The Final Frontier:

The Environmental and Economic Risks of the Introduction of Genetically Engineered (GE) Wheat

Genetically Engineered (GE) Wheat

Wheat is the top traded commodity worldwide and is grown on more acreage than any other crop. Wheat is the main source of calories for 20% of the world's population and serves as a base for many packaged foods.[i] It remains a staple because of its adaptability in growing conditions, ease of storage, and high levels of fiber, carbohydrates, and protein.

This staple crop is now at risk. Monsanto and other major biotechnology companies are currently in the process of developing two varieties of herbicide-resistant GE wheat, specifically focusing on hard red winter and spring varieties.[ii] The company aims to develop a variety resistant to glyphosate as part of its Roundup Ready line of crops, and a variety resistant to the herbicide 2,4-D. Though other herbicides are also a possibility including glufosinate and dicamba. These varieties are being engineered solely for their herbicide tolerance and fail to address issue of drought resistance, water-use efficiency, and/or energy-use efficiency. The introduction of GE wheat poses numerous environmental and economic risks.

Environmental Impact

GE wheat will have significant negative environmental impacts. Current growing methods of conventional wheat often use the herbicide glyphosate prior to harvest as a desiccant to dry out the crop for processing. Herbicide-resistant wheat would then result in an increase in the amount of chemicals used on each wheat crop. This means that one of the main threats of GE wheat is that it will often require even more chemicals throughout production than existing GE crops. Increased use of pesticides and fertilizers will have environmental impacts including the deterioration of soil health, loss of key pollinators, risks to human health, and water pollution.

- Deterioration of Soil Health[iii]: Expanded use of herbicides, propagated by GE crops, will increase the rate of topsoil loss, runoff, the loss of essential microorganisms, and the rate at which soil loses the ability to serve as a carbon sink. Studies show the important role that healthy soil plays, not only as the basis for bountiful agriculture, but also as a carbon sink.[iv] Healthy soil pulls carbon out of the atmosphere, ultimately helping to mitigate climate change. Industrial agricultural chemicals and monocropping result in the destruction of key microorganisms that are essential for maintaining soil biodiversity, proper aeration, and the nutrient base that is key to healthy crop production. Agriculture can either contribute to climate change, as industrial agriculture does, or be part of the solution.

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- Impacts of increased pesticide use[v]: There is a direct link between the loss of key pollinator species, such as Monarchs and bees, with the expanded use of herbicides, such as glyphosate. The threat of industrial chemicals to pollinators is increased when a cocktail of multiple pesticides/herbicides is used. This practice has become increasingly common to combat superbugs and superweeds—pests that have developed immunity to chemicals because of overuse.[vi]

The improper overuse of herbicides has removed much of the pollinator habitats throughout their key migratory corridor between the US and Mexico. A decrease in pollinators puts our entire food system at risk.

- Human health impacts[vii]: Concerns around the human health impacts of herbicides have been raised for years, and recently the World Health Organization deemed glyphosate a probable carcinogen, and 2,4-D a possible carcinogen.[viii]

In a recent report from the Center for Food Safety, *Pesticides in Paradise*, researchers found increased rates of birth defects, developmental problems, asthma, and cancer in communities surrounding GE field trial sites in Hawaii. This research expands on findings in California's Central Valley, where residents neighboring agricultural fields have developed health problems as a result of herbicide use.

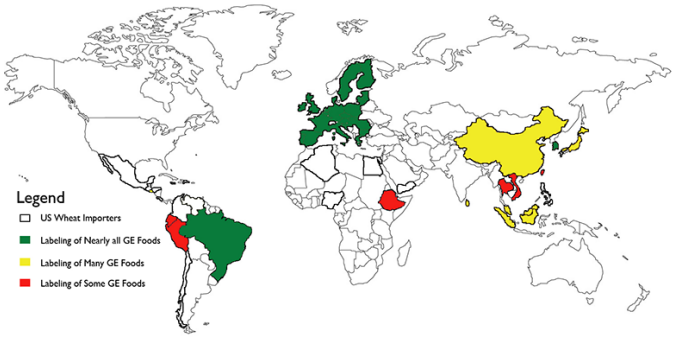
These concerns are heightened by the fact that the wheat retains even higher levels of pesticides compared to other crops we consume. Unlike other GE crops that are heavily processed prior to consumption, wheat goes through minimal processing, leaving higher levels of pesticide residue behind. This will increase the residue levels that people are exposed to and unknowingly consume when they eat products containing GE wheat. This is a major concern as consistently ingesting low levels of various pesticides has major impacts on human health, with links to cancer, nervous system damage, and disruption of the endocrine system. These chemicals are also linked to increases in childhood illnesses and developmental disorders including ADHD, lower IQs, bipolar/schizophrenia spectrum of illnesses and others.[ix] An increase in herbicide use, as a result of the introduction of GE wheat, will further exacerbate the human health impacts of chemical-intensive agriculture.

