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

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06 Oct 2022

2022 has been a difficult year for European agriculture.

One can start with the Russia/Ukraine conflict and how that has changed market conditions and supply chains of critical things, like fertilisers. Then, one can continue with the fact that these difficulties were followed by drought conditions. Figure 1 summarises 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
Soft wheat	5.84	5.74	**5.76**	-1.3	+0.3
Durum wheat	3.52	3.40	**3.42**	-2.9	+0.6
Total barley	4.85	4.83	**4.85**	+0.1	+0.4
Spring barley	4.13	4.10	**4.12**	-0.2	+0.5
Winter barley	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 22 August 2022. JRC MARS Bulletin Vol. 30 No. 8. Yield is presented in tonnes per hectare. MARS stands for 'Monitoring Agricultural Resources.' % 22/5yrs is looking 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?

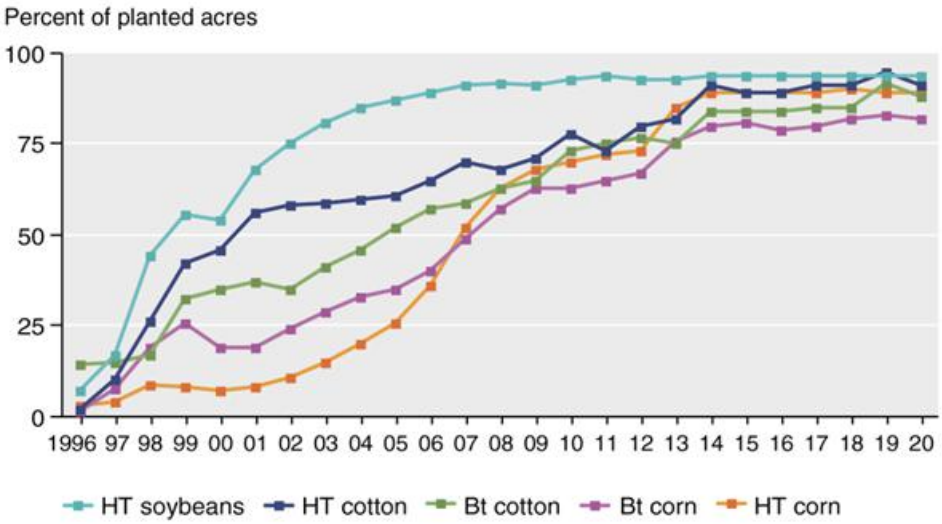
There are European politicians expressing support for the use of genetic modification in agriculture. Italian lawmakers are one such example, as recent heat waves and droughts have increased demand for more resilient crops. Over the summer of 2022, Italy's longest river recorded its lowest levels for 70 years[2]. If genetic modification could help mitigate weather-related crop shortages, one might argue it should receive all due consideration.

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, due to the current highly restrictive rules. This is a 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 for a range of crops in the US[4].

- Herbicide tolerant soybeans saw the fastest 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 uptake. 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.

Source: USDA, Economic Research Service (ERS) using data from the 2002 ERS report, Adoption of Bioengineered Crops, for the years 1996-99 and USDA, Natural Agricultural Statistics Service's June Agricultural Survey for the years 2000-20.

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 would make the plant resistant to insects or herbicides.
- **Gene editing:** this is a newer technique and 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 genetically modified organism (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 tonnes 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 moving based on supply and demand expectations. Research so far indicates the potential for genetically engineered crops to increase yields relative 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 seek 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.

Sources

[1] Source: JRC MARS Bulletin: Crop Monitoring in Europe for August 2022. Issued 22 August 2022. JRC MARS Bulletin Vol. 30 No. 8.

[2] Source: "Italian MEPs back genetically modified crops in response to climate crisis." EURACTIV. July 2022.

[3] Source: Reynolds, Matt. "Europe's Drought Might Force Acceptance of Gene-Edited Crops." WIRED. 13 September 2022.

[4] Source: USDA, Economic Research Service (ERS) using data from the 2002 ERS report, Adoption of Bioengineered Crops, for the years 1996-99 and USDA, Natural Agricultural Statistics Service's June Agricultural Survey for the years 2000-20.

[5] Source: Reynolds, 13 September 2022.

[6] Source: Reynolds, 13 September 2022.

[7] Source: Kovak et al. "Genetically modified crops support climate change mitigation." Trends in Plant Science. July 2022, Vol. 27, No. 7.

[8] Source: Pellegrino et al. "Impact of genetically engineered maize on agronomic, environmental and toxicological traits: a meta-analysis of 21 years of field data." Nature.com/Scientificreports. 15 February 2018.

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