

CAN GENETICALLY MODIFIED CROPS HELP WITH YIELDS, DROUGHT AND INFLATION?

Christopher Gannatti — Global Head of Research
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2022 has been a difficult year for European agriculture.

We can start with the Russia/Ukraine conflict and how that has changed market conditions and supply chains of certain critical things, like fertilizers. Then, we can continue with the fact that these difficulties were followed by drought conditions. Figure 1 summarizes some of what has become visible across the market of European agricultural yields.¹

- Grain maize yield is expected to be down 8.6%.
- Sunflower yield is expected to be down 5.5%.
- Soybeans are expected to be down 9.6%.

Figure 1: Gauging the Crop Yield Forecasts in European Agriculture

Crop	Yield t/ha				
	Avg 5yrs	July Bulletin	MARS 2022 forecasts	%22/5yrs	% Diff July
Total cereals	5.49	5.38	5.28	-3.9	-1.9
Total wheat	5.62	5.54	5.56	-1.1	+0.4
<i>Soft wheat</i>	5.84	5.74	5.76	-1.3	+0.3
<i>Durum wheat</i>	3.52	3.40	3.42	-2.9	+0.6
Total barley	4.85	4.83	4.85	+0.1	+0.4
<i>Spring barley</i>	4.13	4.10	4.12	-0.2	+0.5
<i>Winter barley</i>	5.75	5.72	5.72	-0.5	+0.0
Grain maize	7.87	7.25	6.63	-16	-8.6
Rye	3.90	4.07	4.11	+5.3	+1.0
Triticale	4.19	4.20	4.21	+0.4	+0.2
Rape and turnip rape	3.07	3.13	3.15	+2.4	+0.6
Potato	34.2	35.1	34.2	+0.2	-2.5
Sugar beet	74.4	77.4	75.3	+1.2	-2.7
Sunflower	2.34	2.18	2.06	-12	-5.5
Soybean	2.88	2.72	2.46	-15	-9.6
Green maize	41.6	39.7	38.6	-7.0	-2.6

Source: JRC MARS Bulletin: Crop Monitoring in Europe for August 2022, issued 8/22/22. JRC MARS Bulletin Vol. 30 No. 8. Yield is presented in tons per hectare. MARS stands for "monitoring agricultural resources." % 22/5yrs looks at the percentage difference between the MARS 2022 forecasts and the Avg 5yrs. % Diff July stands for the percentage difference between the MARS 2022 forecasts and the July Bulletin.

Can Gene-Edited Crops Present a Solution?

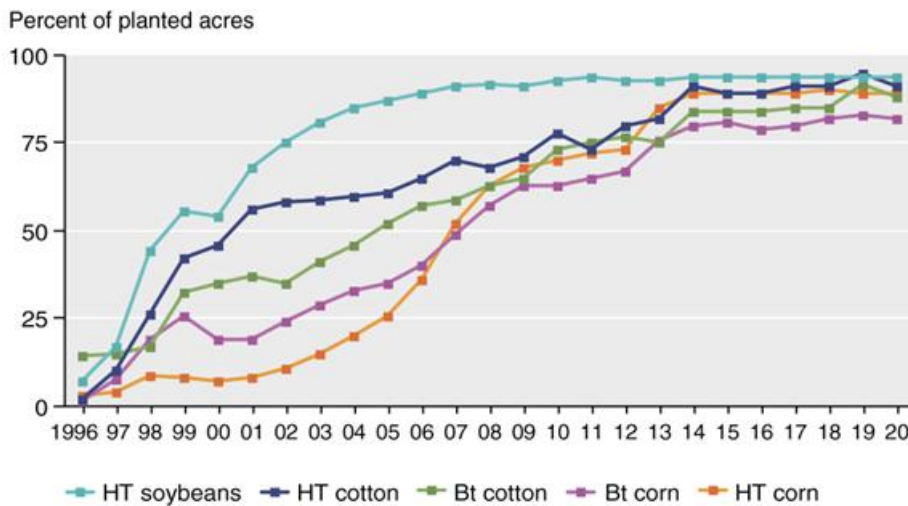
There are European politicians expressing support for the use of genetic modification techniques in agriculture. Italian lawmakers are one such example, and the catalyst is that the recent heat waves and drought are leading to the demand for more resilient crops. If genetic modification is one path to provide for this type of mitigation, it's possible it should receive all due consideration. Italy's longest river recorded its lowest levels in the past 70 years over the summer season of 2022.²

One Genetically Modified Crop Is Grown in Europe

A certain bug-resistant strain of corn is the only genetically modified crop that has been grown within the European Union, based on the current highly restrictive rules. This is in stark contrast to the approach taken in the United States, where about 90% of the soybean and corn fields are genetically modified.³ Figure 2 illustrates the progression of a few different crops in the U.S.⁴

- Herbicide-tolerant soybeans saw the fastest ramp-up in terms of adoption, followed by herbicide-tolerant cotton. Herbicide-tolerant corn had a slower ramp-up, but then a later acceleration to roughly the same ending level in 2020.
- Insect-resistant cotton and insect-resistant corn also saw significant uptakes. As of this writing, insect-resistant soybeans were not yet commercially available.

