Feeding the World: A Monsanto Approach

By Jason Zheng

Pesticides is common household product that is readily available first hand for consumers by their trip to the supermarket. However, the lethality of the pesticides can be compared to a person's abusive use prescription medications in an improper way. To determine these dangers of using every day pesticides, we will investigate one of the most common pesticide product that is used in agriculture, consumer life and other industries—Roundup. As well to further extend the dangers for individuals that are not using them, this paper will also look into the matter of how pesticides like Roundup influence genetically modified organism (GMO), and primarily water qualities.

After these environmental and human health issues are covered, this paper will further investigate the abundance current and future political influences Monsanto and state and/or federal government have in common. Also noted that there is an upcoming presidential election, companies like Monsanto are coming to play. Before Roundup was even patented by Monsanto chemist John E. Franz in 1970, it was just known as glyphosate—a chemical compound composing up of three hydrogen, five oxygen, one phosphate and nitrogen atom. Monsato's patent expired in the 2000's however that did not stop them from creating "Roundup Ready" crops. Now this type of crop will be examined later on in the paper. The investigation will start out with the origins of Monsanto and intellectual establishment of Roundup.

History of Monsanto and Roundup

The earliest known international involvement by Monsanto was during the Vietnam War, which the company mixed two common herbicides (2, 4-D and 2,4,5-T), and create a substance called "Agent Orange". This substance affected both sides of the world, the United States and Vietnam. Vietnam veterans that have been exposed to Agent Orange came with home with rashes and other skin irritations, miscarriages, psychological symptoms, Type-2 diabetes, birth defects in children, and cancers such as Hodgkin's disease, prostate cancer and leukemia. However, it is mindboggling to consider that Monsanto is not to be blamed because the U.S. courts determined that contractors such as Monsanto are not held liable for damage claims associated with chemistry. Although the chemical have been tested on laboratory animals and the results were that human exposure would range from muscular dysfunction, inflammation, birth defects, nervous system disorder and development of cancer. It is hard to ignore the fact that the U.S. government allowed the usage of this bioweapon, while knowing its dangers and ignoring the safety of their own citizens. In 1991 the U.S. government passed the "Agent Orange Act of 1991" to assist those veterans that were exposed to the harmful chemical, however some still do not qualify for the benefits (i.e. those who have actually set foot on Vietnamese soil or river qualify while those who spent time on deep-water Navy ships do not qualify). In the current times, Monsanto continues to have a problematic international role regarding of its primary pesticide.

False Advertisement

Glyphosate was formally recognized as a possible carcinogen in 1985 by Environmental Protection Agency, however in 1991 the EPA stripped this classification and rebranded it as a "non-carcinogen". April 2015 most recent lawsuit (case no: BC 578 942) involves Monsanto falsify information of the chemical properties of their Roundup. Figure 1 on the next page shows that Monsanto advertised Roundup (or glyphosate) as "targets an enzyme found in plants but not people or pets", clearly this is false advertising.

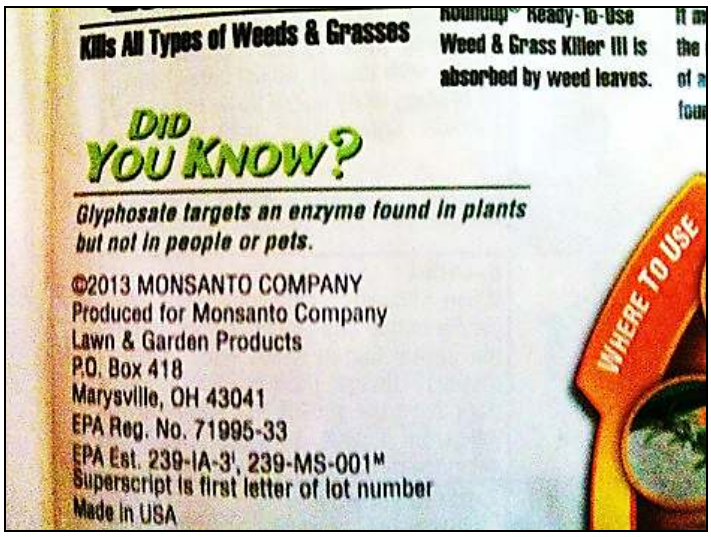

Figure 1

The targeted enzyme is known as EPSP synthase, which is a microbiota that is found in humans and animals intestines. An assessment of both living organisms will be taken in order to determine the lethality of the glyphosate.

