arguably an invention.

Most seed in the world has yet to be commodified. An estimated 80% of seed used in Africa and India is saved and shared. Because each seed embodies cultural knowledge and innovation and is the result of centuries of selective breeding and ecological adaptation, patenting seeds and the subsequent restrictions placed on their use destroys heritage and puts a halt to traditional means of subsistence, causing a slew of problems including, but certainly not limited to, poverty and starvation (Mushita and Thompson 2007: 71).

II. The World Trade Organization and international property rights

Globalization is war by other means and war is globalization by other means.
– Vandana Shiva, 2004

The increasing significance of trade, globalization, and the global economy in the world today has caused Western nations with complex patent policy and large-scale utilization of patenting systems to call for uniform global IPR laws. However, despite years of negotiation and what may or may not be deemed compromise, a global agreement has still not been reached. Developed countries have created various international organizations, groups, and the like to work to create the bureaucracy needed to allow them rights to the vast biodiversity found in many underdeveloped countries. Simultaneously, underdeveloped countries continue to fight with very limited means to maintain the integrity of, and rights to, their own bioresources (Dronamraju 2008: 154).

The World Trade Organization was created on January 1, 1995 during the Uruguay Round of the General Agreement on Tariffs and Trade (GATT). GATT arose from the failed attempts in 1948 of 50 countries to create an International Trade Organization that would be an agency of the United Nations. In the years that followed, GATT was the sole instrument responsible for governing international trade. Under GATT, a series of multilateral negotiations took place called "trade rounds" in various countries that focused on creating new policy and reducing tariffs and barriers to trade. During the Uruguay Round, which lasted seven and a half years, GATT membership rose to 123 countries. It was during this negotiation that the WTO was created and many other novel policies were put into place (World Trade Organization 2011). Large multinational

seed corporations like Cargill and Monsanto were actively involved in the creation of the WTO and trade agreements during the Uruguay Round of GATT (Shiva 2000: 9). The WTO replaced GATT but it still exists as the WTO's "umbrella treaty for trade in goods" (World Trade Organization 2011). As the WTO website states, "Whereas GATT had mainly dealt with trade in goods, the WTO and its agreements now cover trade in services, and in trade inventions, creations and designs (intellectual property)" (World Trade Organization 2011).

The trade-related intellectual property rights (TRIPs) agreement under the WTO was the first agreement created to provide IPRs on living organisms on a global scale. Prior to this agreement, it was legal to borrow inventions from other countries – the United States had been borrowing aeronautics and other innovations from Japan and Germany for years. However, "TRIPs was designed to impel one global market" (Mushita and Thompson 2007: 66). Under the WTO, patents extend for 20 years across the entire globe. In essence, "intellectual property protection increases profit from the exchange of artificially created commodities, which are made artificially scarce by the patent" (Mushita and Thompson 2007: 66).

The TRIPs agreement can be viewed as the WTO's enforcement mechanism. Under this agreement, national governments of WTO members must put in place "fair, equitable, and inexpensive" enforcement mechanisms to prevent or manage violations of the agreement: "Both civil and criminal judicial procedures (Article 42-50) have been prescribed, given courts the power to grant injunctions, assess damages, destroy offending property without compensation, and award penalty payments to the rights holder" (Mushita and Thompson 2007: 67).

Many argue that TRIPs "privileges the already privileged" because the agreement is such that patent offenders must provide evidence to prove their innocence, in essence rendering them guilty until proven innocent (Mushita and Thompson 2007: 66). This is the opposite of the procedures instated before TRIPs, in which the patent holder was expected to provide evidence to prove his claims of offense. In addition, the "national treatment" policy stipulates that a member of the WTO cannot offer special protection to its domestic innovations over imported foreign ones – both products must be treated the same in terms of pricing, marketing, and sale. In underdeveloped countries, this prevents any restoration of balance between the overwhelming majority of foreign-patented innovations and the minority of domestic ones – developed countries hold 97% of all patents in the world (Mushita and Thompson 2007: 68).

According to Vandana Shiva, GATT and the WTO have "institutionalized and legalized corporate growth based on harvests stolen from nature and people." TRIPs "criminalizes seed-saving and seed-sharing" (Shiva 2000: 1). GATT jumpstarted an anti-globalization movement that has "grown tremendously" ever since, and groups such as the Third World Network and the International Forum on Globalization have worked to challenge and combat the consequences arising from globalization, and in many cases they have been successful (Shiva 2000: 2).

In May of 2002, the WTO put out the following statement:

> After a protracted and detailed review of current trade policy and its effects on developing countries, the World Trade Organization has decided to effect a cessation of all operations, to be accomplished over a period of several months.

> The WTO will eventually reintegrate as a new trade body whose charter will be to ensure that trade benefits the poor. (World Trade Organization 2002)

Since 2002, the WTO has undergone extensive reformations during the Doha Round of negotiations, which continues to the present. Today a total of 153 countries belong to the WTO and 29 countries are currently negotiating membership (World Trade Organization 2011).

On September 13, 2007, the United Nations General Assembly adopted a "non-binding declaration upholding the human, land and resources rights of the world's 370 million indigenous people, brushing off opposition from Australia, Canada, New Zealand and the United States" (Dronamraju 2008: 155). Victoria Tauli-Corpuz, the Philippine chair of the UN Permanent Forum on Indigenous Issues, proclaimed the declaration "a major victory for Indigenous peoples" (quoted in Dronamraju 2008: 155). The outcomes of this agreement have yet to be seen, but UN acknowledgment of issues of biopiracy and exploitation of Third World bioresources is significant no less.

III. Seed patenting and biopiracy

[Seeds] consist of improved and selected material, embodying the experience, inventiveness, and hard work of farmers, past and present; the evolutionary material processes they have undergone serve ecological and social needs.
– Vandana Shiva, 1997

For those who oppose patents on life, "biopiracy" is often the term used to describe the act of forcefully stealing or destroying biological wealth through IPRs and patents. Andrew Mushita and Carol Thompson define biopiracy as such:

> Biopiracy is the removal of the organism, whether by literally taking the plant, animal, seed or germplasm and claiming ownership, or by destroying it. Piracy refers to refusal to compensate or even acknowledge the original cultivators/ custodians of the bioresource. Nothing is given in exchange, with the excuse, if one is offered, that the plant or animal is "wild," free for the taking. (Mushita and Thompson 2007: 21)

Opponents of biopiracy use the North-South concept to demonstrate inequalities present in the world today that render certain countries more vulnerable to IPRs than others. The North in this context are those countries, namely the United States and Europe, that create patent laws and impose them on the South, comprised of those countries below the equator that account for virtually all of the biodiversity on the planet. In fact, "all of the developed countries' foodstuffs originated in tropical countries," including corn, black peppers, pineapples, sugar, tomatoes, coconuts, nutmeg, bananas, chocolate, potatoes, citrus fruit, coffee, rice, and vanilla (Mgbeoji 2006: 61). The North, which possesses powerful advantages over the South in a number of ways, has exploited Southern

countries for their resources through "an array of cultural institutions, legal norms, and mechanisms…designed to relocate the genetic centre of the world and to extract surplus profit by inserting the appropriated plant life forms into the stream of commerce as commodities of trade" (Mgbeoji 2006: 62).

