

#InspiredByLife to

# Reduce agricultural inputs and land use while improving maize yields

Over millennia, living organisms and biological systems in nature and the human body have developed a resourceful toolbox of biochemical capabilities, cellular and biomolecular processes and genetic resources. Inspired by a deeper understanding of these tools, life sciences researchers have studied nature to create new biotech solutions, in sectors including healthcare, agriculture and industry that help people and the planet.

Today, modern biotechnology provides breakthrough therapeutic treatments and biofortified nutrition that save lives and improve wellbeing. It enables new technologies that support a circular bio-economy, the European Green Deal and more sustainable agriculture that reduces the impact of human activity on our climate and ecosystems. It has inspired the development of new cutting-edge industrial manufacturing processes that are safer, cleaner and more efficient.



## Insect resistant maize increases yields while using less land and fewer inputs

With an ever-increasing global population, combined with threats such as climate change and drought, there is an urgent need to produce sufficient food and animal feed in a more sustainable way. Bt Maize has been created by scientists to do just that.

By making maize resistant to harmful insect pests, farmers are able to increase their yield by between



7.38% and 10.53% on average.<sup>1</sup> This means using less land and fewer resources to produce the same amount of food with less impact on the environment.

## Reducing the impact of human activity on our climate and ecosystems

In Spain and Portugal, where insect resistant maize has been cultivated for over two decades, farmers have been able to reduce the use of land and agricultural inputs, such as pesticides and water, with benefits for the environment and biodiversity. Since 1999, more than 1,040 m<sup>3</sup> of irrigation water has been saved and the spraying of insecticide on Bt Maize fields has been reduced by 37%, while also reducing the impact of herbicides and pesticides by over 20%.<sup>2</sup>

Bt maize has also enabled farmers to boost production by 1.89 million tons<sup>2</sup> compared to conventional farming. To achieve these levels of production with conventional maize, it would have been necessary to cultivate an additional agricultural area of 15,240 hectares.<sup>2</sup> Bt maize has also resulted in reduced levels of mycotoxins (naturally produced toxic substances which can cause various diseases in humans and animals).

There are benefits too for the climate. Bt maize has



been shown to lead to a reduction in carbon emissions. For example, a recent global assessment of GM technology shows huge carbon savings linked to important cuts in fuel use and tillage changes, resulting in significantly reduced greenhouse gas emissions that were equivalent to removing 16.7 million cars<sup>2</sup> from the roads in 2016.

## Learning from living organisms and biological systems in nature

Thanks to biotechnology, scientists have been able to use a naturally occurring soil bacterium - *Bacillus thuringiensis (Bt)* - to develop insect-resistant plants that help farmers to protect their crops against damage and destruction. For example, Bt maize is resistant to the corn-borer plague, which can cause losses of up to 30% of harvests.<sup>3</sup> Bt maize is a safe, effective way to combat pests and help ensure improved harvests.

## Improving human lives and wellbeing

Bt maize and other crops developed through biotechnology offer the potential to increase food security and improve farmer livelihoods both in Europe and elsewhere. There is an economic benefit both at the local level for farmers and also at the national level. For example, in Spain and Portugal, there was an increase in income of €285.4 million<sup>2</sup> over the 21-year period of 1998–2018. Now, thanks to Bt maize, Spain is also less dependent on imported maize.

By combating pests that wreak havoc with harvest, as well as using fewer inputs (land, water, fuel etc), Bt crops can help feed the world's growing population and tackle hunger in developing countries by producing more food on less land while protecting natural resources.



## Did you know?

- In Spain and Portugal, Bt maize has enabled farmers to boost production by 1.89 million tons<sup>1</sup> compared to conventional farming. To achieve these levels of production with conventional maize, it would be necessary to cultivate an additional agricultural area of 15,240 hectares.<sup>1</sup>
- During the year 2015 alone, at least an additional 9,608 hectares<sup>2</sup> of maize crops would have been required to attain the yields reached by the use of Bt corn in areas that were affected by the European corn borer in Spain.
- Over the 20-year period since Bt maize has been introduced in Spain the average farmer's income has increased by the equivalent €173/ha per year.<sup>3</sup>

## The bio-scientists and researchers were inspired by life to this solution for people and the planet

Bt maize is also helping to overcome food security challenges in West Africa. In partnership with the Bill and Melinda Gates Foundation and USAID, bio-scientists are working with the Water Efficient Maize for Africa (WEMA) project to produce drought resistant maize crops and tackle the destructive impact of the Fall Armyworm.

Dr. Michael Otim, who is leading the project, said: "We have identified the genes that give drought tolerance. We are now developing maize varieties with this gene expression to ensure decent yields even when the rains don't come."

The Fall Armyworm, which originates in Brazil, was first found in Africa in 2016. Since then, the pest has destroyed maize—a staple food for over 300 million people—in over 30 African countries.

This case study including sources and references is available at <https://www.europabio.org/inspiredbylife/case-studies>

<sup>1</sup> GMO info 'Benefits of Bt maize farming in Spain and Portugal' [factsheet](#)

<sup>2</sup> EuropaBio 'Benefits of Bt maize in Spain (1998-2015)' [report](#)

<sup>3</sup> EuropaBio: [Pocket guide to GMO crops and policies](#)

#### Sources:

- **Fundación Antama (06/2019)**. [Benefits BT maize farming – Spain and Portugal \(1998 - 2018\)](#).
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- **Andrea K. Carzoliab, Siddique I. Aboobucker, Leah L. Sandall, Thomas T. Lübberstedt, Walter P. Suza (12/2018; 19:84-91)**. [Risks and opportunities of GM crops: Bt maize example. In Global Food Security](#).
- **GMOinfo.eu (13/06/2019)**. [Insect resistant GM maize has benefited farmers and the environment in Iberia](#).

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