For the humans, an excerpt from the lawsuit illustrates how deadly the ingredients in Roundup are:

> *"'Because it kills-off our gut bacteria, glyphosate is linked to stomach and bowel problems, indigestion, ulcers, colitis, gluten intolerance, sleeplessness, lethargy, depression, Crohn's Disease, Celiac Disease, allergies, obesity, diabetes, infertility, liver disease, renal failure, autism, Alzheimer's, endocrine disruption, and the W.H.O. recently announced glyphosate is 'probably carcinogenic'".*

The International Agency for Research on Cancer, an organization part of the World Health Organization (WHO) and the American Cancer Society followed the suit, and declaring

glyphosate a Group 2A carcinogen. The plaintiffs and residents of California started a GoFundMe campaign to gather funds for the lawsuit.

Endocrine and Carcinogen Studies

The following paragraphs will evaluate the effects of Roundup on animals. Two different case studies will be presented that will further examine how dangerous this pesticide is. The first case is on laboratory rats and mice, while the second case is on pollinator.

Between May and September 1988 the Southern Research Institute in Birmingham, AL conducted a laboratory study on the effects of glyphosate on endocrine disruption on rats and mice. Over a course of 13 weeks, rats and mice were fed a glyphosate diet containing 0, 3125, 6250 12,500, 25,000, or 50,000 ppm of 99% pure glyphosate. The study concluded the two highest dosage submitted to the groups of male rats had a significant reduction in sperm concentration, however the concentration remained within the historical range for that rat group. For the female group, glyphosate delayed the estrus cycle compared to the control group.

Rats that followed a diet containing glyphosate at 0, 89, 362, or 940 mg/kg/day (males) and 0, 113, 457, or 1183 mg/kg/day (females) for two years showed results of increase carcinogenicity. The low-dose and high-dose male groups had a slightly increased incidence of pancreatic islet cell adenomas and hepatocellular adenomas. The mid-dose and high-dose male and female groups had a slightly increased incidence of thyroid C-cell adenomas.

To continue the carcinogenicity study, mice were fed a diet containing glyphosate (0, 150, 750, or 4500 mg/kg/day) for 18 months. The results showed that there were no effects on the low-dose and mid-dose groups. However, in the high-dose groups, there was a decreased body weight gain in both male and female mice. In high-dose males, an increase of renal tubular adenomas, hepatocellular hypertrophy, hepatocellular necrosis and interstitial nephritis were present in this group. In females, researchers noted increase of proximal tubule epithelial basophilia and hypertrophy at the highest dosage. We turn our focus on the next case study on pollinators, especially bees.

The Decline of Bees

Though bees may be considered as “pets”, however nonetheless beekeepers keep these pollinators to produce goods to the consumer world. We will further examine how pesticides negatively impact these creatures and ultimately leading to the next section of focus, GMO’s.

Bees are pollinators that natural harvest sucrose to produce a good and service for consumers, however when people implement the usage of pesticides in certain areas of the land, this hinders the ability of these creatures. In a field study from the University of Buenos Aires in Argentina, while utilizing the *Apis mellifera* a primary species of honeybees in agricultural environment, the study displayed a decrease activities of these bees.

Bees that were exposed to Roundup had a lower ability to identify and track food, another word, lower sucrose production. Exposed bees also displayed a drop in learning performance, memory and had difficulties of distinguishing one smell to another. In short the impaired performance these bees projected, their hives exhibits a colony collapse disorder (CCD). The less numbers of pollinators, means the less ability there is for vegetation life to reproduce. However, in the Monsanto's case, this is one of the perfect timing to introduce their own type of pesticide resistance crop to counter the decline in bees.

GMOs

As stated in the beginning of the paper, Monsanto Company created "Roundup Ready" crops, which are "genetically modified to be resistance to the herbicide Roundup" as defined by the Massachusetts Institute of Technology (MIT). GM crops cannot coexist with organic ones because Monsanto forces farmers to sign a contract citing that the seeds that are being plant on the farms, are an intellectual property of Monsanto. Thus this means that farmers are not allowed to save seeds after harvest, which if they did the results can be jail or a legal suit. Monsanto's seeds are also known as the "seeds of death", this corresponds to the massive suicide rates of farmers in India.

According to *The Economic Times*, nearly 300,000 famers in India committed suicide since 1995 because being driven to debt and the conquest of Monsanto's implementing Bacillus thuringiensis (Bt) cotton. Since Monsanto brought Bt cotton into India, small areas agricultural areas no longer have the ability to compete with the company's harvest yield, thus eliminating conventional farming of cotton. The Bt variant also eliminates the purchase power of pesticides that is needed to treat cotton in conventional farming. Figure 2 notes the production of cotton before the release of the Bt variant and after, courtesy of the Cotton Advisory Board.

