

GMO: Boon, Bust or Blight?

By Matt Stranberg

When people learn that I recently obtained my Masters in Nutrition, I am often bombarded with a variety of questions. These questions typically pertain to low carb diets, kale, gluten, paleo, or a new miracle supplement mentioned on Dr. Oz. Occasionally I am asked to share my opinion on Genetically Modified Organisms (GMOs). Most GMO questions arise from online articles vilifying GMO, and their endless purported evils, or from a local chiropractor's advice to address joint problems with a "GMO free diet." Chances are you have seen products labeled "Non-GMO," or heard news stories detailing protests to promote GMO labeling. Interestingly enough, these examples are but a small fraction of the issues involving GMO. Thus, before I offer my opinion regarding this issue, I will explore the background of GMO issues as the basis for my conclusions.

A Brave New World

The Cartagena Protocol on Biosafety defines a GMO as an analogous term to: "Living Modified Organism," (The Nature of GMOs, 2000). This is classified as "an organism whose genetic material has been altered using genetic engineering techniques, (The Nature of GMOs, 2000). Organisms that have been genetically modified include microorganisms such as bacteria, yeast, insects, plants, fish, and mammals. Contrary to popular knowledge, GMO technology extends far beyond food. GMOs encompass a large spectrum of technologies ranging from food and animals, to bacteria, and stem cell research.

Many of these technologies are nascent. Biotech companies have produced crops that tout improved yields, inborn pest resistance, and claims of improved taste and nutritional value (Reasons we do need GM Foods: It is about improving nutrition, 2009). Similarly, scientists are involved with stem cell cloning and gene manipulations as part of GMO research. Many of the aforementioned technologies assert goals of "eradicating disease," and "curing cancer." Biotech companies, and related scientists, suggest Utopian promises regarding the triumph of humanity over nature's shortcomings, (Tribe, 2012). Even companies such as Google have invested heavily in GMO technology, such as a company called "Calico," that "aims to fight aging and 'solve death'." (How Google's Calico aims to fight aging and 'solve death', 2013)." When popular press views the technology as a whole, GMO advances seem to be the answer to many of life's questions. Similar to the Carborundum Company's slogan in the late 1970's, Biotech appears to boast that "Progress has become a matter of doing what nature never intended

(Gussow J. D., 1978)." The technologies promise to provide a future life that promotes stability, ameliorates the pains of aging, disease and death, and provides a cornucopia of 'perfect' nutritionally dense delicious foods for the world's population.

Despite these impressive claims, when I hear that we "need something," I have found it useful to employ healthy skepticism. This skepticism helps me develop my own educated opinions, and ultimately safeguards my freedoms. In my experience, I have found it useful to demand robust evidence to support strong claims. Historical trends and lessons from wise sages such as Karl Popper would suggest that, "those who promise us paradise on earth never produced anything but a hell." Personally, Biotech's claims immediately seem "too good to be true." Unlike most popular sentiments though, I implore individuals to avoid immediately dismissing or promoting the veracity of GMO's promises and instead analyze the accompanying arguments.

The Safeguard of Science

The GMO debate often considers the safety of these products as they relate to human health. GMO supporters primarily highlight the suggested scientific consensus is largely based in over 600 published safety assessments, (Tribe, 2012). GMO proponents such as Monsanto, and pundit David Tribe, proclaim to help laymen navigate the confusing myths of modern biology by stating that, "the scientific consensus around the safety of genetically modified foods is as strong as the scientific consensus around climate change. These foods are subjected to more testing than any other, and everything tells us that they're safe," (Tribe, 2012).

This position contrasts with the position of by The European Network of Scientists for Social and Environmental Responsibility, who state:

"As scientists, physicians, academics, and experts from disciplines relevant to the scientific, legal, social and safety assessment aspects of genetically modified organisms (GMOs), we strongly reject claims by GM seed developers and some scientists, commentators, and journalists that there is a "scientific consensus" on GMO safety and that the debate on this topic is "over,"" (Statement: No scientific consensus on GMO safety, 2013)

The European Network instead claims that, "consensus on GMO safety does not exist," and states that: "(The scientific consensus) is misleading and misrepresents the currently available scientific evidence and the broad diversity of opinion among scientists on this issue." These critics largely refer

to the promotion of consensus and regulation by the self regulated Biotech, Agribusiness, Pesticide and Pharmaceutical industries. The group also decries GMO proponents by stating that their stance, "encourages a climate of complacency that could lead to a lack of regulatory and scientific rigor and appropriate caution, potentially endangering the health of humans, animals, and the environment." They warn that "Science and society do not proceed on the basis of a constructed consensus, as current knowledge is always open to well-founded challenge and disagreement," and, "endorse the need for further independent scientific inquiry and informed public discussion on GM product safety and urge GM proponents to do the same," (Statement: No scientific consensus on GMO safety, 2013).

In addition to the rejection of the scientific consensus, individuals such as author Michael Antoniou highlight, "an increasing number of studies (that are showing problems with GMOs and their associated pesticides, such as Roundup," and assert that "there is evidence that Roundup, even at the low levels permitted in food and drinking water, could lead to serious effects on health over time, such as liver and kidney toxicity." He suggests that, based on this evidence, the pesticide exposure levels regarded as safe by regulators around the world are questionable," (GMO Myths and Truths Report , 2014). Activists Dr. Chapela and Dr. Huber, present similar concerns regarding possible harm but have been largely silenced by agribusiness focused scientific committees. (Cummings, 2005).

In addition to these objections, other GMO opponents reference:

- A lack of epidemiological studies investigating potential effects of GM food consumption on human health
- Scientific and governmental claims that endorse GMO safety are exaggerated or inaccurate
- EU research project does not provide reliable evidence of GM food safety
- The list of several hundred studies does not show GM food safety
- There is no consensus on the environmental risks of GM crops
- International agreements show widespread recognition of risks posed by GM foods and crops (Statement: No scientific consensus on GMO safety, 2013)

These disagreements clearly demonstrate the intensity of conflict between the opposing camps. When analyzing the aforementioned studies and viewed solely through the lens of the scientific Randomized Control Trial (RCT) focused argument, though, it appears that the GMO safety argument asserting "direct harm and imminent danger," may be overall weaker on the basis of quantity of quality studies. The famous anti-GMO Seralini study that is frequently cited by GMO opposition, for instance, appears weak and contains numerous flaws, (Novella, 2013). This is also the case for the

embarrassing Carman Pig Stomach Case, which was published despite numerous flaws (Gorski, 2013). It is a shame that these studies dominate the popular GMO opposition arguments, as there is a significant number of legitimate GMO critiques available. When analyzing the conversation, a Carman-Seralini based safety argument ironically weakens the efforts of GMO opponents, especially in relation to the scientific community. Although the critiques of these studies are important, a variety of weak studies do not, however, validate the arguments posited by the "pro-GMO" Biotech camp. When comparing the literature review of safety studies, the concerns regarding quantity as an insufficient measure of safety seem reasonable. To suggest otherwise implies that most international positions which contrast the United States' discourse are illegitimate. The implications of this inference are disconcerting.

