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The Contribution of Genetically Modified Crops to Sustainability

- **The import and cultivation of Genetically Modified (GM) crops in the European Union (EU) contributes to Europe's goals for a sustainable food system and is a key driver of safe and affordable food.**
- **The EU imports approximately 70% of all protein-rich crops used in the feed sector, the majority of which are GM. GM technology allows the efficient use of agricultural land ensuring optimal yields and therefore securing EU livestock farmers a competitive and reliable feed supply to sustain their production.**
- **Cultivation of GM crops supports the expansion of conservation agriculture. Through optimization of insecticide use and Integrated Pest Management, GM crops can help promote carbon sequestration, soil health and GHG emissions reductions. In low- and middle-income producing countries, the adoption of GM crops has improved farmers' livelihoods for the past quarter century.**

GM crops contribute to nature conservation and the sustainable growth of European food production

The EU is 70% import-dependent on protein rich crops for its feed sector[1]. According to the European Commission, if soybean imports from land-use efficient production systems like the United States, Brazil and Argentina were to be discontinued, local production to meet the EU's soybean demand would require a 155% increase in productive farmland primarily in France, Italy and Austria[2]. Recent assessments indicate that such expansion would require the conversion of vast areas of EU forests to cropland, negatively impacting biodiversity in the EU.[3]

Similarly, should the imports of GM maize, cotton and oilseed rape come to a halt, an additional 24.2 million hectares of farmland would be needed to produce them[4] – a surface equal to the combined arable land of France, Belgium, the Netherlands, Denmark and Greece[5].

GM crops bring socio-economic gains to farmers in the EU and third countries

In 2019, 190.4 million ha of GM crops were produced in 29 countries, of which 24 were low and middle-income. An estimate of 17 million farmers and their families benefit from improved GM crop technology today[6].

Over the past quarter century, GM crops have contributed to improving the livelihoods in low and middle-income countries by reducing food insecurity[7], increasing pesticide use safety[8], and bringing higher profits[9]. The net economic benefits of GM crops at farm level have been estimated at $225.1 billion for 1996–2018. These benefits are distributed to farmers in both developing and developed countries (respectively 52% and 48%)[10].

In Europe, farmers growing insect-resistant maize in Spain and Portugal increased their income by EUR 285.4 million over the 21-year period of 1998–2018.[11] Access to protein-rich GM crops, grown in favorable climate and soil conditions in the Americas, is an important element in the competitiveness of the EU livestock sector, which accounts for some 40% of the EU's total agricultural production value. A disruption to GM soybean and maize imports would cause price increases, threatening the external competitiveness of EU livestock-derived products, like milk and meat[12].

If feed materials could no longer be accessed in Argentina, Brazil or the US, feed costs in the EU would increase by an estimated 500%. This would reduce the livestock sector by 34% for pigs and poultry, with 7.47% decreases for cattle/sheep and 9.32% for the dairy sector[13]. Similarly, a total ban of GM soybean imports from these countries would lead to increased feed costs of 3% for laying hens to 26% for sheep and goat fattening[14], and reduced production of European pork (-2.8%), poultry (-3%), eggs (-2%) and milk (-0.9%) supplies[15].

GM crops contribute to more sustainable agriculture in producing countries

The cultivation of GM crops supports the adoption and further expansion of conservation agriculture practices like low-till and no-till farming. This provides tangible benefits for soil health, biodiversity, emissions reductions, water use management, and Integrated Pest Management in producing countries.

Soil health - Low-till and no-till farming allows soils to more efficiently store nutrients and water. This maintains soil cover, preventing erosion and runoff. It also increases soil biodiversity by promoting the growth of micro and macro fauna that are affected by mechanical plowing. The reduced soil disturbance promotes the conservation of habitats for mammals, birds and other animals living in agro-ecosystems[16].

GHG emission reductions - The expansion of low-till and no-till farming made possible by GM crops contributes to the reduction of greenhouse gas emissions due to lower fuel consumption for farm machinery. Less soil disturbance also means that carbon is captured and stored in the ground, and not released into the atmosphere[17].

Globally, in 2018, the reduction of greenhouse gas emissions from GM crop cultivated area was 2.4 million kg of carbon dioxide, from 920 million liters of fuel savings, with 5.6 million kg of carbon stored in the soil. This is equivalent to 20.5 million kg of CO2 that was not released into the atmosphere, meaning a total saving of 23 million kg of CO2 not released – equal to taking 15.3 million cars off the road for a year.[18]

Better water management and higher yields - Where pest-resistant varieties are planted, less water is needed due to the reduction in volumes of the insecticides sprayed. Improved crop varieties bring farmers better yields per hectare planted – producing more 'crop per drop' of water used and reducing the need for irrigation[19]. Moreover, fields managed using no-till for multiple years generally have a higher water holding capacity than conventionally tilled fields.[20] Drought-resistant crops also allow farmers to better manage water stress risk, maintaining optimal yields in water-scarce situations[21].