One of the justifications for the exploitation of Southern bioresources is the "common heritage" argument, which concludes that all bioresources are the common property of humankind, and therefore all resources should be available for the taking. Although this concept has been called "almost intuitive," it is tainted and thus opposed due to the exploitation inherent in the historical reality expressed by the term biopiracy (Nazarea 1998: 116) The biological commons argument, however, is also utilized by opponents of biopiracy who claim that ownership of bioresources violates the very principle that all humankind has an inalienable right to the access and use of all bioresources (Shiva 1997: 3). In addition, because the North-South phenomenon is such that developed countries impose upon less developed countries, "this obviously puts small-scale farmers who have nurtured, bred, and experimented with landraces all their lives but know little about the legal system at a distinct disadvantage" (Nazarea 1998: 116). As Roy Pat Mooney, co-founded of Rural Advancement Foundation International, says,

> From one perspective, both IARCs (International Agricultural Research Centers) and Third World farmers could and should take pride in their contribution to global agriculture. In principle, there is no reason why the North should not benefit. The problem arises when the commercial value flowing North is not acknowledged and not compensated. The situation is seriously aggravated when

> northern governments allow the patenting of material wholly or partially derived from farmers' varieties. As private companies move into Third World seed markets, farmers are finding themselves paying for the product of their own genius. (quoted in Nazarea 1998: 116)

The disadvantage of the North over the South is significantly exacerbated by the immense power held by only a few major corporations over the world's seed supply. According to a report put out by the Action Group on Erosion, Technology and Concentration (ETC Group), the global seed market was worth $19,600 million in 2006, and the top three companies, Monsanto, DuPont, and Syngenta, were worth collectively $8,552 million. Monsanto alone accounted for one fifth of this amount (Dronamraju 2008: 181). Hope Shand, the Research Director of ETC Group, said of the major seed companies:

> Less familiar [than giant pharmaceutical firms] are biotech battles in the agricultural sector, where multinational seed companies are using patents to deny farmers—or entire nations—the right to use and sell seeds from patent-protected crops. Patents, we are told, are designed to promote innovation. Instead, they are allowing giant seed companies to secure exclusive monopolies that undermine the economic security of farming communities and jeopardize access to seeds—the first link in the food chain. And lest we forget: Whoever controls the seeds controls the food supply. (quoted in Dronamraju 2008: 182)

In the United States, when a large seed company sells a genetically modified and therefore patented seed variety to a farmer, the farmer most often must sign a bailment

contract, which stipulates that the farmer has no rights concerning the seed at any time. An example of a bailment contract from DuPont reads: "This is a Bailment contract. The parties agree that the seed, growing crops, pollen, tissues or molecular components, and the harvested crop…are solely owned by DUPONT" (quoted in Mushita and Thompson 2007: 96). The farmer therefore "has less collateral to facilitate borrowing money and cannot participate in most U.S. federal farm programs," meaning that he has in effect lost control over his farming operation. All of his decisions are dictated by the terms of his contract and any deviation from them is certain to be met with dire legal consequences (Mushita and Thompson 2007: 96). This is just one example of the means by which major seed companies exert absolute control over farmers.

Large seed and biotech corporations have subtly inculcated the misconception that landraces, or indigenous varieties, are not valuable unless tinkered with in a laboratory setting. Indigenous germplasm becomes "advanced" and "elite," as opposed to "primitive," only when considerable time and money has been invested in its modification. "According to this calculation," says Vandana Shiva, "peasants' time is considered valueless and available for free" (Shiva 1997: 51). This attitude toward indigenous knowledge and tradition disregards centuries of time spent selecting for optimal seed success and developing methods of cultivation best suited to environments and social contexts (Shiva 1997: 52). It is not surprising that large seed and biotech corporations, with this view of indigenous landraces as somehow inferior to seeds modified in a lab, find it their God-given right to exploit the hard work of indigenous peoples.

Considering the capitalist context in which major seed and biotech corporations emerge and the billions of dollars they tend to rake in annually, it is difficult to believe that they possess pure motives for their actions, despite their insistent use of the biological commons argument. In fact, "patents are less concerned with innovation than with territorial takeover by claiming exclusive rights to ownership. The farmers, who are the guardians of the germplasm, have to be dispossessed to allow the new colonization to happen" (Shiva 1997: 53). Overwhelming evidence suggests that large seed and biotech corporations are primarily interested in the control of the world's resources and the resulting profit accretion. As Shiva says,

> The issue of IPRs is closely related to the issue of value. If all value is seen as being associated with capital, tinkering becomes necessary to add value. Simultaneously, value is taken away from the source (biological resources as well as indigenous knowledge), which is reduced to raw material...Tinkering, however, does not create value. The value of the product is dependent on the source…(Shiva 1997: 71)

One of the most famous cases highlighting the extent of the power of large seed corporations is that of Percy Schmeiser, a case that caused widespread outrage across Canada and the United States. In 1999, Monsanto sued Percy Schmesier, a farmer from Bruno, Saskatchewan, for $145,000 because he was harboring their patented canola gene within some of his canola plants. Although perfectly aware that Percy had neither purchased nor planted their patented canola variety, he had, Monsanto claimed, violated the terms of their patent by possessing the patented gene without paying royalties. The

fact that this gene likely arrived via pollen to his fields by wind or by insect did not dissuade Monsanto from suing. Percy had been saving his canola seeds for fifty years and had never purchased anything from Monsanto. The Federal Court of Canada found him guilty by a narrow decision that did not, in the end, provide any compensation to Monsanto. Following the case, canola farmers in Canada attempted but failed to sue Monsanto and another company called Aventis for making it virtually impossible to plant canola in Canada without cross-pollination from patented plants, and many other countries followed by banning imports of genetically modified (GM) canola (Kingsolver, Kingsolver and Hopp 2007: 53).

IV. Seed patents and genetically modified crops: opponents and proponents

Genetic engineering has been sold as a green technology that will protect nature and biodiversity. However, the tools of genetic engineering are designed to steal nature's harvest by destroying biodiversity, increasing the use of herbicides and pesticides, and spreading the risk of irreversible genetic pollution.
– Vandana Shiva, 2000

Despite voices rising loud and clear from all parts of the world to protest patents on life, GM food crops, and their detrimental and harmful effects, there are still those who support their use. Some proponents are associated with the businesses that are raking in huge profits from these endeavors and their motivations are thus very monetary. Others who stand to gain nothing from patents and genetic engineering but continue to argue in favor of them are simply misguided, utilizing arguments that are immediately torn to shreds by well-versed opponents. Oftentimes these arguments are shallow and lack viable evidence or they contain sweeping generalizations about the world that, even if true, could never be proven. It is therefore important to examine these arguments before moving on to the much more substantive points of opposition.

One of the main arguments in favor of GM crops is the very widely accepted but unfounded notion that they will maximize crop yield and therefore feed the masses, who are viewed as living on the brink of starvation. The Food and Agricultural Organization (FAO) has continually put out reports claiming the safety of GM food and its potential benefits, and the U.S. government and the media have ignored many reported disclaimers and cautions and instead reduced reports to sound bites claiming that GM will save the world. This notion has spread like wildfire in a nation whose people are attracted to any

information that relieves them of worrying about the world's devastating poverty. Unfortunately, the quantity of food available for consumption in the world does not factor into the poverty equation because in reality we produce more than enough food to feed the people of the world. Poverty and hunger can be more accurately linked to contextual infrastructure and socio-economic inequalities that influence food access (Mushita and Thompson 2007: 46).

During the Chakrabarty case in 1980, scientists told the U.S. Supreme Court that "genetic research and related technological developments may spread pollution and disease, that it may result in a loss of genetic diversity, and that this practice may tend to depreciate the value of human life" (quoted in Seide and Stephens 2002: 71). However, Rochelle Seide, former vice president of Intellectual Property Valeant, and Carmella Stephens, counsel member of Kenyon and Kenyon Intellectual Property Law, believe quite the opposite:

> …twenty years after Chakrabarty, genetic research has failed to have that effect. On the contrary, genetic engineering has enhanced the value of life by providing new treatments for a vast number of diseases thereby alleviating human pain and suffering associated with those diseases. Furthermore, development of genetically engineered crops and cattle will no doubt enhance food productivity…(Seide and Stephens 2002: 71)

Bioethics expert David Magnus also shares this viewpoint and protests the common heritage argument:

> …the key justification for a patent system is to promote the general good, through encouragement of both investment (in research and development) and disclosure. Thus, even if plants and other purportedly patentable material were part of our common heritage, there is no reason why patent protection or other intellectual property regimes could not be enacted as the best means of utilizing the heritage for the general good. (Magnus 2002: 266)

Along the same lines, Robert Sherwood, Associate Dean for Research and Professor of Science Education at Indiana University, argues that human creativity, "a vast national resource for any country," requires encouragement to be extracted and put into use in the public domain, and "intellectual property protection is the tool which releases that resource" (quoted in Shiva 1997: 12). Vandana Shiva provides the following counterargument to Sherwood's claim:

> This interpretation of creativity, as unleashed only when formal regimes of IPR protection are in place, is a total negation of creativity generated by nonprofit motives in both industrial and nonindustrial societies. It is a denial of the role of innovation in traditional cultures and in the public domain. In fact, the dominant interpretation of IPRs leads to a dramatic distortion in the understanding of creativity, and as a result, in the understanding of the history of inequality and poverty. (Shiva 1997: 11)

It cannot be denied that in the current era it is no longer the farmers who control the food supply, but the major seed corporations. What better way to gauge the effects of patents

and GM crops on the world than by listening to what the farmers have to say? The following is a global appeal written in collaboration by several farmer's unions:

> For several years, patents on genetically modified seeds and animals have been granted worldwide. The damaging impacts on farmers, who are deprived of their rights to save seeds, and on breeders who can no longer use the patented seeds freely for further breeding, are well known…
>
> This frightening new trend in patent policy will affect many more farmers and breeders...These patents will destroy a system of farmers' rights and breeders' privileges that has been shown to be crucial for the survival of farmers and breeders, for food sovereignty, and for the preservation of biodiversity in agriculture. The vast majority of farmers in developing countries are small-scale farmers, completely reliant on saving and exchanging their seeds.
>
> In order to secure the continued existence of independent farming, breeding and livestock keeping and hence the food security of future generations, we, the undersigned farmers, researchers, breeders and civil society organizations from all over the world, restate our rejection of any patents on life, and urge policy makers and patent offices to act swiftly to stop any patents being granted on conventionally bred plants and animals and on gene sequences for use with conventional breeding technique, as well as on methods for the conventional breeding of plants and animals. We also urge companies not to apply for any patents of this kind. (quoted in Dronamraju 2008: 187)

Vandana Shiva believes that converting "common heritage into commodity" through patents on life "will have serious political and economic implications for Third World farmers" (Shiva 1997: 54). Third World farmers are forced to take on new roles in the global market that leave them vulnerable. Instead of local suppliers of traditional produce to their communities, they are now "suppliers of germplasm to transnational corporations," competitors for the rights to bioresources, and consumers dependent on the products of the corporations. As Shiva says, "It is argued that patent protection is essential for innovation, yet it is essential only for that innovation that garners profit for corporate business. After all, farmers have been making innovations for centuries, as have public institutions for decades, without property rights or patent protection" (Shiva 1997: 54).

Many GM seeds are bred to be open-pollinated, meaning they can and will cross-pollinate with other plants in their vicinity. In only a few seasons it is possible for 50% of the plants in an adjacent field to become contaminated with the genes from GM plants, and even plants several miles away can become contaminated (Mushita and Thompson 2007: 41). Even more so than other crops, GM seeds are bred to be particularly virulent. Many people believe this is not a mistake, but that "GM strains cannot sell solely on the basis of their innovative characteristics, but need legal and political power to advance genetic pollution that steals the farmers' original seeds" (Mushita and Thompson 2007: 42). This, many argue, is the true innovative quality of GM seeds, not their "short-term resistance to pests or weeds" (Mushita and Thompson 2007: 42).

The "terminator gene" is one of the most contradictory technologies that large seed corporations like Monsanto have developed. This technology arose from the need

for a solution to the seeds' ability to proliferate indefinitely, which poses a serious threat to large seed corporations' control over the world's farming operations. In general, this technology is such that the seed either does not proliferate or its offspring are not viable (Mushita and Thompson 2007: 43). Specifically, this technology is created when two seeds from inbred lines, or lines that have been solely self-pollinating for many generations, are crossed. The resulting seeds produce first generation plants, called F1 hybrids, that are genetically identical, display higher crop yields than their parent seeds, and produce second generation plants that do not resemble the first generation plants and whose yields are significantly reduced. If farmers cultivated seeds hybridized in this way, these characteristics combined would necessitate that they buy new seed for each harvest (Pollan 2006: 30). But even without this technology on the market, Monsanto's Technology and Stewardship Agreement stipulates that growers using Monsanto seeds may not save or sell the seeds from their harvests without facing legal consequences, which is simply a different means to the same end (Monsanto).

The patent on terminator technology was granted in 1998, but sparked so much controversy internationally that in 1999 Monsanto was driven to pledge not to commercialize it. Although the opposition saw this as a significant victory, at the time Monsanto had 87 patents on terminator genes pending and continued to research and develop the technology (Vidal 1999). An official global moratorium on the technology was passed in 2000 by the UN's Convention on Biodiversity (Rizvi 2006). This moratorium was strengthened in 2006 due to pressure across the globe, but in 2007 Monsanto bought a company called Delta & Pine Land that conducts greenhouse trials of the terminator technology. Although the moratorium still remains, Monsanto states that it

"does not rule out the potential development and use of one of these technologies in the future" (Ban Terminator 2007). Many feel that this "cognitive dissonance is obvious: how can corporations, which claim that GM technology will rescue starving masses in Africa, also develop a plant that destroys its own seed?" (Mushita and Thompson 2007: 43). The consequences of this technology are real, dangerous, and not as yet sufficiently studied.

There is an increasing trend for major seed companies to work alongside and cater to the needs of multinational chemical companies such as Hoescht, Sandoz and Shell that produce fertilizers, pesticides, and other agricultural additives (Mgbeoji 2006: 181). Syngenta, Aventis, Monsanto and DuPont, the world's leading seed corporations, are also the leaders of the global pesticide market (Mushita and Thompson 2007: 92). It is not a coincidence that many crops sold by large seed corporations require significant inputs of these chemicals; in fact, biotechnology is actually aimed at "fostering, rather than reducing" dependence of seeds on specific chemicals (Mgbeoji 2006: 181). Some seeds are designed to grow only with these chemicals. The most famous example is that of Monsanto's GM Roundup Ready crops that require the input of Roundup herbicide for survival. These crops have been genetically modified to resist the Roundup herbicide so that entire fields of the crop can be sprayed and only the weeds will be exterminated (Pollan 2006: 31).

Crop dependence on chemicals represents the "decline of bioresources" as we know them: "Like a drug addict who loses the ability to feel normal without chemical stimulus, modern agriculture has so fried the soil that it cannot produce without larger and larger infusions of chemicals" (Mushita and Thompson 2007: 92). These chemicals

are purported to increase yields, yet "a high-yielding variety means little if the cost to farmers is high for fertilizer, seed, and pesticides. Raising physical yields per hectare does not necessarily increase profits for farmers" (Mushita and Thompson 2007: 87). In addition, the heavy use of pesticides and herbicides has the potential to select for superweeds or superpests that are resistant to the chemicals entirely. Not only this, but the genes that cause the herbicide or pesticide resistance can be transferred to other plants via pollination (Shiva 1997: 36). The first superweed to significantly affect the U.S. was found in Delaware in 2000, and now there are a documented 10 resistant species in 22 states affecting soybeans, cotton, and corn. To fight them, "farmers throughout the East, Midwest and South are being forced to spray fields with more toxic herbicides, pull weeds by hand and return to more labor-intensive methods like regular plowing" (Neuman and Pollack 2010). In terms of the market strategy, selling chemicals alongside crops with resistance to them is quite ingenious, but "this strategy runs counter to a policy of sustainable agriculture, since it undermines the very possibility of weed control" (Shiva 1997: 36).

Although the safety of GM crops and their potential and already manifested effects on environments have not be extensively researched (leading one to wonder how much effort is really being put into assuring our safety), the biotechnology industry and the companies involved continually deny, based on evidence from only a few field tests, that there are any adverse consequences. Yet, these field tests "are not designed to collect environmental data, and test conditions do not approximate production conditions that include commercial scale, varying environments, and time periods" (Shiva 1997: 34). Infuriatingly, "this sort of non-data on non-releases has been cited in policy circles as

though 500 true releases have now informed scientists that there are no legitimate scientific concerns" (Shiva 1997: 34). However, on a local scale, there are many cases of the negative ecological impacts GM crops can have. Increased invasiveness leading to the endangerment of other species, the contamination of other species with transgenic genes via cross-pollination, the exposure of other species to toxicity, the formation of new viral diseases, and the general disruption of food chains are just a few of the possible impacts (Wolfenbarger and Phifer 2000). In addition, a study carried out by the University of Sussex investigating the effects of GM crops in Africa found that "benefits from GM crops were much lower than can be obtained from agricultural techniques, at a much lower cost" (Mushita and Thompson 2007: 50).