Although the scientific consensus has long been a contentious issue, the debate extends beyond the RCT study focus, as comprehensive scientific inquiry encompasses many viewpoints. When expanding the lens to other domains, to include philosophical scientific arguments, critics have argued: "absence of evidence is not evidence of absence of harm." These conundrums are present in every profession, as researcher Chris Masterjohn asserts that many experts sometimes "naively assume that any unmeasured confounding is likely to be simple and straightforward," and can sometimes overplay strengths while failing to recognize critical limitations," (When Standing At the Brink of the Abyss, Staring Into the Great Unknown, We Randomize, 2011) Reputable critiques suggest that a RCT-focused argument appears weak when analyzed in conjunction with Stanford's John P. A. Ioannidis paper regarding, "Why Most Published Research Findings Are False," (Ioannidis, 2005). These red flags seem increasingly apparent, especially in relation to studies involving non-linear complex systems, such as psychosocial experiments or the environment. Research and experience demonstrate that isolated conclusions on a small scale are often susceptible to inappropriate extrapolated conclusions at the macro level, (Ioannidis, 2005). This concern is relevant to assessments claiming, "research findings may often be simply accurate measures of the prevailing bias, (Ioannidis, 2005)." Randy Schekman, Nobel Prize winner, further questioned the scientific consensus of research studies when, in 2013, he criticized peer-reviewed journals by stating that: " Leading academic journals are distorting the scientific process and represent a "tyranny" that must be broke [sic], (Ian Sample, 2013)."

Writer Éric Lépine asserts similar concerns stating that, "The peer-review process, if not broken, is seriously under strain." He cites the "partisan and self-interested aspects" and "unseemly behavior, gender and racial biases, personal vendettas, that certainly don't belong anywhere

within a scholarly environment."¹ Austin L. Hughes discusses in "The Folly of Scientism," that these vendettas are often based on the notion that philosophers go so far as to use 'institutional factors' as the criteria of 'good science'. He expands upon this notion stating that:

"By this criterion, we would differentiate good science from bad science simply by asking which proposals agencies like the National Science Foundation deem worthy of funding, or which papers peer-review committees deem worthy of publication. The problems with this definition of science are myriad. First, it is essentially circular: science simply is what scientists do. Second, the high confidence in funding and peer-review panels should seem misplaced to anyone who has served on these panels and witnessed the extent to which preconceived notions, personal vendettas, and the like can torpedo even the best proposals. Moreover, simplistically defining science by its institutions is complicated by the ample history of scientific institutions that have been notoriously unreliable. The fundamental problem raised by the identification of 'good science' with 'institutional science' is that it assumes the practitioners of science to be inherently exempt, at least in the long term, from the corrupting influences that affect all other human practices and institutions. This assumption is at best naïve and at worst dangerous. If any human institution is held to be exempt from the petty, self-serving, and corrupting motivations that plague us all, the result will almost inevitably be the creation of a priestly caste demanding adulation and required to answer to no one but itself, (Hughes, 2012)"

Éric Lépine's colleague Roger Berkowitz expresses similar sentiments critiquing Oreskes asserting that, "The argument that [any consensus is based on facts] rests on claims about the scientific method: value free studies, evaluated by a system of peer-review, moving towards consensus. Peer-review, for Oreskes, 'is a crucial part of science.' And yet, for those who engage in it know full well, peer-review is also deeply political, subject to petty and also not so petty disputes, jealousies, and vendettas. For this and

¹ The peer-review process, if not broken, is seriously under strain. Arguing that it's the "best we have" is not really an argument... There is no doubt an urgent need for reviewing of this apparent bottleneck and of the corruption (at various levels in the process) that takes place. I can't help but question to what extent the current blind peer-review process survives today solely (or in large part) because the appearance in peer-reviewed journals too often serves as the standard for tenure and promotion decisions? I also worry about the amount of useful information that ends up being lost with this binary/dichotomic "accept/refuse" system (especially in light of the acceptance rates, and how some journals seemingly put a premium on keeping these as low as possible)... Biophysicist Luca Turin is notorious for pointing out the partisan and self-interested aspects of the peer-review process, and how it stymies creativity in academe, while excluding the unorthodox. These are serious concerns that need to be addressed... As a friend pointed out in a prior conversation, it doesn't mean doing away completely with the current approach, but simply acknowledging that there are issues that we need to be dealing with. In the name of science... M. Pigliucci, not long ago, explained: "I am sympathetic to that position, particularly because as author, editor and reviewer I have seen my share of unseemly behavior, gender and racial biases, personal vendettas, and so on that certainly don't belong anywhere within a scholarly environment." In other words: we can do better. - Éric Lépine's thoughts concerning the peer-review process

other reasons, consensus is, as Oreskes herself admits, not always accurate: "The scientific consensus might, of course, be wrong. If the history of science teaches anything, it is humility, and no one can be faulted for failing to act on what is not known." Considering these reports, the GMO scientific consensus seems especially questionable, as unlike Climate Change, ninety-five per cent of GMO proponents originate from the United States (Randerson, 2008).

Expanding upon this theme, Nassim Taleb has based his career on these topics and published numerous works regarding the dangers of misunderstood probabilities and false conclusions. His works and colleagues have suggested that the GMO scientific consensus is most likely the result of flawed reductionist logic. They have raised concerns ranging from numerous fallacies, to monocultures and systemic risk, (Bar-Yam & Taleb, 2014). Jonathan Foley, Director of the Institute on the Environment, has voiced similar concerns regarding faulty reductionist logic in his excellent article, "GMOs Silver Bullets and the Trap of Reductionist Thinking," (Foley, 2014).

In addition to these arguments Taleb has extended these critiques to suggest that many GMO proponents lack "skin in the game," are victims of the "Soviet Harvard delusion," and related "neomania" This implies that the GMO proponents are attracted to the allures of new technologies, possibly employ faulty logic, and are ultimately willing to expose others to more harm than themselves. The result of their intervention could be a primary example of iatrogenic naive interventionism, (Taleb, 2001). This implies that even individuals with seemingly altruistic intentions might cause harm during their attempts to treat, due to their inclination to intervene, even when deemed unnecessary. In addition, this argument is further strengthened by utilizing tools such as Carl Sagan's "baloney detection kit," to employ a healthy skepticism in the face of Biotech's bold claims, (Popova, 2014). Numerous corporations in the past, for instance, have distorted science to manufacture uncertainty regarding the dangers of their product. Two primary examples of these distortions are discussed by Daniel Engber, who recalls that, "the cigarette manufacturers would "establish—once and for all—that no scientific evidence has ever been produced, presented or submitted to prove conclusively that cigarette smoking causes cancer." Tanning industries similarly boasted "the lack of "compelling evidence" that links UV exposure to melanoma," (Engber, 2008). Past mistakes thus emphasize the need to question the authority of purported experts.

