Glyphosate-tolerant crops in the EU

Greenpeace summary

October 2012

Introduction

Renowned agricultural economist Dr. Charles Benbrook was commissioned by Greenpeace International to make the first ever forecast of how Europe would be impacted by the authorisation of the cultivation of herbicide-tolerant genetically-engineered (HTGE) corn, soya and sugar beet, based upon experiences with HTGE crops from the US. The study uses the example of HTGE crops that are tolerant to applications of glyphosate, marketed as Roundup Ready (RR) crops. HTGE rapeseed, which is a major crop in the EU and one that has been genetically engineered to be resistant to herbicides, is not currently the subject of an application for cultivation in the EU and has therefore not been included in the study. The study also looks at some of the impacts farmers will face from the introduction of such crops, including rises in seed prices, and battling with herbicide-resistant weeds.

This summary highlights the key findings of the study. The full study can be downloaded at: http://www.greenpeace.org/international/en/campaigns/agriculture/

About Dr. Benbrook

Dr. Charles Benbrook is a research professor at the Center for Sustaining Agriculture and Natural Resources, Washington State University. He is the programme leader of “Measure to Manage: Farm and Food Diagnostics for Sustainability and Health.” Dr. Benbrook has a PhD in agricultural economics from the University of Wisconsin-Madison, and an undergraduate degree from Harvard University. He holds an adjunct faculty position in the Crop and Soil Sciences Department, Washington State University. He has written more than two dozen peer-reviewed articles in a wide range of technical journals, and has served on many committees and boards.

His career has focused on developing science-based systems for evaluating public health, environmental, and economic impacts of changes in agricultural systems, biotechnology, and policy. He has worked extensively on pesticide use and risk assessment, and the development of bio-intensive Integrated Pest Management. He played an important role in the evolution of the 1996 “Food Quality Protection Act”, and has produced multiple reports on agricultural biotechnology.

Genetically engineered crops in the EU – an overview

The authorisation procedure for genetically-engineered (GE, also called genetically-modified, GM) crops in the EU has frequently been criticised by EU governments and independent scientists as being inadequate[1]. Most prominently, EU environment ministers unanimously concluded in December 2008 that the EU authorisation system has to be substantially strengthened in order to properly implement the requirements of EU law.[2] The steps put forward by the European Commission so far[3] are not sufficient to substantially improve the GE crop authorisation procedure, as requested by the Council and required by EU law.

One of the recommendations of the 2008 Conclusions by the Council of the European Union stresses the need to assess the environmental consequences of changes in agricultural practices (the use of herbicides) caused by HTGE crops.[4] At the same time, the Council emphasised the need to strengthen the risk management side of the authorisation process by addressing the socio-economic impacts of cultivation and marketing of GE crops.[5]

GREENPEACE

International

The new European Food Safety Authority (EFSA) guidelines on the environmental risk assessment of GE crops, which are currently being discussed by Member States, include the assessment of the environmental impact of changes in herbicide use linked to the introduction of HTGE crops. However, the European Commission and EFSA keep considering this issue purely as a question of management, and dismiss the problems related to the cultivation of HTGE crops as an issue originating with farmers, rather than being implicit to the GE agricultural system. According to EFSA, problems related to the increased use of herbicides can be avoided in many cases by using the right agricultural practices. Instead of assessing the wider problems of the HTGE system, this approach simply puts all the responsibility on the shoulders of farmers.

Given the lack of clear guidelines and methodologies to assess the wider environmental and health impacts of HTGE crops, no authorisation of such crops should be granted in Europe. Time is of the essence, as 19 out of the 26 genetically engineered crops currently being considered for approval in the EU are HTGE crops. Of these, 13 are glyphosate tolerant, while 10 are glufosinate tolerant; some of them are stacked, showing both traits. Of the 7 GE crops closest to being authorised, 6 are herbicide tolerant. A decision on authorising them for cultivation could be a reality in early 2013.

Although the HTGE system using glufosinate could show effects similar to those seen with glyphosate systems, it has not been explored here, as it is soon to be phased out across Europe[6]. The example of glyphosate-tolerant GE crops is used in this study because it is widely used in the Americas, and the effects are relatively well documented. However, any HTGE system could give rise to the effects seen with glyphosate-tolerant crops, especially if planted on a wider scale.