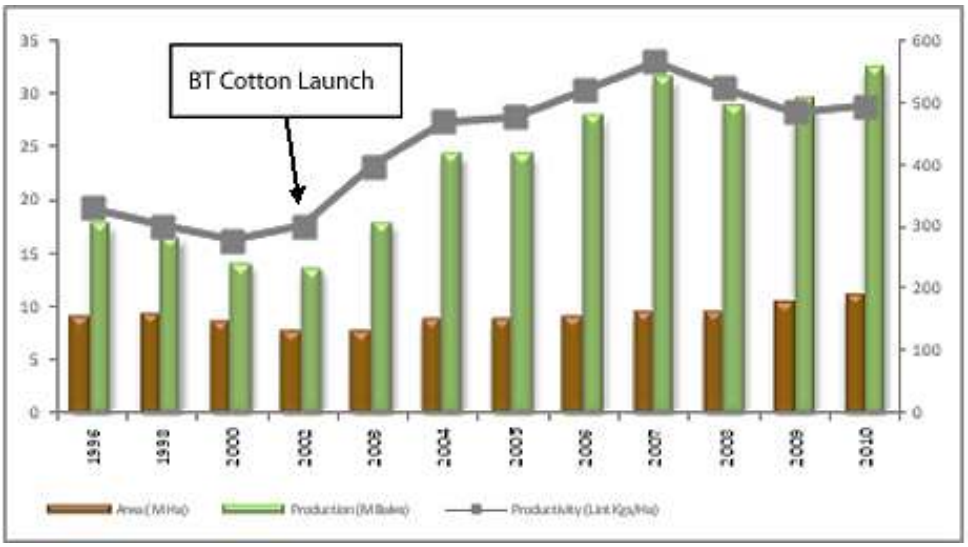

Figure 2

The process of providing a good and service has been changing, one of the goals of Monsanto Company is to recreate a world that compliments its own image. Author Beth Harrison and her book, *Shedding Light on Genetically Engineered Food,* states that the Food and Drug Administration (FDA) is not required to evaluate GM foods, but the company that promotes such products does. The FDA relies on the words and studies of biotech companies, which is common because the federal government is already infected with associates from Monsanto Company, which this will be discussed later on the paper.

Monsanto aims to replace nature, whereas nothing shall be eaten if it's not own or made by humans. The key of controlling the world's population is by controlling the seeds that are used to grow food. When this happens, conventional farming will slowly cease to exist. GM variants crops are already infecting conventional crops, such as pollination from a study of wheat in Oregon. If pollination is not the case, then it is the case of faulty water quality.

Water Pollution

The half-life for glyphosate in water ranges from a few days to 91 days. However, that does not mean that the pesticide is 100% gone because it still remains in the air, not visible but detectable. In 2011, a study was administered in agricultural areas of Mississippi and Iowa, to determine the amount of glyphosate concentration in atmosphere. As well rain water was collected in Indiana to further reinforce the evidence. The data shows that a 60 to 100% concentration of glyphosate was detected in both air and rain. The concentrations of glyphosate ranged from <0.01 to 9.1 ng/m^3 and from <0.1 to 2.5 µg/L in air and rain samples, respectively. As the study reaches the Mississippi River basin, there was a great concentration of glyphosate in air and rain compared to other pesticides.

If glyphosate continues to finds its way into groundwater, it will deprive marine life from attaining the necessary nutrients to survive. Furthermore this means less activities of photosynthesis, water efficiency, shortening of plants root systems and causing plants to release sucrose, which will change the natural pH level of the soil. We can filter water so it can meet the rule of drinking, however the true question is to what extent? Filtering water to the stage where chemical, pesticides and herbicides are majorly removed, some microns will still remain in the water and as it will still remain everywhere else in the environment. However, as individuals we can play a role on minimizing our consumption of industrial made pesticides.

Organic Pesticides

Consumers can opt for alternative methods of pesticides, bringing our focus to organic pesticides. These organic pesticides do not necessarily have to be purchased, different variations can be homemade depending on the type of pest one is dealing with. In this case, glyphosate can be replaced with household vinegar, which will kill weeds without harming humans or pets.

Now that we have covered the how Monsanto Company negatively affects the environment and human health, we turn our focus to how the federal government is allowing Monsanto Company influence domestic and international politics.

Monsanto's Payoffs

Monsanto's role in the federal government remains behind the shadow, their influence can be traced back to the Bush Sr. to the current Obama Administration. Courtesy of Geke.us for the diagram that illustrates the connections between Monsanto and the federal government.