The biotech industry's denial of the dangers of GM leads to some embarrassing contradictions. In order to receive a patent to begin with, these companies must make a claim that a patent candidate is novel and unnatural – that is, it does not exist in nature. But as Vandana Shiva points out, "when it comes time for the 'owners' to take responsibility for the consequences of releasing genetically modified organisms, suddenly the life-forms are not new. They are natural, and hence safe" (Shiva 1997: 22). This demonstrates how science that is motivated by profit gain becomes a very subjective discipline. Major Goodman and Maring Carson of North Carolina State University hold this hauntingly pessimistic view: "Genetic engineering has followed the classic trajectory of all the bandwagons that have come and gone in the history of plant and animal breeding…But before this bandwagon rumbles off into the sunset, it will have dealt serious blows to science, to the environment and to our food supply" (quoted in Mushita and Thompson 2007: 51

V. The threat to biodiversity

It is the shift from ecological processes of production through regeneration to technological processes of nonregenerative production that underlies the dispossession of farmers and the drastic reduction of biological diversity in agriculture. It is at the root of the creation of poverty and of non-sustainability in agriculture.
– Vandana Shiva, 1997

In 1996 the FAO put out the following statement about the loss of global biodiversity:

> The chief contemporary cause of the loss of genetic biodiversity has been the spread of modern commercial agriculture. The largely unintended consequences of the introduction of new varieties of crops has been the replacement and loss of traditional highly variable farmer varieties…For example, of the 7,089 apple varieties documented as having been [in the United States] between 1804 and 1904, approximately 86 percent have been lost…The processes of modernization and varietal replacement, well documented in the United States, have now occurred in many other countries and have surely led to substantial losses of unique genetic materials. (quoted in Mushita and Thompson 2007: 84)

The definition of biodiversity is "The number, variety, and genetic variation of different organisms found within a specified geographic region" (Dictionary.com). When we speak about biodiversity as it relates to agriculture, it either refers to the variety of species within a specific area or to the sum of all diversity represented on the planet. Loss and potential loss of biodiversity are tightly linked to patenting and the biotechnology industry because they are responsible in large part for creating monocultures.

As discussed earlier, GM seeds from large seed corporations are bred to grow into completely identical crops because large quantities of uniform seeds are necessary "when seed suppliers prioritize profit yields through economies of scale" (Mushita and Thompson 2007: 85). There is no competition among these plants because they are all exactly the same, in essence halting natural selection in its tracks. The plants thus form "an orderly mob," and because "no individual plant has inherited any competitive edge over any other, precious resources like sunlight, water, and soil nutrients are shared equitably. There are no alpha corn plants to hog the light or fertilizer. The true socialist utopia turns out to be a field of F-1 hybrid plants" (Pollan 2006: 37).

Monocultures sound sensible when described in this manner, but the reason they are so dangerous stems from the fact that variability among organisms is *the* mechanism that ensures that natural selection will provide for the adaptation and survival of a few organisms whose traits imbue them with fitness in the event of environmental pressures. Genetic vulnerability, as it is known, is defined by the U.S. National Academy of Sciences as "the condition that results when a widely planted crop is uniformly susceptible to a pest, pathogen or environmental hazard as a result of its genetic constitution, thereby creating a potential for widespread crop losses" (quoted in Mushita and Thompson 2007: 85).

Most populations of organisms tend to follow a pattern in which environmental change is followed by adaptation in the form of natural selection. If a population of organisms are not constantly adapting to the changing environment, the tragic result will likely be extinction. Adaptation occurs over generations as organisms with advantageous traits, said to possess fitness, survive and proliferate those traits throughout a population

(Futuyma 1998). Leigh Van Valen describes this evolutionary cycle of adaptation as the Red Queen principle, named for the Red Queen in *Through the Looking Glass*, who says, "In this place it takes all the running you can do to keep in the same place" (quoted in Kingsolver, Kingsolver and Hopp 2007: 53). None of this is possible without genetic variability.

The world's biodiversity, located primarily in the global South, is therefore in danger of replacement and loss as multinational seed and biotechnology corporations convert the world's most diverse farmlands into monocultures. As Vandana Shiva says, "Diverse crop varieties have evolved according to different environmental conditions and cultural needs. The genetic variability of these varieties is insurance against pests, disease, and environmental stress. This resilience is enhanced by traditional agricultural practices, like mixed cropping" (Shiva 1997: 89). The world's small-scale farmers have sustained their crops for generations by allowing variability to flourish and by salvaging the variability by saving seeds year after year. Monocultures threaten to destroy the security and immunity from disaster provided by traditional agricultural systems. In sum, monocultures "encourage crop failure, destroy traditional varieties, favor the rich at the expense of the poor farmers, and put the production of the world's food supply in the hands of a few" (Pringle 2003: 22).

A danger of monocultures that is often overlooked is the potential threat to the soil. Anyone who knows basic botany is aware that a seed cannot become a plant without the nutrients found in soil. If the soil is depleted of it nutrients, it follows that the plant will be as well. For the naïve consumers among us, one tomato may seem just as nutritious as the next tomato, but very often countries like the United States that rely on

monocultures for mass production of foodstuffs end up with produce that has lost much of its nutritional value (Pollan 2006: 37). Thus, eating an apple a day to keep the doctor away may have lost much of its presumed efficacy. Fields that are intensely cultivated run the risk of major depletion of soil nutrients, and synthetic fertilizers can never replace the nutrient value of pure, naturally formed soil. M.S. Rahman, professor of geotechnical and geoenvironmental engineering at North Carolina State University, explains the grim reality of over-cultivated soil:

> The capacity of the soil to sustain productivity is reduced in over-intensive cultivated areas, through a complex interaction that involves erosion of soil, degradation of physical properties, lowering of soil organic matter and plant nutrient content, reducing microbial activity, acidification of land and development of secondary nutrient deficiencies. (quoted in Mushita and Thompson 2007: 87)

Perhaps the most well-known example of the devastating effects of monocultures was the Irish Potato Famine of 1845-1849. This disaster occurred because only a few varieties of potatoes were extensively planted across Ireland, creating the vulnerability inherent to any low-diversity agricultural system. Very unfortunately indeed, these few varieties of potato were all susceptible to infection by *Phytophthora infestans,* or "late potato blight." This fungus-like microorganism attacks a potato's abilities to obtain nutrients from the environment and "can turn a field of potatoes into mush in 24 hours" (Mushita and Thompson 2007: 85). The blight is particularly tricky since plants appear healthy until late in the growing season. In the end the crop failure, combined with British trade policy

that continued to demand that the Irish export grain, led to the deaths of over one million people and the immigration of another one million overseas (Mushita and Thompson 2007: 86).

Not only are low-diversity agricultural systems susceptible to disease, but diseases like the potato blight can attack plant species in completely new ways each season as environmental conditions change. Any climate change at all can render some plants vulnerable, and if all the plants in an agricultural system are identical, they will all harbor the same vulnerabilities. Barbara Kingsolver makes an analogy that nicely illustrates this point:

> Under highly varied environmental conditions, the resilience of open-pollinated land races can be compared approximately with the robust health of a mixed-breed dog versus the finicky condition of a pooch with a highly inbred pedigree. The mongrel may not perform as predictably under perfectly controlled conditions, but it has the combined smarts and longevity of all the sires that ever jumped over the fence. Some of its many different genes are likely to come in handy, in a pinch. (Kingsolver, Kingsolver and Hopp 2007: 53)

The loss of biodiversity is one of the largest threats to the survival of the human race today. As Jack Harlan, author of *Crops and Man* says, "These resources stand between us and catastrophic starvation on a scale we cannot imagine…The line between abundance and disaster is becoming thinner and thinner" (Kingsolver, Kingsolver and Hopp 2007: 52). And, as always, the great Vandana Shiva's biting words eloquently demonstrate the true calamity of the situation:

Biodiversity erosion starts a chain reaction. The disappearance of one species is related to the extinction of innumerable other species, with which it is interrelated through food webs and food chains. The crisis of biodiversity, however, is not just a crisis of the disappearance of species, which serve as industrial raw material and have the potential of spinning dollars for corporate enterprises. It is, more basically, a crisis that threatens the life-support systems and livelihoods of millions of people in Third World countries. (Shiva 1997: 66)

VI. The fight

The time has come to reclaim the stolen harvest and celebrate the growing and giving of good food as the highest gift and the most revolutionary act.
– Vandana Shiva, 2000

History has shown that it is not in our human nature to allow injustice and exploitation to continue unchecked for very long. Uprisings and revolutions against colonizers and/or corrupt leaders have occurred throughout the history of civilizations, and in the modern era activism concerning any number of global issues abounds. Spanning the globe are organizations and groups working to combat seed patents, biotechnology, industrial agriculture, biopiracy, and the depletion of biodiversity. Many of these organizations work to promote seed sovereignty and sustainable agriculture (Shiva 1997: 80). Among these are Slow Food International, which works to defend food biodiversity, pioneers food and taste education, connects producers to consumers, and develops networks through Terra Madre, an international small and local farmers network (Slow Food International). The International Federation of Organic Agricultural Movements works toward "democratization of organic agriculture" and the Swiss Working Group on Genetic Engineering combats issues of genetic engineering in Switzerland (Shiva 2000: 119). Greenpeace International is a well-known organization that works toward "catalyzing an energy revolution," "defending our oceans," "protecting the world's ancient forests," "working for disarmament and peace," "creating a toxic free future," and "campaigning for sustainable agriculture" (Greenpeace International). Hundreds of other organizations exist all over the world to deal with local and national

issues, including India's Navdanya, an organization that grew from Vandana Shiva's Research Foundation for Science, Technology and Ecology (see chapter 1).

Chapter 4: The Story of India

I. An introduction to agricultural issues in India

India is one of the most biodiversity-rich countries in the world. The 2001 Indian census data accounts for 13.2 million people who hold jobs in "agriculture and allied activities" and 742 million people who live in rural areas and depend directly on agriculture (Census India 2001). Because of the nation's vast variety of flora and its heavy reliance on agriculture for livelihood and sustenance, seed patents and genetically modified (GM) crops have had a great impact on India's agricultural practices. In addition, the fact that the country is underdeveloped renders it more vulnerable to the exploits of the transnational seed corporations and agribusinesses. India is therefore exemplary for the study at hand, and because of my own personal experience working for Navdanya, this chapter will serve as a case study of how India specifically has been impacted.

A variety of plants found across regions of India have long provided the necessary sustenance for its people and have thus accumulated great religious and cultural significance. In the Himalayas, amaranth, buckwheat and chenopods are eaten, while in the West and the Deccan, millets are cultivated. In East India, Goa, and Kerala rice and fish provide the main sustenance. Each region is known for cooking with different oils, as well. In the North and East mustard oil is used, in the West groundnut oil, in the Deccan sesame oil, and in Kerala coconut oil (Shiva 2000: 21).

Baranja is one of the most beautiful examples of an Indian method of cultivation – it encompasses hundreds of years of knowledge and practice and is beneficial to both farmer and plants in a number of ways. *Baranja* translates to "twelve seeds" and is a method by which a farmer mixes 12 different kinds of crop seeds and plants them

randomly in a field of farmyard manure. The crops become available for harvest at different times, thus ensuring a steady supply of food into the winter months. The combination of seeds is determined based on the farmer's own knowledge of the relationships between certain plants. For example, *rajma* creepers are specifically adapted to grow on *marsha* plants and will not grow on anything else. These symbiotic relationships make for very high yields in *baranja* fields and the crops bring in a larger profit than crops such as soybeans that are grown in monocultures. *Jakhia,* a plant grown in *baranja* fields, sells for Rs. 60 per kilogram while soybeans only sell for Rs. 5 per kilogram. Unfortunately, "since these yields and incomes are from diverse crops, centralized commercial interests are not interested in them. For them, uniformity and monocultures are imperative" (Shiva 2000: 112).

Globalization and its influence on agriculture in India is of particular importance. As Vandana Shiva says, "Since 75 percent of the Indian population derives its livelihood from agriculture, and every fourth farmer in the world is an Indian, the impact of globalization on Indian agriculture is of global significance" (Shiva 2000: 7). Trade liberalization was established in India in 1991 when the International Monetary Fund (IMF) adjustment package called for millions of hectares of land, including land already used for other crops, to be converted to cotton fields that would produce the crop for export. In the first six years after the package was implemented, the cultivation of cotton increased by 1.7 million hectares. In addition, hybrid seeds from large transnational seed corporations began replacing farmers' varieties and cotton began replacing food crops. What once was land used to grow food to feed local populations was now land used to cultivate a crop to be used by people in other countries (Shiva 2000: 10). To the present,

the IMF misses how fundamentally illogical it is to consistently propose profit gain from export as the solution to the poverty in developing countries (Black 2001).

When the IMF began the adjustment package, the Indian secretary of agriculture echoed the IMF's beliefs by stating that "food security is not food in the *go-downs* but dollars in the pocket" (quoted in Shiva 2000: 14). Shiva responds by saying that "It is repeatedly argued that food security does not depend on food 'self-efficiency' (food grown locally for local consumption), but on food 'self-reliance' (buying your food from international markets)" (Shiva 2000: 14). The IMF argued that the profit from exporting farmed shrimp, flowers, and meat would finance the imports of food for Indian consumption and they planned to completely eradicate local food production. However, as Shiva argues,

> …it is neither efficient nor sustainable to grow shrimp, flowers and meat for export in countries such as India. In the case of flower exports, India spent Rs. 1.4 billion as foreign exchange for promoting floriculture exports and earned a mere Rs. 320 million. In other words, India can buy only one-fourth of the food it could have grown with export earnings from floriculture. Our food security has therefore declined by 75 percent, and our foreign exchange drain increased by more than Rs. 1 billion. (Shiva 2000: 14)

In addition, since many countries at once hold markets for the same items, competition among them causes prices for commodities to plummet. Because of this devaluation of currency, the cost of purchasing imports far outweighs the profits earned from exports. In other words, "Since the Third World is being told to stop growing food and instead to

buy food in international markets by exporting cash crops, the process of globalization leads to a situation in which agricultural societies of the South become increasingly dependent on food imports, but do not have the foreign exchange to pay for imported food" (Shiva 2000: 15).

In essence, "the domination of the export logic in agriculture is leading to the export of [India's] ecological capital" which has been "conserved over centuries" (Shiva 2000: 14). Factory farms created in the image of the U.S. method of meat production are replacing India's traditional livestock economies. This creates problems for farmers who have evolved farming operations that utilize cattle for fertilizer and labor and disbands yet another sustainable farming practice by eliminating renewable energy (Shiva 2000: 14).

The widespread pressure for farmers to cultivate cash crops has led many Indian states to loan land to private corporations and some states have given hundreds of acres to corporations. For instance, the state of Madhya Pradesh has offered land to corporations for 40 years or more. Much of this land will be used by transnational corporations that are attempting to jumpstart a food-processing industry in India (Shiva 2000: 10). Just as the IMF adjustment package lacks simple logic, the takeover of land by self-interested corporations looking to gain a profit does not take into account what is best for the Indian people and unfairly exploits their livelihoods.

As discussed in the previous section, many large seed corporations sell hybrid seeds in conjunction with pesticides. The hybrids sold to cotton growers in India in the 1990s required substantial inputs of pesticides and many farmers fell into deep debt because the cost of the pesticides was not compensated by the profit from their crops. In

addition, many seeds and crops failed. What followed was a deeply haunting incident that throws into harsh relief the horrific impact of industrial agriculture on Indian farmers: In 1997, nearly 400 cotton farmers committed suicide in Andhra Pradesh by drinking the very same pesticides that caused their debt. Many more suicides followed in 1998 (Shiva 2000: 10).

