

THE GREEN G-NOME'S GUIDE TO

# GM CROPS & POLICIES IN THE EU



*EuropaBio*<sup>®</sup>

The European Association for Bioindustries



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# INTRODUCTION





# Welcome to the World of Genetically Modified Crops!

*"There is compelling evidence that GM crops can contribute to sustainable development goals with benefits to farmers, consumers, the environment and the economy."*

*European Academies of Science<sup>1</sup>*

> EASAC

<http://bit.ly/IGSyVV>

Dear Reader,

Today, you are most likely wearing clothes made with genetically modified (GM) cotton and eating something made with biotechnology. Our farm animals in Europe are being fed with significant amounts of GM crops, the vast majority of which are grown and harvested on other continents. Yet, despite having contributed to its creation, Europe has all but expelled the fastest-adopted technology in the history of agriculture.

GM crops have been determined safe and provide multiple benefits. So why are the EU and many of its member states hindering this promising technology which we already rely on?

Notwithstanding fear mongering by anti-GMO groups in Europe, past studies suggest that the majority of Europeans and increasingly the younger generations are actually open to GM crops, especially if they can deliver benefits such as price incentives, a reduction in use of farm inputs, or healthier food.<sup>2,3,4</sup>

Fortunately, several European leaders have also spoken out in favour of GM crops. We think it's time for Europe to face the facts and have an informed debate. We hope to raise your interest with this guide.

*Your EuropaBio Agricultural BiotechTeam*



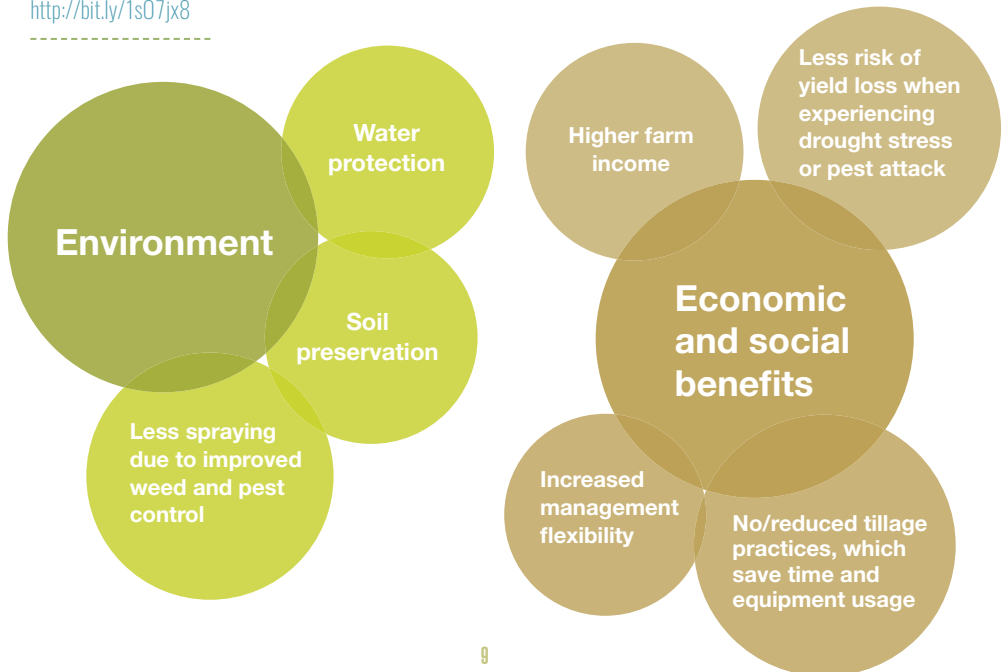


# Why farmers plant GM crops

Farmers around the world make important choices every season regarding the various tools that they will use to produce the best possible crops. Their choices depend on the needs of their consumers and the given climatic and environmental conditions at the time of sowing and growing. In countries where farmers have the choice, biotech seeds are among those tools. The economic benefit of planting GM crops amounted to an **average of almost 100 € per hectare in 2014**.<sup>5</sup>

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> Global impacts  
of GM crops

<http://bit.ly/1s07jx8>  
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# Addressing global challenges with GMOs

Through agricultural biotechnology (green biotech) professional plant breeders can give plants desirable characteristics that are needed to face some of the world's most pressing challenges.

Whether it is improving resistance to certain pests or weeds, enhanced robustness against diseases, developing drought or water tolerant crops, or more nutritious plants – to name just a few traits – green biotech, including genetically modified organisms (GMOs), can support food security, economic development, and the environment.

As the world population grows to ten billion people in 2050, we will need to almost double food production in the developing world and increase it by 60% globally.<sup>6</sup>

Green biotech has already triggered an unprecedented acceleration in innovation that can help us to meet the challenge, but more commitment from the EU is needed to help ensure that it can deliver its potential.

> Glassbarn  
<http://bit.ly/2mFCIA6>



155 people  
TODAY



72 people  
1970



27 people  
1950



9.8 people  
1930

How many people can one farmer feed?<sup>7</sup>

Key  
= 3 people

# Seed is at the origin of all our food

Without plant breeding, many of the foods we consume today would not exist or they would not be as healthy or tasty as they are today. For centuries, farmers have tried to improve their crops by means of crossing, relying on the random rearrangement of existing genes between two closely related parent plants. Agricultural biotechnology (or green biotechnology) encompasses a range of modern plant breeding techniques, including genetic modification, which allows us to improve plants in more targeted ways.