Integrated Pest Management - In countries where GM crops are grown, farmers using GM insect-resistant crop varieties make a more sustainable use of insecticides reducing their environmental impact on the local ecosystem.

Insect-protected GM crops facilitate very targeted pest control, lowering the use of broad-spectrum insecticides, ultimately minimizing the risk on non-target species and wildlife. This supports conservation of beneficial insect populations that can contribute to nature-based environmental services[22].

Since 1996, the use of insecticides on the global area planted with GM insect-resistant crops has been reduced by 112.4 and 331 million kg of active substance for maize and cotton respectively[23]. In 2018, GM insect-protected maize saved an estimated 8.3 million kg of active substance globally – a reduction of 82% in insecticide use compared to the amounts reasonably expected if these crop areas had been planted with conventional maize. For cotton, the estimated saving is of 20.9 million kg of active substance – a 55% reduction in insecticide use.

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1 https://fefac.eu/priorities/markets-trade/eu-protein-plan/
2 https://op.europa.eu/en/publication-detail/-/publication/2dba2ffd-a55c-4f83-b391-c63257fd598d; FEFAC., 2017. Feed & Food Statistical Yearbook 2005. European Feed Manufacturers Federation.
3 https://www.researchgate.net/publication/309523631_Evaluating_the_Economic_and_Environmental_Impacts_of_a_Global_GMO_Ban
4 https://www.tandfonline.com/doi/full/10.1080/21645698.2020.1779574
5 https://ec.europa.eu/eurostat/data/database
6 https://www.isaaa.org/resources/publications/briefs/55/executivesummary/default.asp
7 http://doi.org/10.1371/journal.pone.0064879
8 https://doi.org/10.1179/oeh.2004.10.3.296; https://journals.sagepub.com/doi/10.5367/000000003101294361; https://www.researchgate.net/publication/227414554_Impact_of_Bt_cotton_on_pesticide_poisoning_in_smallholder_agriculture_A_panel_data_analysis; https://onlinelibrary.wiley.com/doi/abs/10.1111/agec.12014
9. http://doi.org/10.1080/21645698.2020.1779574 https://doi.org/10.1371/journal.pone.0111629; https://doi.org/10.1016/j.nbt.2010.05.012
10 http://doi.org/10.1080/21645698.2020.1779574
11 https://www.tandfonline.com/doi/full/10.1080/21645698.2019.1614393?scroll=top&needAccess=true
12 https://op.europa.eu/en/publication-detail/-/publication/2dba2ffd-a55c-4f83-b391-c63257fd598d; FEFAC., 2017. Feed & Food Statistical Yearbook 2005. European Feed Manufacturers Federation.
13 https://www.researchgate.net/publication/228631696_EU_import_restrictions_on_genetically_modified_feeds_impacts_on_Spanish_EU_European_Union_and_global_livestock_sectors
14 https://op.europa.eu/en/publication-detail/-/publication/2dba2ffd-a55c-4f83-b391-c63257fd598d; FEFAC., 2017. Feed & Food Statistical Yearbook 2005. European Feed Manufacturers Federation.
15 https://www.researchgate.net/publication/257160857_On_the_asynchronous_approvals_of_GM_crops_Potential_market_impacts_of_a_trade_disruption_of_EU_soy_imports
16 https://doi.org/10.1016/j.agee.2020.106841; https://doi.org/10.1016/j.ejsobi.2012.02.005;
17 http://www.fao.org/conservation-agriculture/impact/benefits-of-ca/en/;http://www.ecaf.org/ca-in-europe/environmental-benefits
18 https://www.tandfonline.com/doi/full/10.1080/21645698.2020.1773198
19 https://www.tandfonline.com/doi/full/10.1080/21645698.2019.1614393
20 https://www.usda.gov/media/blog/2017/11/30/saving-money-time-and-soil-economics-no-till-farming
21 https://www.ers.usda.gov/webdocs/publications/91103/eib-204.pdf?v=4176
22 https://doi.org/10.1038/nature11153; https://doi.org/10.1016/j.biocontrol.2018.10.001
23 http://doi.org/10.1080/21645698.2020.1773198