By now, it is apparent that the temporal components of analyzing the scientific debate can sometimes be a significant constraining factor. Since the scientific aspects of the GMO debate include many domains of science, this section has only discussed a few major arguments. Unfortunately, many

GMO opponents, especially in social media, focus on embarrassingly flawed and unscientific arguments, which highlight their ignorance and weaken their potency. They vilify their opponents with polemic diatribes and seek to polarize based on ad-hominem arguments. This stance is tragic, because GMO proponents often categorize many well-respected individuals, who cite the legitimate claims of GMO opposition, as illegitimate conspiracy theorists. They are frequently dismissed as "not true authorities, especially in the realms of science," (Tribe, 2012). They are derided as radicals, and luddites, who oppose the progress of the human race. Pundits such as Tribe have claimed that the GMO opposition is "waging a war on science," (Tribe, 2012). Although only time will verify which scientific position is ultimately valid, the foundational basis of the safety measures utilized by GMO proponents is rarely discussed.

Who Watches the Watchmen?

Although GMO health concerns are the primary focus of the Biotech debate, the food safety of the United States has always been a controversial issue. Throughout his career, Bill Clinton asserted: "people should know that the food they eat and the water they drink will not make them sick," (Benbrook, 2006). Despite said promises, reports indicate an increased frequency of contamination outbreaks, and birth defects within our system (Kristof, 2012). Even individuals with PhDs admit that our food system has become complex to the point "[where it is] incomprehensible," (Gussow J. , 1986). Before considering the implications of introducing a complex GMO product, it is important to first understand the United States' capacity to attenuate possible risks regardless of perceived magnitude.

Ever since the early 1900s, researchers have frequently highlighted how many people are unaware of our food system's numerous dangers unaddressed by the FDA, (Perrow, 1984). Evidence regarding frequent daily outbreaks indicates that the capabilities of the FDA are overwhelmed. Despite an ever-increasing number of new products being released upon the market every year, legislation deems the FDA responsible for the safety of only "roughly 80% of food in the United States," (DeWaal & Plunkett, 2009). Additionally, despite an absence of substantial safety based literature and increased prevalence, The Food Safety Act of 2011 includes a clause specifically stating that the FDA "does not regulate GMOs, pesticide use, or antibiotic use in agriculture," (FAQ's about the Food Safety Act, 2012). The FDA is struggling to adapt to our increasingly complex food system. Unfortunately, these reforms are often strongly influenced by private interest groups seeking to exploit legislative loopholes. Although the FDA and policies of food safety were originally grounded in seemingly sound scientific principles, these recent reforms often abuse the shortcomings of the

employed scientific model. This manipulation is demonstrated by private interests frequently hiding behind the protection of a distorted system of "quantitative risk assessment," (Perrow, 1984). Food and drug corporations often seek a desired narrative that overplays potential positives while drastically under- representing possible risks.

A primary example of this flaw is the reactionary model favoring industry gain and related unreasonable burdens of the FDA. Studies generally only examine the safety of isolated elements in the short term, after a product has been released, and do not account for possible cross interactions or exposure beyond the doses utilized by the study, (Meyers, Dumanoski, & Colborn, 1996). History has demonstrated that unforeseen elements and increased exposures often result in widespread harm as exhibited by DDT, BPA, PCBs, and Thalidomide. Originally approved as safe, these products harmed millions before inefficient regulators could react. Our system has become even more complicated since these events. Thousands of new chemicals permeate the markets, in addition to increased involvement from foreign intermediaries. Numerous United States corporations promote interactions with Chinese companies, which are often notorious for egregious food safety violations, (McDonald, 2012). These interactions are protected by risk assessments that manipulate dollar amounts associated with lives as a means of engaging in additional risky measures, (Perrow, 1984). Furthermore, laws promoted by private interest groups have substantially degraded the abilities of the small farm to remain in business and increasingly favor large scale agricultural production. To produce giant yields, companies embrace high-risk policies that maximize the bottom line as opposed to less profitable risk-averse methods, (Perrow, 1984). This irresponsible behavior exacerbates current issues, attenuating food safety risks. Legislation appears to favor a trend toward increased output and complexity that overloads our increasingly vulnerable food-production system. Powerful self interests have, as Charles Perrow stated, relished in the ability of "the power to impose risks on the many for the benefits of the few," (Perrow, 1984). Thus in relation to Biotech, although current short term studies indicate no possible immediate harm from GMO adoption, the aforementioned evidence suggests that our food system has become alarmingly unsafe and GMOs will only further increase complexity. Since the gravity of these current risks is increasingly severe, the key to proper management resides in regulations and ideologies that are risk averse. Mistakes are bound to occur, and it seems in our best interests to limit the overall degree and severity of such possible mistakes. This severity is inherent in our increasingly centralized food system, and is summarized by Willy Denner, who states, "it's just very difficult for a small scale farm to poison thousands of people in 48 states," (Frisch, 2009). Research regarding

GMO safety is often performed on a small scale, but as previously mentioned, systemic collapse would be devastating.

Considering the limited repercussions of past harms in relation to DDT and BPA, it seems especially important to employ preemptive defensive measures against companies that lack "skin in the game." A policy reflecting this objective is Nancy Meyer's risk-averse "Precautionary Principle," which has also been proposed by Taleb et al's previously mentioned papers. Since Taleb and others have spoken extensively regarding unforeseen risks produced by an increasingly complex nonlinear system, it seems alarming to introduce a complex GMO entity into an already incomprehensible system. Many fear that our food safety system could be on the brink of a major catastrophe, similar to the unforeseen financial collapse of 2008. The agribusiness, pharmaceutical industry and related politicians, however, constantly battle these measures by insisting that smaller farming techniques and aforementioned methods are incompatible with current farming models, and therefore prefer to maintain current measures, (Frisch, 2009). Many politicians and researchers have asserted that our food system is in dire need of repair, inefficient, and is becoming increasingly susceptible to systemic failures each time a new complexity is introduced. Despite these claims, big agribusiness largely ignores the concerns and instead asserts that their models and GMO products must be introduced to address pressing concerns. Their argument regarding rapid adoption is often predicated on the need to address the chronic issue of world hunger and malnutrition. To once again understand the strength of these arguments, it is necessary to delve even deeper into the root of the issues at hand.