Report summary

Increase of glyphosate and herbicide use

Glyphosate is a broad-spectrum herbicide that was first marketed by Monsanto under the name Roundup in the 1970s. Numerous companies now produce glyphosate under different trade names. Twenty years after the herbicide came onto the market, Monsanto developed genetically-engineered plants (Roundup Ready plants) that are resistant to glyphosate, and therefore allow a wider application of the herbicide.

The study “Glyphosate tolerant crops in the EU” predicts the changes in the use of glyphosate over a period of 14 years (2012-2025) in the EU, drawing from the experience of the US. It does so by using three scenarios for each of the crops investigated:

Scenario 1: presumes no herbicide-tolerant genetically-engineered (HTGE) crops are approved in the EU.

Scenario 2: projects changes in the use of glyphosate and other herbicides presuming EU farmers adopt HTGE technology as quickly as their US counterparts did, and in the absence of any EU imposed restrictions.

Scenario 3: assumes that HTGE crops are approved, but with enforcable regulatory limitations to hopefully prevent the emergence of glyphosate-resistant weeds, such as a prohibition against planting Roundup Ready (RR) crops two years in a row on any given field.

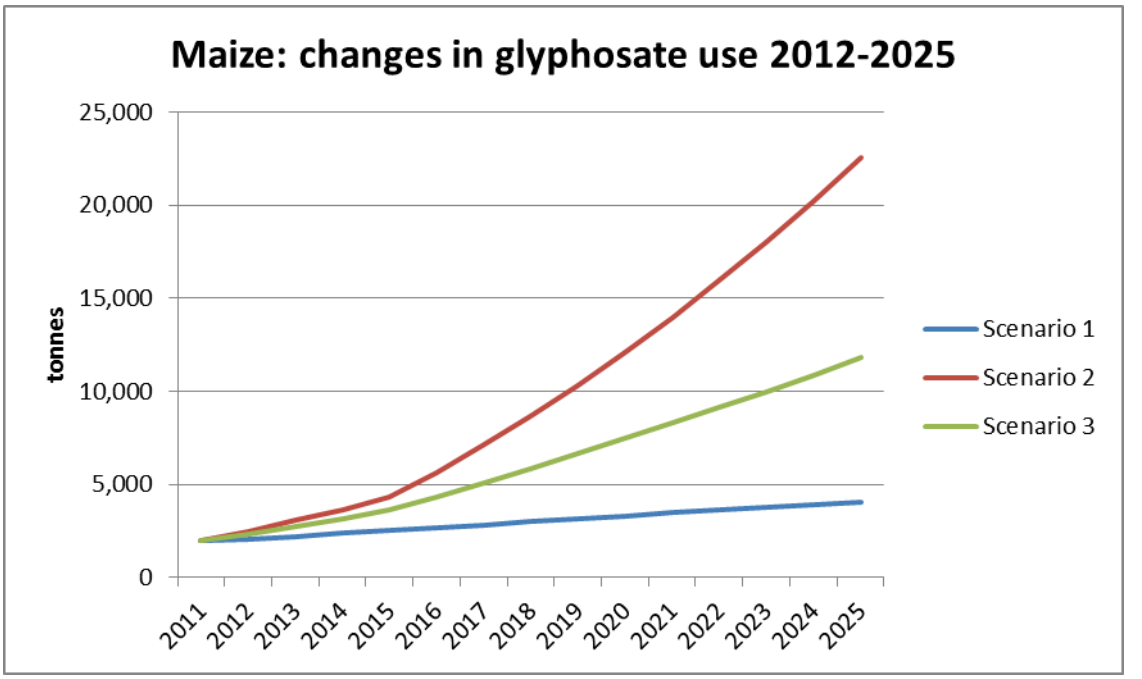
To predict the changes in herbicide use, Europe was divided into three zones – north, central and south – and predictions in herbicide changes were made for each of the zones and crops, matching them to specific US states. Forecasts have been made for each EU country based on its categorisation within the zones.

It should be noted that there are some uncertainties in making such predictions, the most significant being the lack of available data to establish a reliable baseline for the current use of glyphosate for these three crops in Europe.

Maize

Maize is the most important and widely grown crop in Europe. Under Scenario 1, glyphosate use will double but the use of other herbicides will remain largely unchanged. In Scenario 2, however, glyphosate use will increase by over 1,000%, while the total use of other herbicides will decrease by around 25%. Overall herbicide use doubles by 2025, to 33 kilotonnes.