II. The Green Revolution

The Green Revolution refers to several worldwide initiatives that occurred between the years of 1940 and 1970 to increase crop yields by bringing agricultural technology to underdeveloped countries. The Revolution arrived in India in the early 1960s, and while many continue to believe that it was successful, millions of Indian voices have argued to the contrary. Peter B. R. Hazell of the International Food Policy Research Institute says that the Revolution "was driven by a technology revolution, comprising a package of modern inputs – irrigation, improved seeds, fertilizers, and pesticides – that together dramatically increased crop production" (Hazell 2009: 1). Robert Paarlberg, author of the controversial book *Starved for Science: How Biotechnology is Being Kept out of Africa*, states that the Revolution

> was based on a biological science breakthrough: newly improved varieties of wheat and rice capable of producing much more grain in response to water and fertilizer inputs...High yielding when adequately irrigated, fertilized, and protected against insects, these new seeds brought spectacular production gains just in time to support Asia's most rapid surge in population growth, helping to avert famine and permanent food aid dependence. (Paarlberg 2008: 7)

Millions of others, however, believe that the Revolution largely "devalued peasant agriculture as inefficient" and "promoted monoculture as the only way to increase yields" (Mushita and Thompson 2007: 87). Ignacy Sachs, a Polish ecosocioeconomist, describes the Revolution as such: "The First Green Revolution [in the United States] not only transformed agriculture into a market for industrial inputs, but also applied to food

production the industrial philosophy: specialized monoculture became the main thrust of agricultural modernization, the assumption being that it would bring more efficiency" (quoted in Mushita and Thompson 2007: 87).

The actual success of the Green Revolution cannot be measured in crop yields alone. When other factors are taken into account, it becomes clear that an increase in crop output is greatly overshadowed by other widespread and detrimental impacts. Perhaps the most overlooked factor is the high costs of fertilizers, seeds, and pesticides that farmers incurred, items that successful organic growers did not use prior to the Revolution. When the costs of these items are added into the equation, profits from higher crop yields are negligible (Mushita and Thompson 2007: 87). According to Shiva, "Productivity in traditional farming practices has always been high if it is remembered that very few external inputs are required. While the Green Revolution has been promoted as having increased productivity in the absolute sense, when resource use is taken into account, it has been found to be counterproductive and inefficient" (Shiva 2000: 13).

The Revolution has greatly threatened biodiversity in India, as can be seen in statistics gathered in 1996. Half of all rice fields are planted with genetically modified varieties, and only 10% of the total varieties in existence are used in high-yielding fields. Studies have shown that "such a high degree of specialization also undermines productivity" (Mushita and Thompson 2007: 86). Many people argue that industrial agriculture causes a "significant improvement in aggregate nutrition" naturally follows increased yields, and this positive outcome outweighs all the negative ones. However, it is also argued that too much land is given over to grain cultivation, leading to an imbalance in the plant variety necessary for a nutritional diet. Shiva says of the loss of

variety: “Beans, legumes, fruits and vegetables all disappeared both from farms and from the calculus of yields. More grain from two or three commodities arrived on national and international markets, but less food was eaten by farm families in the Third World” (Shiva 2000: 12). It is also common knowledge among agriculturalists that intense cultivation depletes soil of its nutrients, thereby depleting the nutrients in the crops (Mushita and Thompson 2007: 87).

An additional detriment of the Green Revolution was that “varieties produced more grain by diverting production away from straw. This ‘partitioning’ was achieved through dwarfing the plants, which also enabled them to withstand high doses of chemical fertilizer” (Shiva 2000: 12). The loss of straw was detrimental both because it is used as fodder for cattle that provide fertilizer and also because it is a source of organic matter for soil organisms that maintain soil nutrients. In this way, the Green Revolution forced itself on many farmers by taking away their ability to farm organically and forging their dependence on the industrialized forms of agriculture that it was promoting. Shiva says, “Since cattle and earth worms are our partners in food production, stealing food from them makes it impossible to maintain food production over time, and means that the partial yield increases were not sustainable” (Shiva 2000: 12).

A scarcity of water where there had previously been none manifested itself in the 1980s during the Revolution. The hybrid seeds that were purported to increase yields required more water than the indigenous drought resistant varieties that they replaced. Aquifers were built that drew water below ground, decreasing the water accessible to people above ground. The Deccan region of India experienced soil moisture droughts when monocultures replaced the traditional practice of intercropping sorghum with

oilseeds and pulses, which reduced water evaporation. As Shiva says, “Dwarf varieties replaced tall ones, chemical fertilizers took the place of organic ones, and irrigation displaced rainfed cropping. As a result, soils were deprived of vital organic material, and soil moisture droughts became recurrent” (Shiva 2002: 3). Prior to the Revolution water was accessed in many regions of India through “protective, indigenous irrigation technologies,” but these were seen as primitive by those leading the Revolution and replaced by electric pumps and oil engines, both of which “extracted water faster than nature's cycles could replenish it” (Shiva 2002: 3).

What Shiva believes to be one of the most “fallacious myths propagated by Green Revolution advocates” is the notion that crops modified to put out high yields necessarily require less land for cultivation, meaning that more biodiversity is preserved. This is not true: “In India, instead of more land being released for conservation, industrial breeding actually increases pressure on the land, since each acre of a monoculture provides a single output, and the displaced outputs have to be grown on additional acres” (Shiva 2000: 13). Studies show that “a polyculture can produce 100 units of food from 5 units of inputs, whereas an industrial system requires 300 unites of input to produce the same 100 units” (Shiva 2000: 13). These truths are disguised by the claims of high yields and the supposed eradication of hunger that Green Revolution advocates, including the multinational seed, fertilizer, and pesticide companies most profiting, proclaim loudly in the public sphere.

III. Trade and patent policy

India has attempted to resist intellectual property right (IPR) laws since the birth of the General Agreement on Tariffs and Trade (GATT) in 1948 and has had both successes and failures. Forces like large transnational corporations are, in the end, much more powerful than India in implementing and enforcing international policies, even when the means by which they do so are unfair and unjust. Countries like India that continue to resist IPR laws are seen as a huge nuisance to multinational pharmaceutical and seed companies seeking to exploit bioresources for their own profits, and this hostility does not make for fair negotiations (Shiva 1997: 80).

India passed the Indian Patent Act in 1970, which restricted the granting of patents on pharmaceuticals and agrochemicals. This legislation strove to ensure, through compulsory licensing clauses, that the motivation of companies to gain a profit did not take away the rights of the Indian people to food and medicine. The transnational corporations with vested interests in India's bioresources felt that this was discriminatory:

> Grant of an exclusive right is an essential element of an effective patent system. However, some countries subject patents in a particular field to compulsory licensing to third parties on demand. Food, medicines and sometimes agrochemicals are particular targets for this form of discrimination. This results in undue injury to the rights of its owner. (Shiva 1997: 84)

A Patent Amendment Bill was introduced in 1995 after the formation of the World Trade Organization (WTO) to implement trade-related international property rights (TRIPs), allowing "product patent applications and granting of exclusive marketing rights," but

was ultimately rejected (Shiva 1997: 83). On Indian Independence Day, August 15, 1993, the first public demonstration protesting the Green Revolution's plunder of biodiversity was held. Farmers declared, "any company using local knowledge or local resources without the permission of local communities is engaging in intellectual piracy" (Shiva 2000: 80). That same year the Third World Network, comprised of many Third World organizations and activists, began meeting to discuss the issues and how to combat them (Shiva 2000: 80).

After the formation of the WTO, GATT called for all countries to adopt TRIPs by 1999, meaning that all countries in the world would be subject to the same IPR laws. This did not occur, however, because many countries protested TRIPs. Suman Sahai, professor of genetics at the University of Heidelberg, Germany, and researcher for the Indian Agricultural Research Institute, explains that:

> Under TRIPs member nations are required to grant patents on microorganisms, non/biological and microbiological processes as well as effective IPR protection for plants varieties. TRIPs provides a choice for patenting plant varieties. Members may choose from patents or a *sui generis* system (particular to the nation) or a combination of the two. (quoted in Dronamraju 2008: 229)

India did not implement TRIPs, much to the anger of the transnational corporations. It chose the *sui generis* option and refused to implement rights for seed patenting. In 2001 India implemented the Plant Variety and Farmers Rights Act as their *sui generis* legislation. Sahai explains that the Act's intent was "the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders and to

encourage the development of new varieties of plants" and that it recognized "the necessity of protecting the rights of farmers in respect to their contribution made in conserving, improving and making available plant genetic resources for the development of new plant varieties" (quoted in Dronamraju 2008: 229).