The True 'Hunger Games' and the '2 Degrees from Destruction'

In addition to possibly "enhancing our crops", one of the most common arguments for rapid GMO adoption, is the need to address world hunger and malnutrition. Opponents of GMOs are sometimes denounced as selfish individuals who callously ignore pressing world issues such as world hunger and malnutrition. Although substantial improvements in technology have saved millions, in 2013 the *State of Food Insecurity in the World* report research indicated that hunger kills more people every year than AIDS, Malaria and Tuberculosis combined, (Hunger Statistics , 2013). Their findings reported that over 842 million people in the world do not have enough to eat, (Hunger Statistics , 2013). In addition to starvation, the report demonstrated that "poor nutrition causes nearly half (45%) of deaths in children under five amounting to 3.1 million children each year." If you regularly watch television, there is a good chance you have seen commercials concerning donations to feed victims of hunger. In addition to viewer donations, many politicians and nations have pledged efforts to

address world hunger in the form of millions of dollars devoted to "food aid." Since over \$2.1 billion has been donated to help the victims of famine, one must wonder why hunger and malnutrition still plague millions. GMO proponents assert that their products are needed to ameliorate these issues with crops such as "Golden Rice", (Harmon, Golden Rice Life Saver, 2013). The GM crops are said to increase crop yields, protect against pests, and also exhibit inborn micronutrients that can reduce malnutrition. Contrary to the claims of Biotech though, research appears to largely suggest that world hunger and malnutrition do not primarily reside in production but are more related to poverty and inequalities.

Contrasting Biotech's popular narrative, for the past two decades the rate of global food production has increased faster than the rate of global population growth. The UK's Institution of Mechanical Engineers in 2013 reported that the world already produces more than 1.5 times the food necessary to feed everyone on the planet, and accumulates 2 billion tons of food waste every year, (Aggidis, et al., 2013). This amount is enough to feed the predicted population peak of 10 billion people in 2050, (Aggidis, et al., 2013). When analyzing these reports, Biotech's call for increased production, to "feed the world," seems puzzling, especially when the United States has largely been unable to feed its own population. This conundrum is presented by census data and policy research which concluded that "one out of every two kids in the United States at some point in their childhood will be on food assistance and that 1 and 6 Americans can be classified as food insecure (A Place At The Table, 2013).

As an economic leader, it seems peculiar that the United States exhibits an inefficient food system that paradoxically results in a stuffed and starved population. When analyzing crop production though, it appears that the bulk of our crops are ironically not dispersed to the World's 1 billion hungry but instead largely dedicated to biofuels and confined animal feed. Biotech's original call to double food production by 2050 only applies if we continue to prioritize the growing population of livestock and automobiles over people, (Gimenez, 2012). These contradictory behaviors are apparent in trends for US farmers growing the corn plants genetically modified for the sole purpose of supplying ethanol in petrol tanks. Many researchers claim that these products are unsuitable for food and as Suzanne Goldenberg warns: "could further worsen a global food crises," while cross contaminating edible foods from fuel only plants," (Goldenberg, 2011). These warnings are often dismissed as our country's leaders stoke fears of coming energy shortages.

Once again opposing the claims of Biotech and recent trends, when addressing world hunger, there exist many viable alternatives. Danielle Nierenberg's research, for instance, highlights international entities such as Self-Employed Women's Association of India (SEWA), or local initiatives within the United States as a potent means to address these issues (Nierenberg, 2013). Unfortunately, these economically and ecologically sound solutions are largely ignored by those, such as Biotech and the Bill Gates Foundation, who are invested in Big Agriculture's preferred models. Instead, the Western food system continues to promote the overconsumption of a few consolidated commodities such as rice, wheat, soy, alfalfa, and variations of corn. It is rarely discussed that these trends highlight the inability to purchase a variety of foods due to economic inequalities, as the primary determinant of malnutrition.

In addition to Nierenberg's efforts, many reforms are also squelched by private investments. Speculation by institutions such as Goldman Sachs and Barclay capital frequently increase food prices and plunge millions into poverty and hunger, (Livingstone, 2012). Similar to how Wall Street has starved millions by means of commodity indexes, investors often simply view food resources as a tool for financial gain, (Kaufman, 2010). History has demonstrated that the loyalty of the banker often opposes efforts solve world hunger as they instead favor the bottom line and conceptualize the impoverished as a "growing consumer market," (Ashton, 2012).

Overall, most research largely indicates that Biotech's claims are false and that promoting food sovereignty is key to addressing hunger. Groups such as Food Secure Canada, promote food sovereignty as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems," (What is Food Sovereignty , 2014) This concept is rarely recognized by GMO proponents who instead favor the paternalistic notions of larger centralized mechanized industrial farming. Numerous studies report that only providing food, such as BT Corn, can actually worsen outcomes, since it undercuts food sovereignty, and disrupts supply chains, (Rosenberg, 2013). In many instances dominant nations use these food aid efforts and altruistic claims as a means to engage in corporate land grabs (Holt-Giménez, 2012). Promoting food sovereignty, instead, facilitates collective self-efficacy as a means to revitalize economies. It empowers formerly downtrodden societies and breaks cycles of colonialism. Evidence such as the successful efforts of independent Mali women to provide food for their country counters paternalistic notions that struggling nations lack the means to develop innovative solutions, (Hufstader, 2009). The movements minimize the "deep dangers of

paternalism inherent in any voluntary service activity," discussed by author Ivan Illich in his essay, *To Hell with Good Intentions*, (Illich, 1968). Many reports demonstrate that these local, sustainable efforts not only address world hunger, but can also contribute to worldwide efforts to end racism, inequality, terrorism, and improve the environment. In addition to SEWA and Mali women, the IAASTD suggested that "rather than pursuing industrial farming models, 'agro-ecological' methods provide the most viable means to enhance global food security, especially in light of climate change," (Aggdis, et al., 2013). Their methods were based on "practical scientific research regarding traditional seed varieties and local farming practices adapted to the local ecology over millennia," and concluded that "Agro-ecology has consistently proven capable of sustainably increasing productivity," (Aggdis, et al., 2013). To truly abolish world hunger, food system researchers implore activists to redirect financial aid to support these movements. GMO proponents however, seem to largely ignore these alternatives in favor of a fallacious argument for increased production.