In Scenario 3, glyphosate use will still increase by nearly 500% over the current use.



Scenario 1: No adoption of HTGE maize

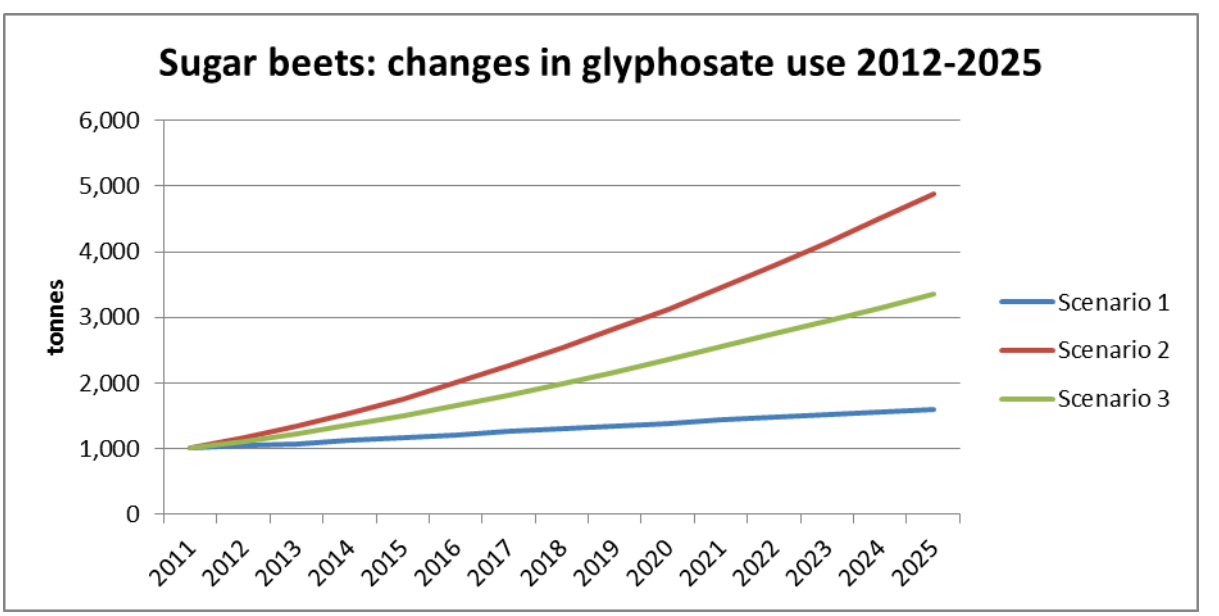
Scenario 2: Unlimited adoption of HTGE maize

Scenario 3: Limited adoption of HTGE maize

Sugar beet

There is much less sugar beet grown in the EU than maize (around one ninth) but it is a herbicide-intensive crop with around half as much herbicide being applied as is the case for maize.

Under Scenario 1, glyphosate use will increase by 50%, but the overall herbicide use will decrease due to the projected decrease of non-glyphosate herbicides. In Scenario 2, however, there will be a 380% increase of glyphosate, and even in Scenario 3 – the targeted adoption of HTGE crops – there will be an increase of over 220%.