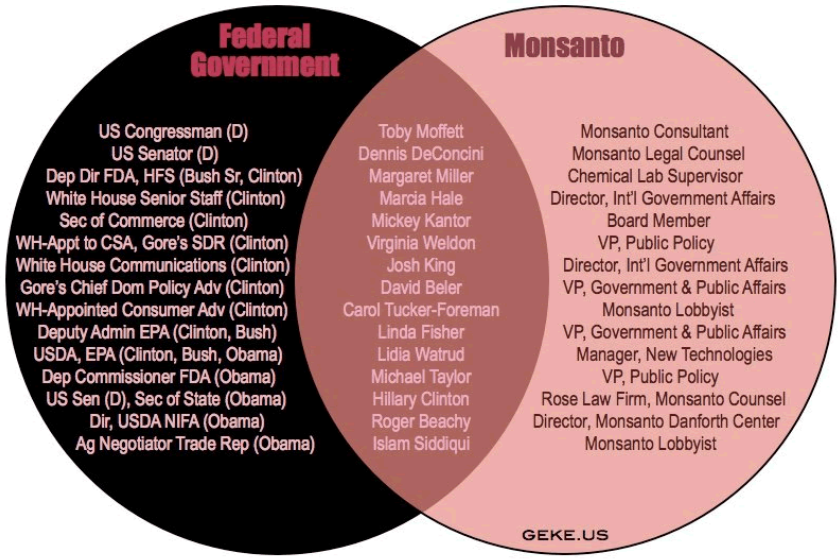

Figure 3

The Obama Administration passed laws and policies that reflected their friendly attitude toward Monsanto. Whether we like it or not, we have been puppets under Monsanto's control. Of the federal initiatives that were passed under the Obama Administration, the 2010 African hunger plan and the 2012 Farm Bill are both examples of maintain relationship with a company that promotes false advertisement.

The 2010 hunger plan was enacted to promote economy and food growth in poor areas in Africa, however certain areas in Africa do not have access to proper planting conditions—this is where Monsanto steps in with their GM crops. Is a positive stance to provide food to the poor and also bringing the poor regions of Africa to the modern economy, however we also have to keep in mind that these glyphosate treated crops by Monsanto are factors of carcinogen.

The United States does not have any formal federal regulations on GMOs, rather they are regulated based on health, safety and environmental regulations governing the conventional

crops. The government aims to regulate GMOs on the nature of the products, rather than the process that was taken to gain this product.

In 2012 the Obama Administration remained silent of Farm Bill, where the mandate declares to have genetically modified foods to be labeled. However, there are no federal regulations that fully ensures that all GMOs are labeled, and the possibility of the Administration vetoing the bill is low. The Farm Bill will benefit agro-companies like Monsanto, however it will also limit the federal government to regulate commerce in the Department of Agriculture. Monsanto Company also provides a list of "funds" that have been contributed to each state and local government. A list of Monsanto's contribution to federal government lobbyists can be found here.

The Obama Administration made numerous changes to policing however, the appointment of Elena Kagan as Associate Justice of the Supreme Court, by President Obama secured the legacy of Monsanto. When Kagan was a Solicitor General of the United States, she filed an amicus brief in favor of Monsanto during a legal suit between Monsanto and farmers in 2007. The suit regarded the topic of how conventional crops were being cross-pollinated by Monsanto's GMO ones. This was considered as an unusual act for a Solicitor General because it is to be considered as a neutral body. Some have argued that Kagan was sympathetic to Monsanto's corporate interests.

As the 2016 presidential approaches, Democratic candidate Hillary Clinton, also the Former First Lady of the United States, has publicity support Monsanto Company and GMOs. As Figure 3 shows, Clinton was once part of the Rose Law Firm, Monsanto Counsel. Her connection with Monsanto can be similarly referenced as a "pork barrel" project. Monsanto Company have been contributing funds to the Clinton campaign, which if she did win the election, this would strengthen agro-companies and GMOs. Regardless if Clinton wins or not, the relationship between the federal government and Monsanto will still remain.

The World in Monsanto's Hands

The course of this investigation depicted Monsanto's true nature in a geopolitical world today. How human are tempting to surpass nature, while knowing that this is utterly impossible because everything we touch, see, and taste originated from nature. If agro-companies continue to aim to replace nature, it is nature that will replace them. The usage of pesticides is indeed wrong, however we cannot ignore the shortage of food production. Poverty stricken countries like Africa cannot afford basic necessity to survive, not even food. However, when GMOs enter the playing field, these crops allow people of Africa to have accessibility like any other countries in the world.

Hence there are alternative planting methods that we can advocate if there was enough people involved, but we also have to consider food shortage. Due to the growing population and demand of the of food supplies, there is not enough food for us all. GMOs would solve the shortage, however unorthodoxly. The bottom line is that at the end of the day, we all would have to choose a side. We could all starve to death and also halt reproduction, hence humans replace humans or

we could opt for alternative methods that will keep us all alive and continue reproduction. Many would not choose the former, so we opt for the latter—which is what we are doing now.