In addition to the aforementioned analyses of the true sources of hunger and malnutrition, a dark topic rarely discussed by both camps, is world hunger in relation to climate change. Despite the Koch Brothers efforts to fund over "\$67,042,064 to groups denying climate change science since 1997," the world community has largely accepted that our current climate trends are ultimately unsustainable (*The Koch Brothers: Funding \$67,042,064 to Groups Denying Climate Change Science Since 1997*, 2014). Although they have recently increased in popularity, climate change and threat of irreversible ecocide, are not new issues. The state of our "suicidal" progression is much more alarming than asserted in Al Gore's *Inconvenient Truth*. This information has been readily since 1960's and 70's regarding coal consumption, CFC production and related ozone degradation. Movements such as The Limits to Growth and "The Club of Rome" think tank, have attempted to popularize the disastrous consequences that would result if humanity failed to properly regulate our unsustainable trajectory. As early as 1970, the estimates of the MIT researchers warned "if human beings continued to consume more than nature was capable of providing, global economic collapse and precipitous population decline could occur by 2030, (Strauss, 2012). Unfortunately, the models have been proven wrong. Recent reports demonstrated that their predictions were too conservative as carbon dioxide release has increased to a level that will soon surpass the 565-gigaton allowance which would destroy our ecosystems, resulting in what scientists have deemed "a planet straight out of science fiction," (McKibben, 2012). Reports concluded that even if the international negotiations to substantially reduce consumption rates were successful, the atmosphere might still rise 2°C, which would destroy most of Africa, (McKibben, 2012). The pleas of the African nations at the 2009 Copenhagen Conference were

largely ignored, as "neither China nor the United States, which between them are responsible for 40 percent of global carbon emissions, was prepared to offer dramatic concessions," (McKibben, 2012). Contradicting their claims for international concern, the United States, petroleum interests, and big agribusiness, plan to continue and expand their environmentally harmful models. Their strategies involve promoting relentless fracking and invading the Arctic as means to provide the energy required to increase consumption, (Ryan, 2009). Biotech's publicized efforts to feed malnourished populations would therefore become irrelevant since global warming would instead forever eradicate their existence.

It therefore appears that no matter what course of action is pursued, the United States' proposed actions are primarily reliant on technology to maintain current behaviors. Despite our impressive scientific accomplishments, Georg Borgstrom states "technology has not changed in one iota man's dependence on soil, water, and food," (Borgstrom, 1973). The calls to increase consumption appear to ignore humanity's numerous diverse populations and their dependence on dwindling finite resources. The actions conform to dominate historical analyses that conclude "the material welfare of mankind was increasingly based on a vast world market in which the interests of all nations converged and interacted." Borgstrom concludes that this narrative "mirrors in almost uncanny terms a gruesome and myopic ethnocentricity or possibly reflects the callousness that only Western man counts in history," (Borgstrom, 1973). These assessments in relation to the actions of the West seem to effectively deconstruct the seemingly humanitarian stated goals of Biotech's crusade to end hunger. This aforementioned grim aspect of the debate is rarely addressed. As early as the 1970's, the Club of Rome concluded that every proposed solution to hunger and wealth disparities could still possibly result in climate disaster and as of now it appears that we are accelerating this course of action. Although the solutions are unclear, what is clear is that the answer for hunger is far more complex than simply increasing production.

Potent Tool or Potential Pandora?

Overall, it is apparent that GMO are an incredibly complex issue. Although GMO are an evolving science, many reports suggest Biotech's ultimate promises sometime remain unfulfilled. Just as Biotech highlights successes, farmers and scientists report failures, such as a significant reduction in overall crop yields. Widespread "yield drag" has lead many early adopters to question the claim of "higher crop yields with fewer inputs," (Scientists, 2009). The attempts to rectify the unpredictability of nature have also resulted in unforeseen increases in pesticides as a means to counter the GMO based epidemic of herbicide resistant "super weeds,"

(Dupont, 2014). In addition to "Super Weeds," international governments also report destruction of surrounding crops and related ecosystems due to widespread GMO contamination and accompanying glyphosate herbicides, (Philpott, 2011). The Mexican government cites glyphosate based GMO crops as a possible key-contributing factor to plummeting Monarch butterfly populations, (Wines, 2013). Despite their efforts to remain independent of GMO crops, scientists and farmers report that bee pollination patterns often guarantee Biotech crops inevitably contaminate their surrounding natural plant varieties, (Cummings, 2005). Many experts, though, assert that the ultimate concern rests in the possibly disastrous implication of increased reliance on a limited seed bank and patented monocultures.

Despite these controversies, GMO technology has experienced many positive successes, such as possibly saving Hawaii's Papayas and Florida's oranges from viruses and possible extinction, (Palmer, 2013). As previously discussed, Biotech appears correct when stating that current evidence indicates that GMO food is most likely safe to eat at this moment. That being said, the most alarming facet of this debate might not reside in the contested efficacy and safety of GMO products, but in the questionable ethics exhibited by Biotech firms to promote their overall message. If their products fulfill their claims, why does the history of GMO promotion reveal a disturbing trend of suppressing the free speech of scientists and farmers in conjunction with extensive efforts to hide past failures? (Cummings, 2005).

Although each side accuses the other of manipulating science as a means to manufacture uncertainty, the disparities between capital devoted to said efforts is enormous as Biotech, Monsanto and related interests, invest millions in "perception management" and campaigns that work to silence the works of activists, such as Dr. Chapela and Dr. Huber, (Cummings, 2005). Although the science of GMO skepticism is sometimes questionable, it does seem disconcerting to ignore reasonable claims for "more testing" and target those who raise concerns with extreme prejudice, as evidenced by Dr. Pustazi's career, (Randerson, 2008). In addition to possibly intimidating scientists, GMO proponents invest millions in preventing legislation that attempts to regulate their products, (Prop 37 Opponents Spending Millions To Oppose GMO Label Law, 2012). Even Canadian GMO seed industry spokesperson, Dale Adolphe, remarked, "it's a hell of a thing to say that the way we win is don't give the consumer a choice," (Cummings, 2005). Some claim that it is not unrealistic to state that promotion of a superior genome, an unwavering final solution, and aggressive censorship prompt alarming parallels to Eugenics, Nazi Germany and Communist Russia. Accusations regarding possible conflict of interest are not unfounded considering that many politicians such as Hillary Clinton served under Monsanto as a Rose Law Firm representative, (Sager, 2012).