Scenario 1: No adoption of HTGE sugar beet

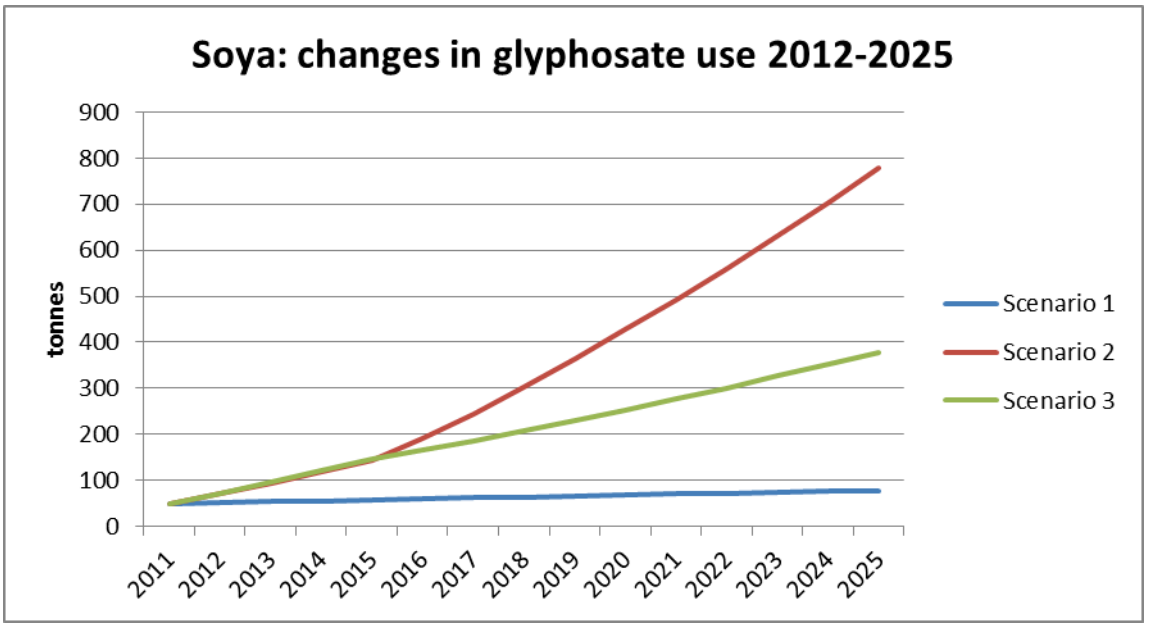
Scenario 2: Unlimited adoption of HTGE sugar beet

Scenario 3: Limited adoption of HTGE sugar beet

Soya

Soya is the smallest of the three crops when it comes to growing area, accounting for just 2.4% of the cropland area of all three crops combined.

In Scenario 1 there will be a 56% increase in glyphosate use, but a 21% decrease in the use of other herbicides. But in Scenario 2 the increase of glyphosate use will be nearly 1,500%, coupled with a 56% decrease of other herbicides. Total herbicide use in the EU will therefore increase by over 120%. Even under Scenario 3 the relative increase of glyphosate will reach 660%, resulting in a 60% rise in the total number of herbicides used for soya production.



Scenario 1: No adoption of HTGE soya

Scenario 2: Unlimited adoption of HTGE soya

Scenario 3: Limited adoption of HTGE soya

In total, the glyphosate use for all three crops combined is projected to increase by 88% under Scenario 1. Combined with a decrease in the use of other herbicides, this will result in a small overall decrease of all herbicides. Under Scenario 2 the combined increase of glyphosate will reach over 800% with a total increase of all herbicides of more than 70%. A targeted adoption of HTGE crops will still result in an overall 25% increase of all herbicides, and glyphosate is forecast to increase by 400%.

Impact on farming

Glyphosate-resistant weeds

One of the main problems caused by the widespread use of HTGE crops is the rapid emergence of weeds resistant to glyphosate. Experts have been warning about accelerated weed resistance since HTGE crops were first introduced. The first documented resistant weed in the US was horseweed, in the year 2000. Since then the number of weeds that are resistant to glyphosate has increased rapidly. In 2004 there were five newly-confirmed resistant weeds, and as of today 23 glyphosate-resistant weed species in the US have been documented.

The spread of such weeds has been growing so rapidly that even data reported in the Dow AgroSciences survey suggests that over 12 million hectares of cropland producing soya beans were infested with glyphosate-resistant weeds in 2010. Across the major resistant weed species, almost 37 million hectares were impacted.

Farmers are responding to the spread of glyphosate-resistant weeds by making multiple applications of glyphosate, increasing herbicide application rates, applying additional herbicide active ingredients, and using deep tillage to bury weed seeds, as well as manual weeding. Biotechnology companies such as Monsanto and Dow have responded to this by developing new GE crops that are resistant to stronger and arguably more toxic herbicides such as 2,4-D and Dicamba. This essentially locks farmers into an herbicide treadmill, using herbicides that increase in volume and toxicity.

Seed prices

When farming with GE seeds, farmers will have to buy seeds every year according to the contracts that have to be entered into with manufacturers. In the US, Monsanto has sued a number of farmers for breaches of such contracts. The problem is not only with the inability of farmers to keep and replant their seeds, but also the ever-increasing costs associated with GE seeds and, as is the case in some places in the US, the lack of availability of conventional seeds.