## What is genetic modification?

Genetic modification is a specific agricultural biotechnology used to improve plants in a more precise way than conventional breeding. It means that existing genes are modified, or new genes included, to give plant varieties desirable characteristics (traits), such as making crops more robust against diseases, resistant to certain pests and herbicides, and tolerant to drought or water.

Because only a few genes with known traits are transferred, GM methods are faster and more targeted than traditional breeding.

Find more responses to FAQs on our [website](#).

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> EuropaBio's FAQs

<http://bit.ly/2jt6CrJ>  
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# Biotechnology in our everyday lives

Biotechnology uses living organisms to make useful products. Production may be carried out by using intact organisms, such as yeasts and bacteria, by using natural substances (e.g. enzymes) from organisms, or by modifying plant genomes.

Biotechnology has been used for more than 6,000 years for lots of interesting and practical purposes:<sup>8</sup> making food such as bread and cheese, preserving dairy products and fermenting beer. Although we do not always realise it, biotechnology is a huge part of our everyday lives. From the clothes we wear and how we wash them, to the food we eat and the sources it comes from, to the medicine we use to keep us healthy and even the fuel we use to take us where we need to go, biotech already plays, and must continue to play, an invaluable role in meeting our needs.

> Biotech timeline

<http://bit.ly/2k3ZV01>



# Is it safe to eat GM crops?

**Yes. There is no evidence that a crop is dangerous to eat just because it is GM.** That's the clear answer of the Royal Society (British academy of science).<sup>9</sup> Trillions of GM meals have been eaten with zero cases of harm.

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> Food insight  
<http://bit.ly/1XiGzz9>

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> What people say  
<http://bit.ly/2cslDEN>  
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All representative scientific organisations<sup>10</sup>, the European Academies of Science, the World Health Organisation, the European Commission<sup>11</sup> and the European Food Safety Authority agree: safety assessed GM crops are **at least as safe as conventionally bred crops**.

All GM crops that are currently on the market have proven to be safe. GM products all have to go through a rigorous safety assessment by a competent authority. In the EU, this role is carried by the European Food Safety Authority (EFSA).



In 2000 and 2010, the European Commission released two reports that cover 25 years of research, which concluded that GMOs are just as safe as conventional plants.<sup>12</sup>

## FIND OUT MORE

> **Factsheet** Facing the Facts on GMOs in the EU<sup>13</sup>

<http://bit.ly/2eu56CX>

> Royal Society's **Q&A** on GM Plants<sup>9</sup>

<http://bit.ly/2k6XI9X>

> **European Academies Science Advisory Council (EASAC) policy report** on opportunities and challenges for using crop genetic improvement technologies for sustainable agriculture (June 2013)<sup>1</sup>

<http://bit.ly/1ezwEA1>



# STATUS OF GM CROPS WORLDWIDE





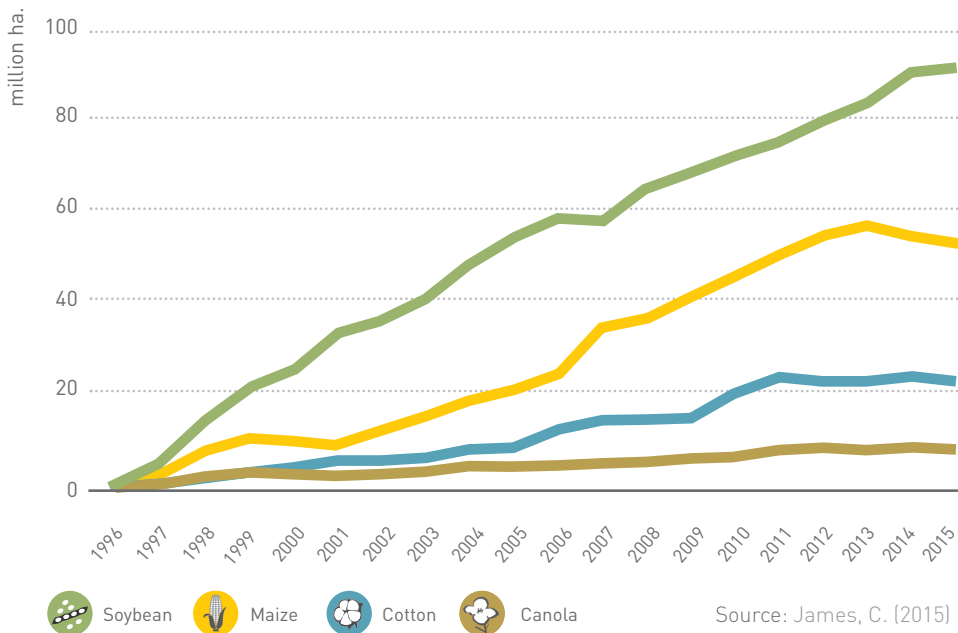


# The fastest adopted crop technology

> ISAAA

<http://bit.ly/2533Pol>

Since 1996, GM crops have been increasingly cultivated and consumed world-wide<sup>14</sup>, making GM the fastest adopted crop technology in history. GM crops are mostly grown outside of Europe and increasingly in the developing world.<sup>14</sup>



Source: James, C. (2015)

## Bigger than EU crop farming

More farmers are now planting biotech crops globally than all EU farmers put together, on a surface that is larger than all EU arable land.

**18 million farmers planted GM crops in 2015** – that is about 6 million more than all EU farmers.

While the global area of biotech crops is about **six times as big as the total land area of Italy**, the EU's share is only about the size of a big city.