The Biological Diversity Act was implemented in 2002 and "seeks to establish India's sovereignty over its biological resources and associated traditional knowledge" through the policy that "access to biological resources by non-Indian people or companies and by non-resident Indians requires prior approval of the National Biodiversity Authority. For resident Indian citizens and companies, the State Biodiversity Board must grant permission for access, while for local communities none of these restrictions apply" (Dronamraju 2008: 179).

In 2005, the Plant Variety and Farmer's Rights Authority was established under the Act to initiate a large-scale effort to register plant varieties to "provide them internationally-recognized protection against piracy" (Dronamraju 2008: 177). The Authority has developed specific rules and regulations that are crop-specific for those seeking patents (Dronamraju 2008: 177).

The U.S. government, however, disputed India's refusal to adopt TRIPs through the WTO and ruled that "India's failure to amend its patent law is illegal according to GATT" (Shiva 2000: 89). As Shiva says, "India is being held guilty under the WTO 'constitution,' because the Indian people, the Indian parliament, and the Indian government have acted democratically in accordance with the rights and duties bestowed upon them by their national constitution" (Shiva 2000: 89).

IV. The basmati rice patent

Rice has likely been cultivated in India for 8000 years and mention of it is found in ancient texts such as the *Atharva Veda*, written in 1500 BC. Basmati rice, specifically, has been cultivated for centuries (Robinson 2010: 47). Prior to the Green Revolution, during which rice monocultures were introduced, 200,000 basmati rice varieties were grown in India. Today, there are only 27 documented and distinct varieties of basmati rice grown. Since the Green Revolution, exports of basmati rice have grown to 650,000 tons a year, up to 500,000 tons of which are exported (Shiva 2000: 85).

In 1997, a U.S. company called RiceTec Inc was granted a patent on basmati rice that included the rice plant, its seeds, and the method of selecting and breeding that the company employed. After campaigning and protests, many Indian NGOs finally gained the support of the Indian government and an organization called the Agricultural and Processed Food Products Export Development Authority submitted a reexamination application of the patent. In 2002 RiceTec withdrew some of its claims, but not all, and as long as some exist the company still holds immense control over the crop (Robinson 2010: 47).

Aside from the outrage over the foreign ownership and control of a plant that Indians have been cultivating for thousands of years, frustrations have arisen with the discovery that germplasm used to breed the patented rice varieties was taken from Pakistan. In addition, the method of breeding and the plants that result are not seen as novel to Indian farmers, who have been employing the same methods for centuries (Robinson 2010: 47). Shiva says that "These varieties are farmers' varieties bred over centuries on the Indian subcontinent. RiceTec's method of crossing different varieties to

mix traits…is not novel. It is a very commonplace method of breeding, which anyone familiar in the art of breeding knows" (Shiva 2000: 86). The fact that farmers have used these methods for centuries is not recognized by US patent law because the U.S. claims the information is not documented or accessible. Daniel F. Robinson, professor of environmental studies at the University of New South Wales, counters this argument when he says that:

> …arguably there are plenty of examples of documents describing the qualities and breeding characteristics of basmati rice…Many of these publications have documented the breeding and characteristics of basmati rice in accessible international journals prior to the date of application of the patent. Therefore, even according to the U.S.'s national novelty standards, the patent should not have been granted based on the majority if not all of the claims made. (Robinson 2010: 49)

RiceTec sells rice grown in the U.S. called "Texmati" that they claim is "American basmati." Andrew Kimbell, executive director of the Center for Food Safety, says that "The current U.S. policy of allowing virtually any aromatic rice to be labeled basmati or jasmine is nothing short of criminal" (quoted inDronamraju 2008: 175).

The Green Revolution created a trade industry for basmati rice in the 80s and the crop is now grown for export in large quantities. Export profits reached Rs. 7 billion in 2006. Those involved in cultivating the cash crop saw RiceTec's patent as a direct threat to their industry and pressured the U.S. Patent and Trademark Office (USPTO) into prohibiting the company from using the term "basmati" in its products. This ensures that

"consumers of basmati rice from around the world are fully aware that the long-grained, aromatic rice strain from India is the only genuine product" (Dronamraju 2008: 227).

In response to the patents, Navdanya helped organize a global campaign through which "organizations and individuals bombarded the USPTO with protest letters, demanding the U.S. Patent Office not to protect biopirates" (quoted in Dronamraju 2008: 228). Navdanya has also created a large-scale initiative to collect and preserve indigenous strains of rice. The organization, "in association with farmers from nine Indian states, has developed a register documenting over 2,000 indigenous rice varieties. As a result of these protests, no new patents have been given to RiceTec, and no new right has been given to market their varieties as equivalent or superior to basmati" (Dronamraju 2008: 228).

VI. The mustard seed oil crisis

In 1998 it was discovered that large quantities of mustard oil produced by nearly all mustard oil brands in India had become adulterated with diesel, waste oil, industrial oil, and a weed called *Argemone mexicana*. Consumption of the adulterated oil caused a condition called "dropsy" that resulted in the death of 50 individuals in Delhi and affected thousands. The most severe symptoms included diarrhea, liver toxicity, kidney damage, cardiotoxicity, and heart failure. The adulteration of mustard oil by local producers to cheat customers had been done before, but this incident was suspect because the adulteration occurred in nearly all brands and the agents were present in much higher quantities (30%), indicating to many that a conspiracy had taken place (Shiva 2000: 24).

What resulted from the adulteration was also suspect: The sale of mustard oil was banned in more than ten provinces and the Indian government made the decision to import 1 million tons of soybeans, the oil of which would act as a substitute for mustard seed oil. Many groups, including the Agricultural Ministry, protested these imports because it there was no guarantee that the soybeans were not genetically engineered. In addition, the soybean imports destroyed the local mustard oil industries and jeopardized not only the livelihoods of thousands, but also the food economies of the poor, who "depend on unpackaged oil since it is cheaper and they can buy it in small quantities" (Shiva 2000: 24). Since the crisis, the price of mustard products has dropped from Rs. 2,200 to Rs. 600-800 per 100 kilograms (Shiva 2000: 25).

The health administrator of Delhi stated that the "adulteration was not possible without an organized conspiracy. It was done in such as way that it could kill people quickly and conspicuously, and an immediate ban on mustard oil and free import of

soybeans and other oilseeds for oil became available" (quoted in Shiva 2000: 25). The Rajasthan Oil Industries Association voiced their belief that "invisible hands of the multinationals were involved" (Shiva 2000: 25).

And indeed, multinational companies did benefit from the crisis. In attendance at the Globoil India 98 conference held by India's soybean lobby was the U.S. Soybean Association, which pushed for soybean imports to India. The ban on mustard oil has since been lifted, but the seed company Monsanto has now patented the *India brassica* mustard oil plant. What this means is that if farmers wish to grow mustard plants in the future, they will be forced to use genetically modified varieties and will be completely dependent on Monsanto and subject to the legalities attached to its patent (Shiva 2000: 26).

Soybeans imported to India are Monsanto's Roundup Ready variety, discussed previously. Because these soybeans rely on the use of chemical inputs, cultivating the crops comes with the added price of purchasing chemicals. According to Shiva,

> The United States has been unable to sell its genetically engineered soybeans to Europe because of European consumers' demands that such foods be labeled, something that is ardently opposed by agribusiness interest and their allies…U.S. companies are therefore desperate to dump their genetically engineered soybeans on countries such as India. The mustard oil tragedy is a perfect 'market opening' …Every agent of the government in the United States and India is being used by the soybean lobby to destroy agricultural and food diversity in order to spread the soybean monoculture. (Shiva 2000: 27)

In addition to the high costs incurred from soybean cultivation, there are many indications that soybean consumption causes a slew of health problems. An investigation published in New Zealand in 1994 indicates that trypsin inhibitors "inhibit pancreatic processes, cause an increase in pancreatic size and weight, and can even lead to cancer" (Shiva 2000: 31). A study published in the *Journal of Biological Chemistry* in 1952 shows that lecitins found in soybeans "interfere with the immune system and the microbial ecology of the gut." When injected into rats, "lecitins isolated from soybeans were found to be lethal" (Shiva 2000: 31). However, the "most significant health hazard posed by diets rich in soybeans is due to their high estrogen content" (Shiva 2000: 32). This estrogen content can cause miscarriages, a rare form of malignant vaginal cancer, and male infertility. According to Richard James, an ecologist from New Zealand, soybeans are "unsafe at any speed and in any form" (quoted in Shiva 2000: 32).