Reports from Princeton, further bolster accusations, indicating that our current government operates as a corporate dominated oligarchy, (Gilens & Page, 2014). It thus might be reasonable for countries to resist importing a vastly inefficient environmentally harmful, obeseogenic food system based on possibly spurious claims, (Toxic Food Environment, 2014). This is especially pertinent for weaker countries as history demonstrates that big agribusiness and the IMF have profited immensely from plundering third world nations, (Goldsmith, 1997). The United States corporations, for instance, are accused of benefiting from collapsing the economy of Iraq and Afghanistan in many respects, as these nations are now increasingly reliant on our imports and an artificial reconstruction towards a more "consumer oriented, mechanized, fuel based economy," (McArdle, 2011). In addition to these concerns it also seems reasonable to doubt the purported humanitarian intentions of Monsanto. These doubts would be rooted in the company's past human rights violations, legal troubles, misleading advertising and production of insidious products such as DDT, Agent Orange, PCBs, recombinant bovine growth hormone, and possible future development of self-terminating seeds. These harmful products in many instances were preceded by numerous scientific studies verifying safety as well as "perception management" campaigns that would include advertisements such as the infamous jingle "DDT is Good for me," (Wade, 2011).

Extensive efforts to patent various seeds and legislative battles regarding biopiracy and "unintended" contamination possibly validate farmer concerns that Biotech seeks to control the seed as a means to control the people, (Harmon, On Hawaii a Lonely Quest for Facts about GMOS, 2014). Although patents as a means to protect Biotech's scientific innovation initially seem justifiable, it also seems reasonable to conclude that the patents could be utilized as a tool of oppression. These concerns are especially relevant in light of the new secret Trans-Pacific Partnership which will extend the ability of corporations to sue governments. Various watchdogs have hypothesized that "an agribusiness company could sue a country that bans GMOs in order to recoup lost profits, which has already been possible, to some extent, under NAFTA — as in the cases "Eli Lilly v. Canada" and "Metalclad v. Mexico," (Louv, 2014). Underlying profit motivated attitudes are often conveyed by the Bill Gates foundation, who working extensively with Monsanto and GMO, have referred to Africa and the world's poor as "the bottom of pyramid, presenting a fast growing consumer market," for products that address the aforementioned issues (Ashton, 2012). All of the humanitarian claims of the United States seem especially disingenuous when considering our foreign policy actions and George Keenan's 1948 Memo PPS23. Keenan's memo governed post world war two policies and advised strategists that the United States should seek to oppress by devising "a pattern of relationships, which will permit us to maintain this position of

(wealth) disparity without positive detriment to our national security." He warns that the United States must "not deceive ourselves that we can afford today the luxury of altruism and world benefaction," (Kennan, 1948).

It appears that perhaps these actions reveal that American Biotech firms are consciously flirting with Pandora's Box in an attempt to obtain full spectrum dominance. As a nation that prides itself as a beacon of Democracy, is it not reasonable to debate the matter of whether or not we should commit to this venture into a realm of uncertain perils? The real answer to these questions will be revealed if Biotech and the United States are willing to promote a food system without GMO if evidence indicates possible harm. Aggressive sociopathic imperialistic behaviors would be confirmed if this information is ignored in a similar manner to the United States overriding climate change protocols proposed by the 2009 Copenhagen Climate Change and Kyoto Protocol. These behaviors often seek to control, and this is clearly visible in parties that seek to limit the topics of the GMO debate to one particular facet. As Noam Chomsky states in *The Common Good*, "The smart way to keep people passive and obedient is to strictly limit the spectrum of acceptable opinion, but allow very lively debate within that spectrum" (Chomsky, 2002). In the scientific community, control in this fashion can manifest when denying funding or allocating disproportion grants to related interests. Outside of the scientific community, Monsanto can further skew public perception with actions to deemphasize the voice of farmers affected by GMO and Big Agribusiness while redirecting the focus to a RCT focused argument. Similar to the organic debate, it currently appears that dominate corporations are dictating conversations to focus on lack of immediate health risks as a masquerade for ulterior motives. The underlying motive of these companies primarily resides in increasing financial gain, maintaining, reinforcing and ultimately expanding their ideological influence. Similar to how studies in William Greider's works detailed the means by which large private capital have mocked democracy by distorting public opinion and distorting the voting process, trends infer similar attitudes are espoused by Biotech industry consultant, Don Westfall who states "the hope of the industry is that over time the market is so flooded that there's nothing you can do about it. You just sort of surrender," (Cummings, 2005). Evidence of these unethical actions suggest it is reasonable for those to distrust the military industrial complex and agribusiness industries that, as Pollan posits, promoted cheap corn to a state where we are "impoverishing farmers, degrading the land, polluting the water and bleeding the treasury," (Pollan, 2007). All things considered, GMO opposition is not without fault as efforts to delude public opinion are frequently espoused in online arenas by faux activists mindlessly quoting incorrect statistics and encouraging unwarranted fear-mongering.

Advancing the conversation relies on expanding the spectrum of discussed domains. An argument based solely in impassioned ad-hominems is ignorant and irresponsible. An argument solely based in RCT studies, however, promotes science without humanity. An appeal to scientism is an especially dangerous notion as ideologies that espouse this focus frequently devolve into a plutocratic tyranny of experts, and have resulted in numerous grave mistakes, such as phrenology, social Darwinism, eugenics and the rationalized extermination of millions. It is crucial to explore all aspects of the arguments so that we can best understand GMO and avoid exacerbating negative trends. These conversations might result in compromises that find products such as genetically modified, disease-resistant papayas an acceptable safe addition to the food supply. Overall, the GMO debate extends beyond the papaya or BtCorn. GMO is the logical solution proposed by the capitalist food model. This answer illogically exacerbates the mechanisms accelerating humanity's current suicidal trajectory. A more rational answer to humanity's plight however, does not reside in corporate farming and increased corn yields. Numerous innovators have demonstrated that our future resides in small, organic, sustainable farming. This solution will largely ameliorate many of our current predicaments and promote the needed fuel dependence transition to the more risk averse sun driven fuel economy. If you are opposed to our current food system that has produced the perverse dichotomy of a stuffed-and-starved population, we must stress food system reform. Before these improvements can occur, we must first reclaim the conversation to avoid actions that Barbara Kingsolver states, "can permanently cancel our natural insurance policy of genetic variability," and finally breach climate change's ecological threshold for mass extinction, (Kingsolver, 2002). The future of humanity resides in food system reform and the GMO discussion is a great place to start.