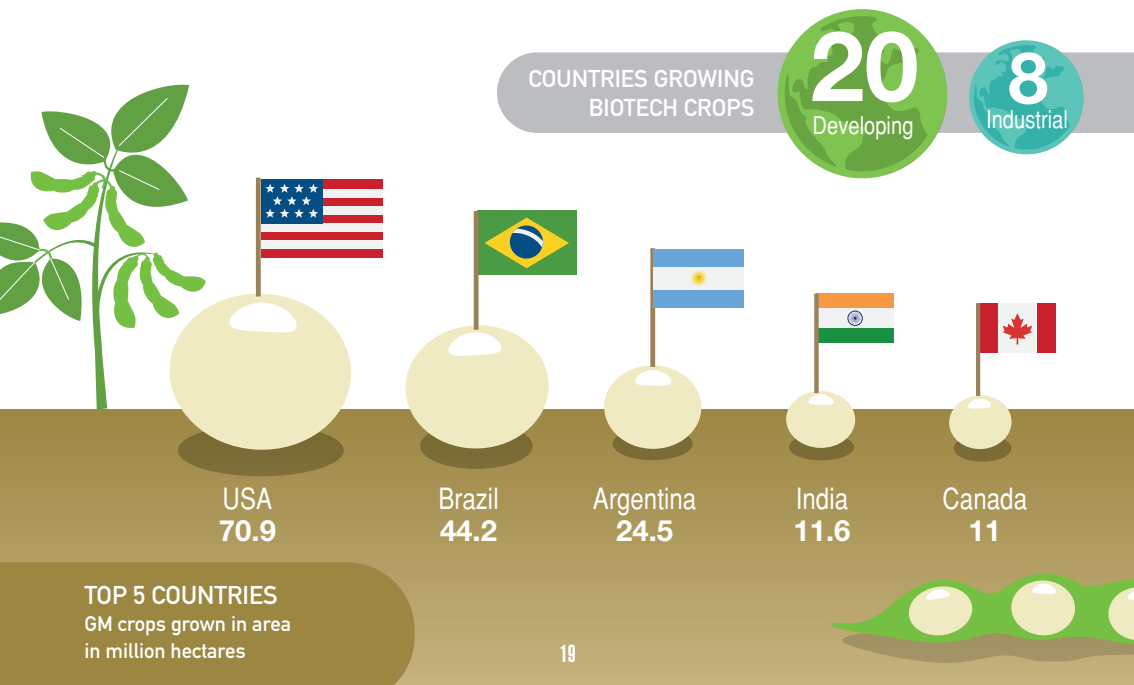


# Leaders in GM crop cultivation

> ISAAA Biotech Crop Highlights

<http://bit.ly/1QE0aC2>

The top five countries planting GM crops each grew more than 10 million hectares in 2015.<sup>15</sup> Since 2012, developing countries have grown more GM crops than industrialised countries. Out of the 18 million farmers growing GM crops globally in 2015, around 90% were small, resource-poor farmers, including around 14 million cotton farmers in India and China alone.

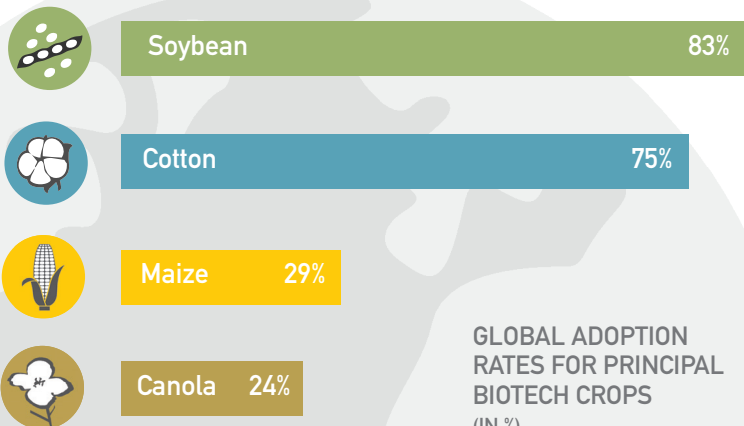


# Which GM crops are grown around the world?

The most widely grown GM crops are soybean, maize, cotton and rapeseed (canola). Other GM crops that have been approved and grown around the world include sugar beet, alfalfa, papaya, squash, poplar, tomato, sweet pepper, potato, rice and various flowers.

The four main GM crops have significant adoption rates. In fact, the vast majority of soya beans and cotton grown today are genetically modified. We import a lot of these GM harvests into the EU to feed our farm animals, and to clothe ourselves.