Figure 2: Adoption of Genetically Engineered Crops in the United States, 1996–2020



Notes: HT = herbicide tolerant. Bt = insect resistant. Data for each crop category include varieties with both HT and Bt (stacked) traits. Bt soybeans are not yet commercially available.

Sources: USDA Economic Research Service (ERS) using data from the 2002 ERS report, "Adoption of Bioengineered Crops," for the years 1996–1999 and USDA National Agricultural Statistics Service's June Agricultural Survey for the years 2000–2020.

Importantly, there is a difference between genetic modification and gene editing.⁵

- **Genetic Modification:** Genetic material from another organism is inserted into the DNA of a plant. Typically, this makes the plant resistant to insects or herbicides.
- **Gene Editing:** This is a newer technique, and it involves editing or adjusting the genome of the organism, not bringing in material from a different organism.

It was thought that gene editing might avoid GMO regulations in Europe, but these hopes were dashed in 2018 when the European Court of Justice ruled that gene-edited crops should be subject to the same regulations as GMOs.⁶

What Are the Most Desirable Outcomes?

If it is determined that the avoidance of gene editing and GMOs is the most desirable outcome, that is one thing. Maybe the current policies in Europe meet this goal. However, globally we have many different goals. Lowering greenhouse gas

emissions is certainly another goal that is widely discussed in Europe and across the planet.

What if the wider adoption of genetically modified crops in Europe could reduce the equivalent of 7.5% of the total agricultural greenhouse gas emissions for the region? This is roughly equal to 33 million tons of carbon dioxide equivalents per year.⁷

Maybe the most desired outcome is to increase yield, since this could lead to greater food security for a given region, and it could also increase supply relative to a baseline during a time of higher [inflation](#). Agricultural commodities tend to see their prices move based on supply and demand expectations. Research so far indicates the potential for genetically engineered crops to increase yields compared to non-altered baselines.⁸

Conclusion: Important to Keep All the Doors Open That We Can

2022 has been a stressful year in many respects. Higher inflation is stressful. Market performance is stressful. Thinking about a possible recession across much of the developed world is stressful. The fact that COVID-19 is still with us is stressful. The list goes on and on.

Thematic equity strategies, at their core, are about finding companies that are seeking to provide solutions for the big problems and the big questions. If the world is to support roughly 10 billion people by 2050—in a way that is as close to net neutral on a carbon emissions basis as possible—it is likely we will need to explore many solutions. How we decide to grow food is at the core of that.

[WisdomTree's BioRevolution strategy](#) seeks to invest in an array of different companies focused on human health, agriculture and food, materials, chemicals, even energy—if a company can understand the information embedded in DNA, then it can open up further and further possibilities.

¹ "JRC MARS Bulletin: Crop Monitoring in Europe for August 2022," 8/22/22, vol. 30, no. 8.

² Valentina Romano, "Italian MEPs back genetically modified crops in response to climate crisis," EURACTIV, 7/8/22.

³ Matt Reynolds, "Europe's Drought Might Force Acceptance of Gene-Edited Crops," WIRED, 9/13/22.

⁴ Sources: USDA Economic Research Service (ERS) using data from the 2002 ERS report, "Adoption of Bioengineered Crops," for the years 1996–1999 and USDA National Agricultural Statistics Service's June Agricultural Survey for the years 2000–2020.

⁵ Source: Reynolds, 9/13/22.

⁶ Source: Reynolds, 9/13/22.

⁷ Source: Kovak et al., "Genetically modified crops support climate change mitigation," Trends in Plant Science, 7/22, vol. 27, no. 7.

⁸ Source: Elisa Pellegrino et al., "Impact of genetically engineered maize on agronomic, environmental and toxicological traits: a meta-analysis of 21 years of field data," Scientific Reports, 2/15/18, vol. 8.

Christopher Gannatti is an employee of WisdomTree UK Limited, a European subsidiary of WisdomTree Asset Management, Inc.'s parent company, WisdomTree Investments, Inc.

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Inflation : Characterized by rising price levels.