Works Cited

1. *A Place At The Table*. (2013 йил 1-March). Retrieved 2014 йил 3-March from Participant Media: <http://www.participantmedia.com/wp-content/uploads/2013/01/APATTfinalnotes.pdf>
2. Aggidis, G., Arbon, I., Brown, C., Clarke, C., Earp, J., Fox, T., . . . Williams, D. (2013). *Global Food Waste Not Want Not*. London: Institution of Mechanical Engineers. From http://esa.un.org/wpp/Other-Information/Press_Release_WPP2010.pdf
3. Ashton, G. (2012 йил 27- February). *Bill Gates' support of GM crops is wrong approach for Africa*. From Seattle Times : http://seattletimes.com/html/opinion/2017612869_guest28ashton.html

4. Bar-Yam, Y., & Taleb, N. N. (2014). *The Precautionary Principle*. From https://docs.google.com/file/d/0B8nhAlfIk3QIbGFzOXF5UUN3N2c/edit?usp=docslist_api
5. Benbrook, C. (2006). *Successes and Lost Opportunities to Reduce Children's Exposure to Pesticides since the mid 1990's*. Washington DC: The Organic Center.
6. Borgstrom, G. (1973). Food and People Giving and Taking. In G. Borgstrom, *The Food and the People's Dilemma* (pp. 1-12). Belmont: Wadsworth Publishing Company .
7. Chomsky, N. (2002). *The Common Good (The Real Story Series)*. Berkley: Odonian Press.
8. Cummings, C. H. (2005 йил January). *Trespass: Genetic Engineering as the Final Conquest*. From World-Watch : <http://www.worldwatch.org/node/568>
9. DeWaal, C. S., & Plunkett, D. W. (2009). *Building a Modern Food Safety System For FDA Regulate Food*. Washington: Center For Science In The Public Interest. From <http://www.cspinet.org/new/pdf/fswhitepaper.pdf>
10. Dupont, V. (2014 йил 13-January). *US 'superweeds' epidemic shines spotlight on GMOs*. From Phys Org : <http://phys.org/news/2014-01-superweeds-epidemic-spotlight-gmos.html>
11. Engber, D. (2008 йил 16 -April). *The Paranoid Style in American Science*. From Slate: http://www.slate.com/articles/health_and_science/science/features/2008/the_paranoid_style_in_american_science/an_uncertain_truth.html
12. *FAQ's about the Food Safety Act*. (2012). From Organic Farming Research Foundation: <http://ofrf.org/faqs-about-food-safety-act>
13. Foley, J. (2014 йил 26-February). *GMOS, Silver Bullets and the Trap of Reductionist Thinking*. From Ensia: <http://ensia.com/voices/gmos-silver-bullets-and-the-trap-of-reductionist-thinking/>
14. Frisch, T. (2009 йил December). *The coming battle over food safety*. From The Valley Table: <http://valleytable.com/article.php?article=004+Features%2FThe+coming+battle+over+food+safety>
15. Gilens, M., & Page, B. (2014 йил 9-April). *Testing Theories of American Politics: Elites, Interest Groups, and Average Citizens*. Princeton, New Jersey , United States: Gilens and Page. From

<https://www.princeton.edu/~mgilens/Gilens%20homepage%20materials/Gilens%20and%20Page/Gilens%20and%20Page%202014-Testing%20Theories%203-7-14.pdf>

16. Gimenez, E. H. (2012 йил 2-Май). *We Already Grow Enough Food For 10 Billion People -- and Still Can't End Hunger*. From Huffington Post: http://www.huffingtonpost.com/eric-holt-gimenez/world-hunger_b_1463429.html
17. *GMO Myths and Truths Report* . (2014 йил May). From Earth Open Source: <http://www.ensser.org/increasing-public-information/no-scientific-consensus-on-gmo-safety/>
18. Goldenberg, S. (2011 йил 15-August). *GM corn being developed for fuel instead of food*. From The Guardian: <http://www.theguardian.com/environment/2011/aug/15/gm-corn-development-food-fuel>
19. Goldsmith, E. (1997 йил 1-March). *Development as colonialism*. From Edwardgoldsmith.org: <http://www.edwardgoldsmith.org/751/development-as-colonialism/>
20. Gorski, D. (2013 йил 17-June). *Once more bad science in the service of anti gmo activism*. From Science Based Medicine : <http://www.sciencebasedmedicine.org/once-more-bad-science-in-the-service-of-anti-gmo-activism/>
21. Gussow, J. (1986). *The Nutrition Debate*. Palo Alto: Bull Publishing Company.
22. Gussow, J. D. (1978). *The Feeding Web: Issues in Nutritional Ecology* . Boulder: Bull Publishing Company.
23. Harmon, A. (2013, August 24). *Golden Rice Life Saver*. Retrieved from New York Times: <http://www.nytimes.com/2013/08/25/sunday-review/golden-rice-lifesaver.html?pagewanted=all>
24. Harmon, A. (2014 йил 4-January). *On Hawaii a Lonely Quest for Facts about GMOS*. From New York Times : <http://www.nytimes.com/2014/01/05/us/on-hawaii-a-lonely-quest-for-facts-about-gmos.html?pagewanted=1&r=2>
25. Holt-Giménez, E. (2012 йил 1-December). *Land Grabs Versus Land Sovereignty*. From Food First: <http://foodfirst.org/publication/land-grabs-versus-land-sovereignty/>

26. *How Google's Calico aims to fight aging and 'solve death'*. (2013 йил 3-October). From CNN Tech:
<http://www.cnn.com/2013/10/03/tech/innovation/google-calico-aging-death/>
27. Hufstader, C. (2009). *The Global Food Crises One Year Later Homegrown Solutions to Hunger*. Boston: OXFAMExchange . From OXFAM Exchange Fall 2009 .
28. *Hunger Statistics* . (2013). From World Food Programme :
<http://www.wfp.org/hunger/stats>
29. Ian Sample. (2013 йил 9 -December). *Nobel winner declares boycott of top science journals*. From The Gaurdian :
http://www.theguardian.com/science/2013/dec/09/nobel-winner-boycott-science-journals?CMP=twf_fd
30. Illich, I. (1968, April 20). *To Hell with Good Intentions*. Retrieved from swaraj: http://www.swaraj.org/illich_hell.htm
31. Ioannidis, J. P. (2005 йил 30-August). Why Most Published Research Findings Are False. *PLoS Med*, 2(8), 124. From
<http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.0020124>
32. Kaufman, F. (2010 йил July). The Food Bubble. *Harpers Magazine*, pp. 27-34.
33. Kennan, G. (1948 йил 28-February). *Memo PPS23 by George Kennan*. From Wikisource: http://en.wikisource.org/wiki/Memo_PPS23_by_George_Kennan
34. Kingsolver, B. (2002). Small Wonder. In *A fist in the eye of God* (p. 100). New York: Harper COLLins.
35. Kristof, N. (2012 йил 2-May). *How Chemicals Affect Us*. From The New York Times: <http://www.nytimes.com/2012/05/03/opinion/kristof-how-chemicals-change-us.html>
36. Livingstone, G. (2012 йил 1-April). *The real hunger games: How banks gamble on food prices – and the poor lose out*. From The Independent:
<http://www.independent.co.uk/news/world/politics/the-real-hunger-games-how-banks-gamble-on-food-prices--and-the-poor-lose-out-7606263.html>
37. Louv, J. (2014, July 11). *The Trans-Pacific Partnership Could 'Establish a War of All Against All*. Retrieved from Vice News:
<https://news.vice.com/article/the-trans-pacific-partnership-could-establish-a-war-of-all-against-all>