> ISAAA slides  
<http://bit.ly/1Qc1eP2>



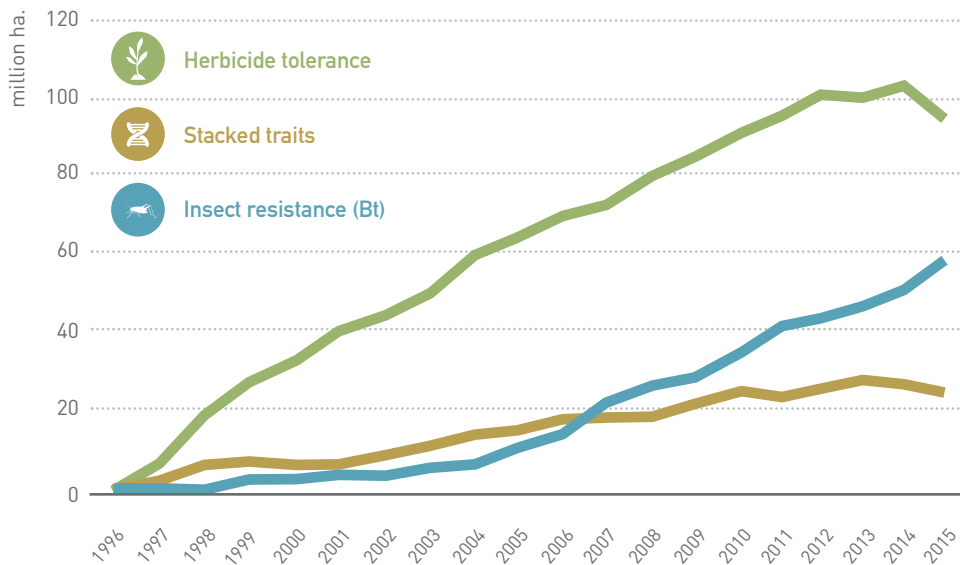
GLOBAL ADOPTION  
RATES FOR PRINCIPAL  
BIOTECH CROPS  
(IN %)

# Which improvements are the most common?

> ISAAA slides  
<http://bit.ly/1Qc1eP2>

Most of the GM crops grown commercially today have improved traits for herbicide tolerance, insect-resistance, or both (stacked traits). Other GM traits aim at disease resistance, drought tolerance, health or nutritional benefits, longer shelf life or more efficient industrial use.<sup>16</sup>

## GLOBAL AREA OF BIOTECH CROPS BY TRAIT



Source: James, C. (2015)

# Direct consumer benefits available But not in Europe!

Recently, the first GM crops with direct consumer benefit traits became available in North America. These include soya beans modified to deliver healthier oil profiles, as well as potatoes and apples which bruise or brown less, and can therefore reduce food waste.

For more information on GM worldwide, please see <http://www.isaaa.org>

> ISAAA website

<http://bit.ly/1pB8z3r>





# TRADE & APPROVALS OF GMOs IN THE EU







# Why does the EU import GM crops?

The EU is one of the world's biggest importers of agricultural commodities. We import what we cannot or do not grow enough of on our own soil. A substantial and increasing part of these imports is based on GM crops. They are grown almost exclusively in countries outside Europe, where farmers have the choice between conventional and GM varieties.

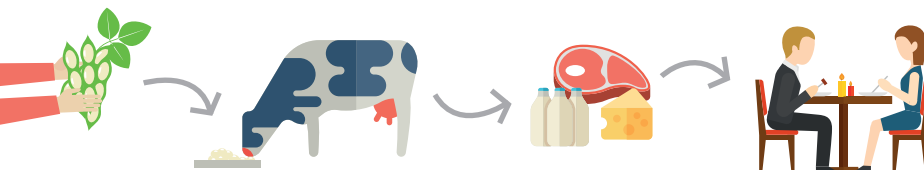
European import dependency is particularly high for soybean used in feed for EU livestock. EU domestic soybean production covers less than 5% of the demand. We also import significant quantities of GM maize and oilseed rape (colza) to meet our needs.

For cotton, we depend almost entirely on imports as finished products.



## EU depends on GM soya bean imports

The **GM soya beans** which are imported into the EU weigh **as much as we do** – totalling more than 60 kg for each of the EU's 500 million citizens per year, an incredible number of almost 34 million tonnes. The EU spends about € 13 bn on importing soya beans and soya meal. That's more than on any other agricultural commodity including coffee.



**Today, GM varieties are the standard for soybeans.**

Almost all soya is provided by South and North American countries, where GM technology adoption is over 90%. China is now by far the biggest importer, ahead of the EU.



## GM trade adds value in the EU

> Factsheet GM trade

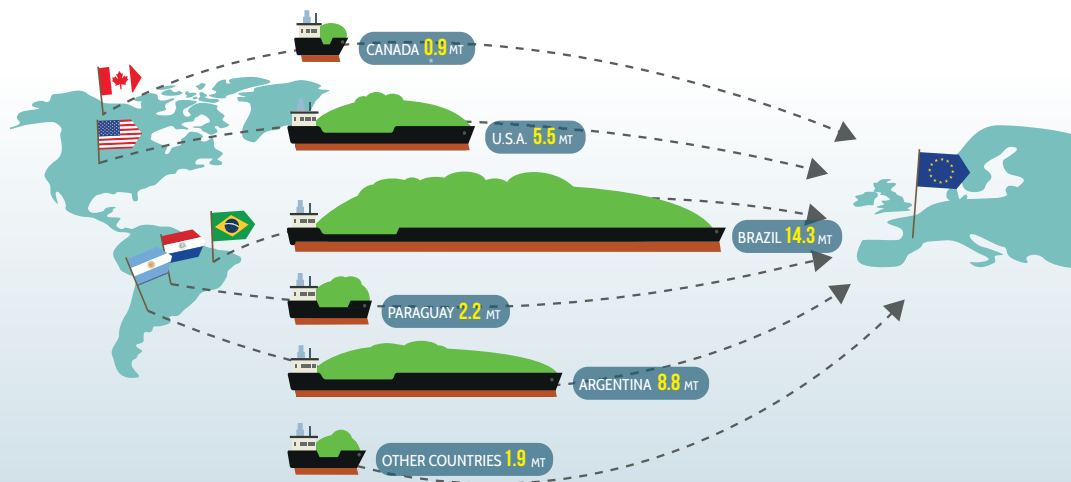
<http://bit.ly/1S6h1DR>

> Factsheet

GMO import bans

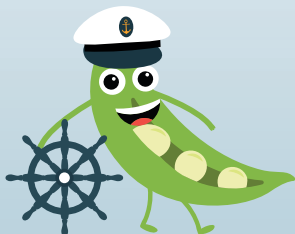
<http://bit.ly/2kn6PLm>

We use soya beans to **feed our cows, pigs and chickens<sup>17</sup>** and to produce high quality milk and eggs. Substituting GM soy with non-GM soy would lead to an increase in feed **costs of around 10%<sup>18</sup>** for the livestock sector.



