



## What Crop Traits are Genetically Engineered (or GMO)?

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There continues to be a great deal of discussion on potential market opportunities for “GMO free” crops and products, such as milk, from animals fed these crops.

GMO is the commonly used term that stands for genetically modified organism and is really being misused in this context. In reality many things in agriculture are genetically modified compared to their ancestors. Humans have used selection criteria to propagate crops that better fit their needs for thousands of years. In the last century this has been accelerated by what are now commonly referred to as conventional plant breeding techniques.

When we hear the term “GMO free” in reference to a food production it is actually referring to products that are not genetically engineered (GE) or contain GE derived ingredients. The definition of genetic engineering is “the deliberate modification of the characteristics of an organism by manipulating its genetic material”. The primary examples of this in row crops are herbicide tolerant crops and crops with traits that protect them from certain insect pest, notably the *Bacillus thuringiensis* (Bt) trait.

It is important to recognize the extensive track record of safety and approval of GE crops and that they represent a valuable “tool in the toolbox” for crop production; however, it is also clear that producers struggling with low margins are giving these potential markets serious consideration. As producers are asked to consider shifting production to “GMO Free” and the potential price incentives attached to that shift there are a number of questions surrounding what it means to be “GMO Free”. Here we will address a few areas of question.

### *What traits are derived from genetic engineering?*

Table 1 provides a list of crop traits, which ones are derived from genetic engineering and which ones are derived from natural breeding.

### *How do conventional varieties/hybrids compare in yield and production cost?*

It is difficult to find clear data on this question. The yield potential of conventional varieties and hybrids is on par with their genetically engineered counterparts; however, the cost, management considerations and potential risk for problems during the growing season can vary widely and produce scenarios that can favor either convention or GE crops.

### *What is “GMO contamination”?*

In crop production “GMO contamination” is a term used to refer to the fact that there is cross pollination of plants and in some cases a GE plant will pollinate a conventional plant resulting in a small amount of GE material in the DNA makeup of the conventional plants seed. In addition to the GE material showing up in conventional plants in a production field, it can also occur in crops grown for seed and thus be present in conventional seed purchased for planting. Much like the term “GMO Free” this term is used in an ambiguous way; however, it needs to be recognized that these are the terms commonly being used and it is important to understand their actual meaning.

Milk is a natural product with no genetic modification; however, the term “GMO free” milk has surfaced in marketing campaigns and refers to the total diet fed to the dairy herd and if any of the feed ingredients are derived from GE sources. In this case the producer needs to account for potential comingling of all feed ingredients from homegrown forages to purchased grains and other additives.

The producer assumes a great deal of risk in assuring the final product remains under defined thresholds for presence of GE inputs. When purchasing seed for planting or feed ingredients it will be important to verify with the supplier if they have tested their products for the presence and percentage of GE material in the seed or feed.



Table 1: Crops Relevant to Row Crop, Dairy and Livestock Production

| Genetically Engineered  | Conventional   |
|---|--|
| <b>CORN</b>   |  |
| <ul style="list-style-type: none"> <li>• Herbicide Tolerance               <ul style="list-style-type: none"> <li>○ Glyphosate tolerance                   <ul style="list-style-type: none"> <li>▪ Roundup Ready (RR)</li> <li>▪ Glyphosate Tolerant (GT)</li> </ul> </li> <li>○ Glufosinate tolerance                   <ul style="list-style-type: none"> <li>▪ Liberty Link (LL)</li> </ul> </li> <li>○ 2,4-D tolerance                   <ul style="list-style-type: none"> <li>▪ Enlist</li> </ul> </li> <li>○ Dicamba tolerance                   <ul style="list-style-type: none"> <li>▪ Roundup Ready Plus Extend</li> </ul> </li> </ul> </li> <li>• Bt Insect Protection               <ul style="list-style-type: none"> <li>○ Corn Rootworm</li> <li>○ Lepidoptera (Moths &amp; Butterflies)</li> </ul> </li> <li>• Drought Tolerance               <ul style="list-style-type: none"> <li>○ <i>SOMETIMES</i>, check with seed supplier</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Brown Mid Rib (BMR)</li> <li>• Floury Starch Silage Hybrids</li> <li>• Disease Tolerance</li> <li>• Drought Tolerance               <ul style="list-style-type: none"> <li>○ <i>SOMETIMES</i>, check with seed supplier</li> </ul> </li> </ul>            |
| <b>SOYBEANS</b>   |  |
| <ul style="list-style-type: none"> <li>• Herbicide Tolerance               <ul style="list-style-type: none"> <li>○ Glyphosate tolerance                   <ul style="list-style-type: none"> <li>▪ Roundup Ready (RR or RR2)</li> <li>▪ Glyphosate Tolerant (GT)</li> </ul> </li> <li>○ Glufosinate tolerance                   <ul style="list-style-type: none"> <li>▪ Liberty Link (LL)</li> </ul> </li> <li>○ 2,4-D tolerance                   <ul style="list-style-type: none"> <li>▪ Enlist</li> </ul> </li> <li>○ Dicamba tolerance                   <ul style="list-style-type: none"> <li>▪ Roundup Ready Plus Extend</li> </ul> </li> </ul> </li> <li>• High Oleic               <ul style="list-style-type: none"> <li>○ <i>SOMETIMES</i>, check with seed supplier</li> </ul> </li> </ul>   | <ul style="list-style-type: none"> <li>• Disease Tolerance</li> </ul>  |
| <b>ALFALFA</b>  |  |
| <ul style="list-style-type: none"> <li>• Herbicide Tolerance               <ul style="list-style-type: none"> <li>○ Glyphosate tolerance                   <ul style="list-style-type: none"> <li>▪ Roundup Ready (RR)</li> </ul> </li> </ul> </li> <li>• Low Lignin               <ul style="list-style-type: none"> <li>○ HarvXtra</li> </ul> </li> </ul>   | <ul style="list-style-type: none"> <li>• High Quality (HQ)</li> <li>• Low Lignin (other than HarvXtra)</li> <li>• Hybrid</li> <li>• Multifoliate</li> <li>• Potato Leafhopper Tolerance</li> <li>• Alfalfa Snout Beetle Tolerance</li> <li>• Disease Tolerance</li> <li>• Branch Rooted</li> </ul> |
| <b>COTTON</b>   |  |
| <ul style="list-style-type: none"> <li>• Herbicide Tolerance</li> <li>• Bt Insect Protection</li> </ul>   |  |
| <b>CANOLA</b>   |  |
| <ul style="list-style-type: none"> <li>• Herbicide Tolerance</li> </ul>   |  |
| <b>SUGAR BEETS</b>  |  |
| <ul style="list-style-type: none"> <li>• Herbicide Tolerance</li> </ul>   |  |