38. McArdle, P. (2011 йил 19-June). *Afghanistan's Last Locavores*. From New York Times: <http://www.nytimes.com/2011/06/20/opinion/20mcardle.html>
39. McDonald, M. (2012 йил 21-June). *From Milk to Peas, a Chinese Food-Safety Mess*. From The New York Times: <http://rendezvous.blogs.nytimes.com/2012/06/21/from-milk-to-peas-a-chinese-food-safety-mess/>
40. McKibben, B. (2012 йил 19-July). *Global Warming's Terrifying New Math*. From Rolling Stone : <http://www.rollingstone.com/politics/news/global-warmings-terrifying-new-math-20120719>
41. Meyers, J. P., Dumanoski, D., & Colborn, T. (1996). *Our Stolen Future: A Decade Later*. From San Francisco Medicine: [file:///C:/Users/Matt%20Stranberg/Downloads/OSF_Decade_Later%20\(1\).pdf](file:///C:/Users/Matt%20Stranberg/Downloads/OSF_Decade_Later%20(1).pdf)
42. Nierenberg, D. (2013). Agriculture: Growing Food and Solutions. *State of the World* , 190-200.
43. Novella, S. (2013 йил December 14). *Science Based Medicine*. From The Seralini GMO Study – Retraction and Response to Critics: <http://www.sciencebasedmedicine.org/the-seralini-gmo-study-retraction-and-response-to-critics/>
44. Palmer, R. (2013 йил 31-July). *GMO Oranges, Papayas, Potatoes: A Look At Foods Modified To Resist Disease*. From International Business Times : <http://www.ibtimes.com/gmo-oranges-papayas-potatoes-look-foods-modified-resist-disease-1365387>
45. Perrow, C. (1984). Living with High Risk Systems. In *Normal Accidents* (pp. 304-315). Basic Books Inc.
46. Philpott, T. (2011 йил 19-August). *USDA Scientist: Monsanto's Roundup Herbicide Damages Soil*. From Mother Jones: <http://www.motherjones.com/tom-philpott/2011/08/monsantos-roundup-herbicide-soil-damage>
47. Pollan, M. (2007). Corn-flation. In M. Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals*. Farmington Hills: Large Print Pr.
48. Popova, M. (2014). *The Baloney Detection Kit: Carl Sagan's Rules for Bullshit-Busting and Critical Thinking*. From Brain Pickings: <http://www.brainpickings.org/index.php/2014/01/03/baloney-detection-kit-carl-sagan/>

49. *Prop 37 Opponents Spending Millions To Oppose GMO Label Law*. (2012, October 26). Retrieved from Huff Post Food :
http://www.huffingtonpost.com/2012/10/26/prop-37-opponents_n_2023719.html
50. Randerson, J. (2008 йил 14-January). *Arpad Pusztai: Biological divide*. From The Guardian :
<http://www.theguardian.com/education/2008/jan/15/academicexperts.highereducationprofile>
51. *Reasons we do need GM Foods: It is about improving nutrition*. (2009 йил 1-April). From Monsanto: Beyond the Rows:
<http://monsantoblog.com/2009/04/01/gmos-improving-nutrition/>
52. Rosenberg, T. (2013 йил 24-April). *When Food Isn't the Answer to Hunger*. From New York Times :
http://opinionator.blogs.nytimes.com/2013/04/24/when-food-isnt-the-answer-to-hunger/?_php=true&_type=blogs&_r=0
53. Ryan, J. (2009 йил 9-January). *As Arctic melts, U.S. ill-positioned to tap resources*. From The Washington Post : <http://www.washingtonpost.com/wp-dyn/content/article/2011/01/09/AR2011010903400.html>
54. Sager, J. (2012 йил October). *Monsanto Controls both the White House and the US Congress*. From Global Research :
<http://www.globalresearch.ca/monsanto-controls-both-the-white-house-and-the-us-congress/5336422>
55. Scientists, U. O. (2009). *Genetic Engineering has failed to significantly boost U.S. crop yield despite biotech industry claims*. Cambridge: Union Of Concerned Scientists.
56. *Statement: No scientific consensus on GMO safety*. (2013 йил 21-October). From European Network of Scientists for Social and Environmental Responsibility : <http://www.ensser.org/increasing-public-information/no-scientific-consensus-on-gmo-safety/>
57. Strauss, M. (2012 йил April). *Looking Back on the Limits of Growth* . From Smithsonian Magazine : <http://www.smithsonianmag.com/science-nature/looking-back-on-the-limits-of-growth-125269840/>
58. Taleb, N. N. (2001). *Fooled By Randomness Glossary*. From Fooled By Randomness: <http://www.fooledbyrandomness.com/af-glossary.pdf>

59. *The Koch Brothers: Funding \$67,042,064 to Groups Denying Climate Change Science Since 1997*. (2014). From Green Peace :
<http://www.greenpeace.org/usa/en/campaigns/global-warming-and-energy/polluterwatch/koch-industries/>
60. *The Nature of GMOs*. (2000). From FAO Corporate Document Repository:
<http://www.fao.org/docrep/006/y4955e/y4955e03.htm>
61. *Toxic Food Environment*. (2014). Retrieved from Harvard School of Public Health: <http://www.hsph.harvard.edu/obesity-prevention-source/obesity-causes/food-environment-and-obesity/>
62. Tribe, D. (2012). *GMO Pundit a.k.a. David Tribe Helping readers navigate the confusing myths of modern biology*. From 600+ published safety assessments: <http://gmopundit.blogspot.com/p/450-published-safety-assessments.html>
63. Wade, L. (2011 йил 27-June). *DDT IS GOOD FOR ME-E-E!* From Sociological Images: <http://thesocietypages.org/socimages/2011/06/27/ddt-is-good-for-me-e-e/>
64. *What is Food Sovereignty* . (2014). Retrieved from Food Secure Canada:
<http://foodsecurecanada.org/who-we-are/what-food-sovereignty>
65. *When Standing At the Brink of the Abyss, Staring Into the Great Unknown, We Randomize*. (2011, December 16). Retrieved from The Daily Lipid:
<http://blog.cholesterol-and-health.com/2011/12/when-standing-at-brink-of-abyss-staring.html>
66. Wines, M. (2013 йил 13-March). *Monarch Migration Plunges to Lowest Level in Decades*. From New York Times :
http://www.nytimes.com/2013/03/14/science/earth/monarch-migration-plunges-to-lowest-level-in-decades.html?_r=0