



Hey everyone,

I've mentioned in the last few emails about our movement to entirely non-GMO crops and wanted to send out some info on GMO vs Non-GMO crops. This is NOT a discussion of right or wrong. There's a lot of confusion and miseducation on the topic so I thought a quick, unbiased explanation would be helpful. I think there's a time and a place for GMO products. They've done great things in less developed countries regarding farmer income and health. However, I think they are far too often used as a crutch and the sole method of insect/weed control etc, which has potential to cause, and has caused, serious issues.

### Intro

A GMO crop is a crop that has a trait that could not be incorporated into it by breeding. For example, the Round-Up gene was taken from a bacteria and transferred into plants. There are some crops that have special traits that are the result of a breeding program and are still considered Non-GMO. GMO traits are typically a defense against insects or tolerance to a herbicide. I'll briefly outline how this compares to the crops we grow.

### Wheat

Wheat is quick to explain because all wheat commercially grown is Non-GMO. This is because wheat has weed relatives that it can pollinate and would be able to transfer traits, such as herbicide tolerance and insect resistance, to weed populations. Which would be a disaster. I am only aware of one type of wheat available with a herbicide resistance. But since it was developed by a breeding program using plants naturally tolerant to a herbicide, it is still considered non-GMO.

### Soybeans

Soybeans are also relatively easy since the only GMO traits I can recall are related to herbicide tolerance. I can think of 5 herbicides (some still awaiting approval) that have GMO soybeans associated with them, there's various strengths and weaknesses to them that I won't get into here. That said, we're not convinced there's a significant benefit to weed control that makes them necessary in our operation, especially with a 1.5-2\$/bu premium that comes with Non-GMO soybeans.

Weeds are easily developing herbicide resistances way faster than new herbicides are developed. There's populations of weeds near our location that are resistant to 5 different herbicides. And Palmer Amaranth, which has literally put many farmers out of business, has been found in our county. Non-GMO soybeans limits herbicide options, which would be a serious issue if weed management depended solely on herbicides. We always have the option to return to GMO technologies if we ever needed them.

## Corn

Corn, in addition to herbicide resistance GMO traits similar as described above, also has insect defense using DNA originally found in bacteria. These traits, referred to as Bt-corn (a reference to the bacteria from which the trait originated, *Bacillus thuringiensis*) cause the plant to make a crystalline toxin that, when eaten by susceptible insects, generally caterpillars and a few grubs/beetles, causes a rupturing of intestines and death by sepsis. There are various combinations of Bt protection, some corn varieties may produce the toxin in roots, while others may produce it in above ground vegetation, or both. Using a Bt hybrid requires the grower to plant a certain percentage of the field to non-GMO corn, either at the edge, or it is pre-mixed in the bag and randomly scattered in the field. This area of “susceptible” corn is called a refuge. The reasoning behind this is that if all corn is Bt, then all pests that eat any corn will die...except those with a genetic mutation that makes them resistant to the Bt toxin. They would then produce offspring with other resistant individuals, producing a generation of insects resistant to Bt, which would then make the Bt corn useless, very very fast. The refuge allows some non-resistant insects to feed on non-toxic corn and live, mating with resistant individuals, and therefor keeping susceptible genes in the population.

The biggest issue with the system is that the scientific community has shown consistently that the refuge size requirement is much too small to keep resistance from forming. In fact, several of the species Bt corn was developed for have confirmed reports of Bt resistance and will only continue to get worse. Our area has confirmed Bt resistance in several insect species.

We’re currently exploring premium options for non-GMO corn but have heard reports of ~.40 cents/bushel. In addition to the premium, there is a huge savings in seed. Last year, we paid about 250\$/bag for GMO corn. This year it was about 170\$/bag for non-GMO. Assuming 2.2 acres/bag, that’s about 35\$/acre less just in seed cost for products that have the same, and sometimes even more, yield potential as their GMO counterparts.

We’re excited about some of the price premium opportunities and savings from using non-GMO and the path to grow more of a specialty product. While there are some potential impacts on pest control strategies, having the correct resources and a holistic plan mitigates these concerns.

Frank