**EU IMPORTS  
OF SOYA BEANS  
AND SOYA BEAN  
MEAL FOR 2014**

\*MT = MILLION TONNES



# Which GMOs can be imported into the EU?

As of December 2016, a total of 55 GM crops were approved for import and processing and/or for food and feed in Europe.<sup>19</sup> More than half of those crops were types of GM maize. Other crops included soybean, rapeseed, sugar beet and cotton.<sup>19</sup>

> EU Register of authorised GMOs  
<http://bit.ly/1mmC20e>

# How is the safety of GM products assessed in the EU?

All GM plants used for food and feed must undergo a rigorous review of their safety as part of the authorisation procedure before they can be put on the market. In the EU, this task is carried out by the European Food Safety Authority (EFSA), whose panel of independent scientific experts work closely with national authorities on food safety.

The risk assessment procedure includes comparative safety assessments between the GMOs and their conventional counterparts, food/ feed safety studies, and assessments of potential environmental impact. The goal is to ensure that the GM product is at least as safe for human and animal consumption and for the environment as its conventional counterpart. Read more on **risk assessment**<sup>20</sup> and **product safety**<sup>21</sup> in EuropaBio's factsheets.



> Factsheet  
Risk assessment  
of GM plants  
<http://bit.ly/2kwp4NB>

> Factsheet  
Product safety  
<http://bit.ly/2aoBdTP>

## A solid EU approval process

Specific GMO legislation outlines the approval process and guarantees that all GM products placed on the EU market are as safe as their conventional counterparts.

1. **Risk assessment** is done on a case-by-case and step-by-step basis.

2. When EFSA has completed the environmental, human and animal health safety assessment, its scientific opinion forms the basis of a **Draft Decision** to be proposed by the European Commission.

3. Member states vote on the European Commission's proposal.

4. Once released, GMOs are subject to **monitoring, traceability and labelling**: monitoring plans need to be approved prior to marketing the product. Traceability is ensured by labelling and administrative records throughout the food chain.

5. **Public information**: Information is provided to the public throughout the approval process.



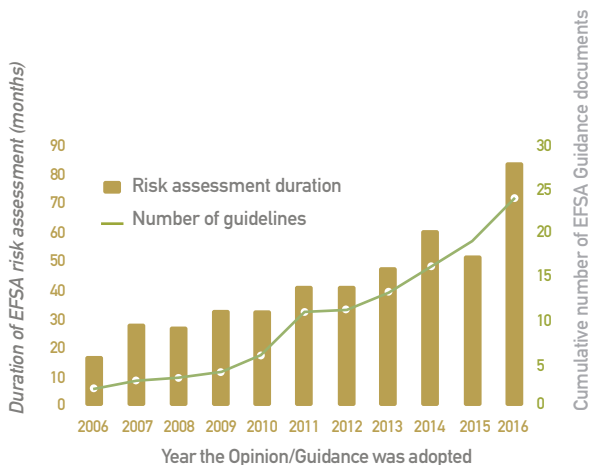
With this and comparable regulatory frameworks in place across the world, GMOs are one of the most assessed food products in history. Other widely consumed products, like coffee, might not receive market authorisation if assessed in a similar way. Still, people continue to consume coffee because the benefits from drinking outweigh the (perceived) risks.

## Political hurdles for imports in practice

Despite its import dependency, the EU and its member states often unnecessarily delay import authorisations, impacting farmers and threatening trade.

## Slowing and politicised risk assessment

Despite 20 years of history of safe use, EFSA, the EU's scientific body that is responsible for assessing food and feed safety, is spending more and more time on risk assessment of GM crops.



In fact, risk assessment timelines more than tripled in the EU from well under 2 to more than 6 years in the past decade (over 7 years from submission to approval). And as of January 2017, over 40 GM applications are pending at EFSA level awaiting risk assessment.



As a comparison, the average time required for a complete GM product approval is now under 2 years in the US, Brazil and Canada. These countries have equally high standards for risk assessment based on internationally recognised scientific principles.



Unlike other countries that have predictable and science-based assessment systems, data requirements in the EU keep changing, often without scientific justification. For example, EU-funded research confirmed that there is no need for new animal testing studies that have been needlessly imposed on the industry and animals. EFSA has itself called the studies unnecessary.

Unfortunately, this situation is adding to unpredictability concerning the approval timelines and repelling investors from putting valuable resources into the EU. Read more [here](#).<sup>20</sup>

> Factsheet  
Risk assessment  
timelines

<http://bit.ly/2jUOBBG>



**Stop!**  
*Please move the ball...  
over there!*





## EU countries often vote against the science!

> Factsheet Member states and GMOs  
<http://bit.ly/1Ckl89F>

Although there is ample evidence that GM foods are as safe as conventional foods, **some EU countries regularly vote against scientific advice**<sup>22</sup> in the product approval process, which each GMO has to complete before being placed on the EU market.



Which countries voted  
in favor of science in 2014?