Protests against the ban on mustard oil and the widespread implementation of soybean products have cropped up across India since the crisis began in 1998. Shiva was part of a group called *Sabla Sangh* that protested in Delhi and illegally distributed mustard oil in conjunction with *Sarson Satyagraha*, a Gandhian movement that implement non-violent non-cooperative tactics to combat food issues in India. In addition, the National Alliance for Women's Food Rights has brought challenges to the Supreme Court of India. As Shiva says, the group is "building direct producer-consumer alliances to defend the livelihood of farmers and the diverse cultural choices of consumers" (Shiva 2000: 32).

Navdanya and other organizations in India and around the globe are working to combat issues directly affecting India. Even with very limited resources, the people of

India have seen great success in fighting the agricultural issues afflicting their nation. In accordance with the philosophy of Gandhi that Shiva has followed in her work with Navdanya, she says:

> *Swadeshi* is the spirit of regeneration, a method of creative reconstruction. According to the *swadeshi* philosophy, people already possess, both materially and morally, what they need to free themselves of oppressive structures. *Swadeshi*, for Gandhi, was a positive concept based on building the resources, skills, and institutions of a community, and when necessary, transforming them. Imposed resources, institutions, and structures leave a people unfree. For Gandhi, *swadeshi* was central to the creation of peace and freedom. In the free trade era, the rural communities of India are redefining nonviolence and freedom by reinventing the concepts of *swadeshi*…They are say "no" to unjust laws. (Shiva 1997:125)

Chapter 5: Conclusion

This thesis tells the story of how what seems as innocent as a patent can actually threaten something as vital as a national food system. It has explored the philosophy and concept of patents, patents on life, international property rights, the loss of biodiversity and indigenous knowledge from the global South, as well as the dangers of agrichemicals and genetically modified (GM) crops. If the issues at hand can be narrowed down in this manner, then there are probably four main themes to take away from this discussion. First, patenting life is counterintuitive and unjust, and legal ownership of life is utilized by self-interested corporations that cater to and profit from the industrial agriculture market, which can and does result in the exploitation of the global South. Second, industrial agriculture, GM crops, and agrichemicals threaten biodiversity, health, and destroy indigenous knowledge in the global South, just as the earlier industrial agriculture decimated biodiversity in the North. Third, international trade and commerce as currently structured are threatening the food sovereignty and food security of underdeveloped nations. Finally, the destruction of food systems due to the aforementioned factors has exacerbated poverty and hardship all over the world and will continue to do so if the situation does not change.

What lies at the heart of these contemporary phenomena are certain misguided attitudes humans have adopted about our relationship to nature. Among these are the belief that life can be owned, that the building blocks of life can be tinkered with to achieve a desired (and self-interested) outcome, and that some organisms are simply an instrument for the will of others. These attitudes constitute a removal from the natural context in which humans first emerged on this earth and show that we have truly forgotten that we are organisms ourselves who exist in an ecosystem like any other – one

in which the survival of all organisms depends on balance and cooperation and symbiotic relationships.

These contemporary phenomena also demonstrate a preoccupation with wealth, the origins of which I will not even attempt to identify. It is truly despairing to see evidence across the planet and throughout history that the drive to accumulate capital has the power to blind people to the despicable character of their exploits and overshadows justice and integrity. Biotechnology companies responsible for engineering the GM crops that have caused so much damage to the global South purport to want to save the world, and perhaps some individuals do hold this altruistic motivation. But ultimately the underlying incentive for the work of these companies is purely monetary and focused on the present, and because of this they are ignorant of concerns for safety and the potentiality of harming others now and in the future. This same blindness is present in the proceedings of agrichemical companies, large seed corporations, and all those involved in bringing industrial agriculture to the global South.

Although completely eradicating our misguided attitudes about our relationship to nature and our preoccupation with wealth is surely a daunting, if not impossible, task, this does not mean the situation is hopeless. Realizing we hold these attitudes and questioning why is crucial for stepping outside of ourselves and placing into perspective the reality of the issues facing the world today. The spread of information to bring about awareness can help forge these realizations.

Anthropology is a fundamental medium through which information is made available, and it can provoke people to rethink truths they hold to be absolute, or begin to think about things they have never before considered at all. Carrying out ethnographic

fieldwork in nations afflicted by the exploits of agricultural industries is absolutely necessary for transmitting information that alerts the world to the realities of the harm that is being done there. In addition, contemporary anthropology has seen a shift towards the study of the developed world, the study of us. This study has never been more crucial than it is now. An anthropological perspective of our own lives lifts a veil from our eyes and sheds light on aspects of our culture we would never see otherwise. Ideally, this forges within us a desire to change that which we realize is unjust. In the United States, awareness is slowly rising about the dangers and exploits of agribusiness and biotechnology companies, the dangers of GMOs, and the horrors of industrial agriculture. And people are beginning to fight for change. The further the information spreads, the more people join the movement, and the more people join the movement, the closer we become to real change. The following are some examples of movements for change.

On International Food Day in 2009, La Via Campesina International Peasant Movement globally mobilized "along with allies in an overwhelming expression of outright rejection of Monsanto and Genetically Modified Organisms…in the name of food sovereignty" (La Vie Campesino 2009). Through this movement, hundreds of important events occurred all over the world: teach-ins in the U.S., actions at the headquarters of Monsanto in Brazil, an anti-Monsanto brigade that held protests in European countries that have allowed the cultivation of GM crops, and fasting and protests in India. Dena Hoff, coordinator of La Via Campesina North America, said, "It's time for all civil society to recognize the gravity of this situation; global capital should not control our food, nor make decisions behind closed doors. The future of our food, the

protection of our resources and especially our seeds, are the right of the people" (La Vie Campesino 2009).

Following the earthquake in Haiti in 2010, Monsanto's gracious act of "charity" was to donate 475 tons of GM corn and other vegetable seeds to Haiti. Many of these seeds came from plants that had been treated with toxic pesticides and herbicides. Chavannes Jean-Baptiste, the Executive Director of the Peasant Movement of Papay (MPP), felt that the donation was "a very strong attack on small agriculture, on farmers, on biodiversity, on Creole seeds…and on what is left of our environment in Haiti" (Bell 2010). The MPP responded by burning all 60,000 sacks of seeds and holding a protest march in Haiti on World Environment Day (Bell 2010).

Recently, in March of 2011, 60 family farmers, seed businesses and organic agricultural organizations, consisting of 270,000 members, filed a lawsuit against Monsanto to challenge "the chemical giant's patents on genetically modified seed" (Cornucopia Institute 2011). Because they felt that contamination of their organic crops with Monsanto's patented GM crops was imminent, and because Monsanto's patents provide the company legal jurisdiction to sue farmers harboring genes from its GM crops, these farmers decided to sue preemptively. Dan Ravicher, Executive Director of the Public Patent Foundation, said, "It seems quite perverse that an organic farmer contaminated by transgenic seed could be accused of patent infringement, but Monsanto has made such accusations before and is notorious for having sued hundreds of farmers for patent infringement, so we had to act to protect the interests of our clients" (Cornucopia Institute 2011).

These large-scale protests of GMOs and seed patents and the powerful actions taken to combat them demonstrate that these issues are being realized and, even more importantly, people are beginning to fight back. But though these movements for change give us hope, we must not let that hope give us reason to rest – there are still people living in terrible hardship all over the world because of companies like Monsanto. There are still hundreds of thousands of starving peasants in India. We must recognize that we are on the right track, but that there is still work to be done, and we must push forward.

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