Economic Implications

In 2012, the US wheat harvest was valued at $17.9 billion, and about $8.1 billion in American wheat was exported, or nearly half the total crop.[x] The US is the largest exporter of wheat worldwide, with wheat being a top traded commodity worldwide.

In 2013, the discovery of Monsanto's unapproved GE wheat varieties in non-testing fields, and the international reaction, demonstrates the enormous backlash that all US wheat production could face if GE wheat is introduced. A number of unapproved glyphosate-resistant wheat plants were found in a wheat field in Oregon. As an immediate response, Japan, Taiwan, and Korea refused all shipments of US wheat and the European Union began testing all shipments it received for the presence of GE material. This incident caused prices for US wheat to drop which negatively impacted farmers. US wheat farmers recently settled with Monsanto for $2.4 million in damages.[xi]

Map: GE Food Labeling Regulations of US Wheat Importers* [xii]



*The top 30 importers of US wheat

The US, as one of the top wheat exporting countries, risks losing a large portion of its world market with the introduction of GE wheat. Currently the US exports to countries with strong GMO regulations, such as Japan, Korea, the EU, and Brazil. This is of particular concern as wheat has a weak domestic market relative to other commodities and relies heavily on exports to support production.[xiii] Internationally, the negative sentiment towards GE crops continues to grow. Recently Germany, Scotland, and other EU states submitted applications to ban GMOs. 64 countries worldwide already require GMO labeling, and the push for labeling in the US is also

strong, where more than 90% of consumers wish to know whether their food contains GMOs.[xiv]

Unlike corn and soy, where the majority of the crop goes to animal feed and ethanol, wheat is primarily a food grain for humans. This increases the likelihood of market rejection, particularly from the major importers that limit or ban GMOs.

There is global demand for non-GE wheat, and the US currently lacks the capacity and necessary mechanisms to properly segregate GE wheat from non-GE wheat. This lack of capacity puts the non-GE wheat market at a greater risk for contamination throughout the supply chain and represents an area of increased expense for the industry as a whole. Building the necessary storage capacity will be costly. In 2003, estimates suggested that segregating GE from non-GE wheat would add a $.21 premium per bushel, removing the competitiveness of US wheat in the marketplace.[xv] In order to avoid contamination, a number of countries will stop purchasing US wheat all together.

Wheat growers also risk a backlash at home. The non-GMO and organic sector continues to steadily grow in the US. If there is a rapid adoption of GE wheat, it would reduce the supply of non-GMO and organic wheat at a time when consumers are increasingly looking for non-GMO products.

Within a ten-year period GE corn went from representing only 20% of the US corn supply to making up over 90%.[xvi] As a result companies are now facing the challenge of finding ample supply of non-GMO corn and soy ingredients as consumer demand is firmly building for non-GMO and organic products. If GE Wheat is introduced in the US, the growing domestic demand for non-GMO and organic wheat will then be increasingly met by imports from other countries, harming the livelihood of domestic wheat growers.

Wheat growers who adopt GE wheat will also be faced with growing costs for seeds and herbicides eating into their profits. This is due to the short-term incentives that are offered to entice farms to transition to GE. Once the incentives are gone the cost of production drastically increases. Wheat farmers who do not grow GE wheat will be faced with the risk of contamination, when seeds from nearby GE fields blow on to their non-GE fields: a particularly relevant issue as wheat is self-pollinating and can lay dormant for years. This increases the difficulty for non-GMO wheat farmers to meet the demands of non-GMO consumers in the US and abroad. The introduction of GE wheat seeds will also threaten non-GE wheat farmers' access to non-GMO seeds, as the seed market for wheat becomes monopolized by the biotech industry, a trend that has been seen in corn and soybean seeds.

Under any scenario, the introduction of GE wheat in the US risks the livelihoods of farmers and the significant revenues earned from US wheat exports.

Conclusion

The economic, environmental, and health impacts of the introduction of GE wheat far outweigh the benefits touted by the biotech industry. Farmers, who adopted GE sugar beets because of promises of increased yields and reduced costs, have found the reality is far different. These farmers are now losing market share, particularly in a market place that is shifting towards non-GMO and organic.[xvii]

Wheat is the last major commodity crop to remain untouched by genetic engineering. For a world faced with a changing climate and an increasing population, GE wheat is not the solution and will only increase the overall cost of food and exacerbate climate change. We must focus our efforts on developing more sustainable and regenerative agricultural growing practices. Research should be focused on the development of a diverse variety of wheat species that focus on regional conditions. The introduction of GE wheat is ill advised and puts the sustainability of our food system at risk.

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