Poland



Against

Italy



Abstain

Germany



Abstain

France



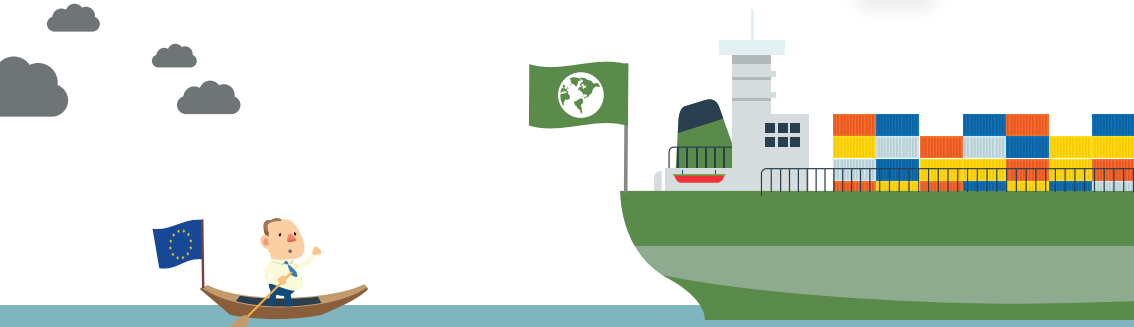
Abstain

# EU “Opt-out” proposal endangers trade

Following the adoption in 2015 of the EU’s “GMO cultivation opt-out” legislation, which effectively allows individual EU countries to ban their farmers from growing EU-approved GM crops without scientifically justified grounds, in 2015, the EU Commission proposed to also allow for GMO import “opt-outs”, despite evidence which shows that **EU import bans would cost Europe dearly!**<sup>18</sup>

If we continue to damage trade in soya for animal feed, we risk losing our export markets for European produced livestock products. We may force EU livestock farmers out of business, leading to more imports of meat from abroad and higher prices for European consumers.

> Factsheet GMO  
import bans  
<http://bit.ly/2kn6PLm>



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> Commissioner  
V. Andriukaitis  
<http://bit.ly/2kn5Smq>  
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*"Banning GM imports means doing away with our capability of producing food."*

*Vytienis Andriukaitis, EU Commissioner<sup>23</sup>*

## How does EU regulation affect innovation and trade?

Despite the EU's dependency on imported GM crops, the EU and its member states are hindering the development, application, and trade of this promising technology. The aforementioned approval delays and barriers represent **obstacles to trade**. These obstacles have already resulted in trade disruptions and higher prices for key agricultural commodities, because the EU's authorisation system is much slower than those in other developed countries. Even after product safety is confirmed, many months are lost in administrative and political processing before a variety that may already be approved overseas is approved for import. As a result, shipments thought to contain traces of unapproved GM crops in the EU may be sent back to the countries of origin. The overall related cost to the European economy of trade disruptions

could total up to **€9.6 billion per year** according to a report published by the European Commission.<sup>24</sup>

**The approval delays are not a matter of safety; after all, the crops waiting for authorisation in Europe have undergone a rigorous safety assessment at EU level.**

The lack of **timely implementation of EU policies** on biotech crops makes predictions about authorisations extremely difficult. Without predictability in Europe, the food industry, commodity traders and livestock farmers will face even greater challenges in the future.



> USDA 2016 report  
<http://bit.ly/2jAAX5p>

"The EU's complex policy framework developed under pressure from antibiotech activists has limited research, development, and production of biotech crops. (...) As part of their political strategy, their actions include lobbying public authorities, acts of sabotage (destruction of research trials and cultivated fields), and communication campaigns to heighten public fears."

U.S. Department of Agriculture's (USDA) 2016 Agricultural Biotechnology Annual report for the EU<sup>25</sup>

## While Europe scratches its head, the rest of the world is moving ahead

The EU's dysfunctional approval system and reluctance towards the adoption and import of GMOs has also had major effects on farmers outside the EU. Many developing countries take inspiration from EU policy approaches, some European non-governmental organisations have been spreading **unfounded fears** both within and outside of Europe, and the increased risk of trade disruptions as well as lower productivity, increase world food prices. This tends to hit farmers and consumers in the developing countries the hardest.





# CULTIVATION & BENEFITS







# GMOs for the environment

The UN Food and Agriculture Organisation (FAO) estimates that **global food supply must increase by 70%.**<sup>26</sup> It is estimated that nearly half the world's population will be living under **severe water stress**<sup>27</sup> by 2030.

In order to meet global food challenges, we will have to grow more with less: less land, less input, less water and less energy. **Making use of modern biotechnology helps to achieve:**<sup>28</sup>

- **Lower losses and higher yields:** GM crops can improve yields by 6%-30% on the same amount of land<sup>29</sup>, avoiding the need to use land that is currently a haven for biodiversity. **In 2014, GMOs allowed farmers to use over 20 million less hectares of land to produce the same amount.**<sup>30</sup>