Seed prices for HTGE crops are projected to rise significantly compared to conventional seeds should such crops be adopted in the EU. In the US, the technology fees of the seeds that are applied to the other fees for GE seeds have increased much more rapidly than those for conventional seeds. This is illustrated by the example of soya bean seeds. In 1995, the year before the first GE varieties were marketed, soya bean seed cost $13.60 US dollars a bushel, and soya beans sold for $6.72 a bushel, for a soya bean seed to soya bean market price ratio of about 2:1. In 2005, when over 80% of all soya beans in the US were genetically engineered, the GE seed-to-soya bean price ratio was 6:1, while the conventional seed-to-soya bean price ratio was 3:4. In the 25 years from 1975 to 2000, the “all soya bean” seed price rose about 63% in the US. In the next 12 years in the GE systems, the price rose another 211%.

In the pre-GE period from 1975 to 1997 the cost of soya bean seed per hectare accounted for 4% to 8% of gross soya bean income per hectare. In 2001, GE seed costs accounted for 15% of gross soya bean income per hectare, and trended upward through 2009 to 22.5%. The situation is similar with maize. Over the last 35 years, the average “all corn” price of seed has risen by a factor of 4.9 between in 1975 and 2009. In 2001, the average price of GE seed was $110.00, compared to $85.30 for conventional seed. By 2012, the GE corn seed price averaged $263.00 a unit, while conventional seed sold for an average of $167.00.

Implications of Dr. Benbrook’s study

Increasing use of glyphosate is inevitable if GE glyphosate-tolerant crops are cultivated in Europe, especially – as the experience from North America shows – the development of resistance to glyphosate in weeds leads to increased use of glyphosate, and also requires the use of additional herbicides. An extensive UK study[7] analysing the impact of HTGE technology on biodiversity pointed to biodiversity concerns for at least some HTGE crops, especially medium to long-term effects on food sources for farmland wildlife, including birds. But these trials only looked at the first years of cultivation, and could not therefore factor in the effects of weed resistance and associated increased spraying.

Not only will there by damaging effects on biodiversity if HTGE crops are planted on a large scale, but also farmers will have to spend increased amounts on both the GE seed and the herbicides they apply. A recent publication by Dr. Benbrook[8] estimated that herbicide-resistant crop technology led to a 239 million kg increase in herbicide use in the US between 1996 and 2011. The costs of increased use in herbicides will be borne by EU farmers if HTGE crops are authorised for cultivation in the EU. The example of glyphosate-tolerant GE crops was used here, but similar effects would be expected with any other HTGE crop system.

Greenpeace demands:

- As herbicide-tolerant GE crops lead to an increase in herbicide usage, that no herbicide tolerant GE crops should be authorised for cultivation in Europe.
- As part of the implementation of the 2008 Council Conclusions, that the European Commission should substantially strengthen the EU risk assessment procedure for GE crops by carrying out a thorough evaluation of the environmental and socioeconomic impacts of HTGE crops.

For more information, contact:
enquiries@greenpeace.org

Greenpeace International
Ottho Heldringstraat 5
1066 AZ Amsterdam
The Netherlands
Tel: +31 20 7182000

greenpeace.org

1 See, for example, Abbott A (2009). European disarray on transgenic crops. Nature (News) 457: 946-947.

2 Council of the European Union (2008). Council Conclusions on Genetically Modified Organisms (GMOs), 2912th Environment Council meeting, Brussels, 4 December 2008.

3 Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions on the freedom for Member States to decide on the cultivation of genetically modified crops, Brussels, 13 July 2010, p. 3;
Non-Paper from DG SANCO, Update on the implementation of the Environment Council Conclusions on GMOs of December 2008, State of Play, 29 April 2011.

4 Ibid, p. 3, recital 4.

5 Ibid, p. 5, recital 7.

6 In 2009, the EU adopted legislation that regulates the production and licensing of agrochemicals (Regulation (EC) No. 1107/2009). Based on these criteria, 22 currently authorised agrochemicals, including glufosinate, cannot have their marketing licence extended.

7 Firbank LG, Rothery P, May MJ, Clark SJ, Scott RJ, Stuart RC, Boffey WH, Brooks DR, Champion GT, Haughton AJ, Hawes C, Heard MS, Dewar AM, Perry JN & Squire GR (2006). Effects of genetically modified herbicide-tolerant cropping systems on weed seedbanks in two years of following crops. Biology Letters 2: 140-143.

8 Benbrook CM (2012). Impacts of genetically engineered crops on pesticide use in the US – the first sixteen years. Environmental Sciences Europe 2012, 24:24 doi:10.1186/2190-4715-24-24.