> FAO How to Feed the World in 2050  
<http://bit.ly/1fjWWFX>

> Key impacts of global GM crop use  
<http://bit.ly/2kn9N2w>

> Factsheet Farming & Environment  
<http://bit.ly/2ayGCZI>

> GMO Answers  
<http://bit.ly/2knhaHd>



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> GMO Answers  
Factsheet on water  
<http://bit.ly/2k4i5yG>  
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> Water Efficient  
Maize for Africa  
<http://bit.ly/2jthN3t>  
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- **Soil protection:** GM crops make it practical for growers to control weeds with reduced or no ploughing or tillage. In Argentina and the U.S., the use of herbicide-tolerant soybean crops has reduced the number of tillage operations by up to 58%.<sup>31</sup> No-till or low-till practices contribute to better carbon sequestration by carbon-enriched soils and can cut CO<sub>2</sub> emissions by saving on fuel consumption.
- **Greenhouse gas emission savings:** Reduced tillage also means fewer trips by tractor, leading to lower fuel use and emissions.
- **Water protection:** Non-tilled soils trap moisture better, reducing run-off into streams and rivers **and contributing to more efficient water use**.<sup>32</sup> Drought-tolerant GM crops are now available. In addition, the public-private partnership Water Efficient Maize for Africa is developing GM drought tolerant and insect resistant maize for smallholder farmers in **Sub-Saharan Africa**.<sup>33</sup>

## GROWING BIOTECH CROPS REDUCED CO<sub>2</sub> EMISSIONS BY 23.1 BILLION KG

Equivalent to taking  
**10.2 MILLION CARS OFF THE ROAD  
FOR A YEAR**

- **Reduced Spraying:** Crop biotechnology has reduced pesticide spraying (1996-2014) by 581,000 tonnes (-8.2%). This is equal to the total amount of pesticide active ingredient applied to crops in China for more than a year.<sup>5</sup> In the case of Spain, insect resistant GMO maize has enabled a 36% cumulative decrease of insecticide use on maize since 1998 (544 tons of insecticide active ingredient).<sup>5</sup> By reducing the frequency of activity required to remove weeds, biotech improved crops not only reduce the use of inputs, they save farmers time and money, leading to a more efficient use of resources.

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> Global Benefits of  
GM Crops

<http://bit.ly/1s07jx8>  
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## GMOs & sustainable development goals

The modernisation of agriculture has been the main driver of progress in reducing hunger and poverty – the first two United Nations sustainable development goals.

The part of humanity that lives in extreme poverty and hunger is smaller than ever before, but still 800 million people go hungry, and over 3 million die from malnutrition each year.

Although millions of small, resource-poor farmers in developing countries now benefit annually from GM crops<sup>15</sup>, some of the most severely affected countries have not yet granted farmers access to the tools that can help them produce more and better – including biotechnology and genetically modified crops. Many countries are still banning GMOs even though the FAO has acknowledged that biotechnology can help poor farmers and consumers in developing nations<sup>34</sup>.

# What's in it for me as a consumer?

On the market:

Reduced  
prices

Healthier  
oils

Reduced  
toxins

Low  
acrylamide

Improved  
flavor

Ready to go to the market:

Life-saving  
nutritious  
rice

Longer  
shelf life

Being developed:

Gluten-free  
wheat

Enhanced  
nutrition

"Biotechnology for crop improvement must be part of the response to societal challenges. The EU is falling behind new international competitors in agricultural innovation and this has implications for EU goals for science and innovation, and for the environment as well as for agriculture."

European Academies of Science Advisory Council<sup>1</sup>

> EASAC

<http://bit.ly/1ezwEA1>

## Already on the market:

- **Reduced price:** GM crops help farmers improve yields, which reduces prices for consumers.
- **Healthier oils:** Several soy and oilseed rape varieties have been modified to produce healthier oils.
- **Reduced toxins:** Insect resistant maize can defend itself from insect pests, thereby also limiting cancer-causing mycotoxins. These mycotoxins come from naturally occurring fungi (molds) which enter into the maize through the holes left by insects. There are also potatoes which produce less cancer-causing acrylamide during frying.

## Ready to go to the market:

- **Life-saving nutritious rice:** Vitamin-A-enriched Golden Rice can prevent blindness, disease and premature deaths. Vitamin A deficiency is prevalent among the world's poor whose diets are based mainly on rice.
- **Longer shelf life:** Non browning apples and potatoes have been authorised in North America, which can reduce food waste.

## Being developed:

- **Gluten-Free wheat:** Spanish researchers are working to remove gluten proteins from wheat, which could improve the quality of lives of people with coeliac disease.
- **Enhanced nutrition:** Various projects are underway to enhance the nutritional value of crops like sorghum and cassava, which are so important for consumers in the developing world.
- **Improved flavor:** Some GM foods, like the GM purple tomato and a new pink variety of pineapple, are already considered to be tastier than conventional varieties.
- **Low acrylamide:** GM technology can be used to reduce levels of asparagine, which is found in many starchy foods and produces acrylamide, which is suspected to be a human carcinogen. A GM potato with reduced levels of asparagine has already been developed.

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> Factsheet  
Consumer benefits  
<http://bit.ly/2ayFRQh>  
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Read more [here](#).<sup>35</sup>

# Which GMOs are cultivated in the EU?

Only one GM crop is approved for cultivation in Europe – an insect-resistant maize. It is currently being grown mostly in Spain and Portugal. It was first approved in the EU in 1998 and helps fight off insect pests. Despite its authorisation at EU level, several member states ban their farmers from growing it.

## Reaping the benefits of GM maize in Spain

Spain is the EU leader in planting insect resistant GM maize. This particular GM maize (known as Bt maize) is resistant to the corn borer plague that can cause losses of up to 30% of the total crop and accounts for about one third of all maize grown in Spain. Insect resistant maize cultivation in Spain has resulted in numerous benefits, including:

- higher yields where there are pest problems, varying on average between 7.4% and 10.5%.
- quality benefits linked to reduced mycotoxins.
- economic benefits for farmers due to higher yields and a lower use and costs of inputs like crop protection products and fuel.
- social benefits for farmers due to increased flexibility and simplicity in crop management.

> Benefits of Bt maize  
in Spain

<http://bit.ly/2kwz79w>

- environmental benefits, including a smaller water footprint and a higher fixation of carbon with important benefits for biodiversity.
- Bt maize has also allowed Spain to be less dependent on maize imports.<sup>36</sup>

Reduction of maize imports by **over 1m tons**

Water savings equivalent  
to the use of **almost 750.000 citizens**

Farmers' margins improved  
by up to **147 € per hectare**





# FARMERS AROUND THE WORLD

## Reaping the benefits in Europe

**Name:** Maria Gabriela Cruz

**Profession:** Maize farmer

**Country:** Portugal

**Background:** Gabriela is a fourth generation farmer in her family farm. She holds a degree in agricultural engineering and has found ways to practice sustainable farming.

**Challenges:** Pests pressure, soil erosion and need for water conservation.

**Opportunities:** Biotech maize copes with high pest pressure and reduces the use of insecticides by eliminating 3 applications.



> #FOODHEROES

<http://bit.ly/2frD02d>

*"GM crops are a way to keep farmers on their land in Europe. If we don't have more GM crops, we will become less competitive and have to import more food as well as use less sustainable farming practices."*





# INNOVATION & IP





# Why do we need innovation in agriculture?

Boosting innovation across the agricultural system is essential to grow more food with less impact on the environment.

Innovation in plant breeding, including GM technology, has already delivered phenomenal benefits, including improved quality of seeds, higher productivity of crops, increased farmer incomes, lower food prices, and reductions in energy consumption and CO<sub>2</sub> emissions.

## How can IP help?

Modern plant breeding needs and benefits from intellectual property (IP) protection, including plant variety protection rights (PVPs) and, in some cases, patents. Both of these tools help drive innovation for more productive and sustainable seeds by providing an incentive to innovators to take entrepreneurial risks that benefit us all.

> IP52 Video  
<http://bit.ly/2j7XRop>

More on the role of IP  
in innovation in this  
IP52 video<sup>37</sup>



Intellectual property rights (IPRs) ensure that public or private developers of new technologies are rewarded for their efforts and investments and that scientific knowledge is published and shared. This enables developers to continue to invest in new technologies and products and innovation to flourish. The many economic and societal gains obtained from biotech innovations are therefore highly dependent on an effective IPR system.

As in any high-tech industry, patent systems ensure return on investment for the lengthy and costly process of research and development (R&D). New crops that have higher yields and/or grow with less water are based on unique inventions. In order for the developer to be able to go the whole way from inventing to producing and gaining market access, there needs to be adequate protection of the inventions to ensure the investments made along the way can be recovered at least in part. At the same time, the transparency gained by publishing the science which forms the basis of the patent protection encourages increased innovation.

Read more [here](#).<sup>38</sup>

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> Factsheet  
Intellectual Property  
<http://bit.ly/2k4vCGI>  
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## FAST FACTS

The industry's top **10 companies** annually invest about **\$2.25 billion**, or 7.5 % of sales into developing new products.<sup>39</sup>

On average, it takes **13 years** and **\$136 million** to bring a biotech commodity crop to market.<sup>40</sup>

# A promising R&D pipeline – at least outside of Europe!

## Who are the new developers?

Rise of China, India, Brazil and other emerging nations

Public institutions and Public Private Partnerships (PPPs)

## What is being developed?

First generation: insect resistance and herbicide tolerance

Next generation: nutritional value, stress tolerance, disease resistance

New crops: emphasis on crops for developing world

New traits: climate change mitigation and adaptation

New techniques

## Why isn't innovation faster?

Genetic modification of crops, which can be considered the fastest-adopted technology in the history of agriculture, may also be the most hindered innovation on the planet. The regulatory processes around the world, perhaps most notably in Europe, have become so long and arduous that they are effectively stalling innovation from reaching farmers and consumers, especially in the developing world, where both yields and livelihoods are stagnant. Whether it is through undue delays of GM crop approvals for import or cultivation, through unscientifically justified bans, or through neglecting the tools, like intellectual property, that would catalyse innovation, Europe is keeping the world and itself from meeting our food and farming challenges.





# Innovation for developing countries

Realising their potential to improve lives, the biotech industry and public research centres are developing biotech varieties for important staple crops such as cassava, bananas, sorghum and maize in developing countries.

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> Laureates letter  
<http://bit.ly/299bhttp>  
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- **The Golden rice project** – the vitamin A enriched rice is close to commercial approval in the Philippines and was developed to prevent diseases such as blindness, caused by vitamin A deficiency.<sup>41</sup> More than 120 Nobel laureates have asked governments to reject Greenpeace’s campaign against Golden Rice specifically, and crops and foods improved through biotechnology in general, asking “How many poor people in the world must die before we consider this a “crime against humanity”?<sup>42</sup>
- **BioCassava Plus project** – improving the nutritional quality of cassava, the primary source of calories for over 250 million people in Sub-Saharan Africa.<sup>43</sup>
- **Africa Biofortified Sorghum project** – developing a more nutritious and easily digestible sorghum that contains increased levels of amino acids, vitamins, iron and zinc. Sorghum is the fifth most important cereal crop and the main dietary staple for more than 500 million people.<sup>44</sup>
- **Water Efficient Maize for Africa (WEMA)** – developing drought-tolerant maize, a staple that more than 300 million Africans depend on as their main food source.<sup>45</sup>

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