



Nature Biotechnology

**Peer-reviewed surveys indicate
positive impact of commercialized
GM crops**

Janet Carpenter

[Nature Biotechnology \(2010\), 28 \(4\), 319-321](#)

Peer-reviewed surveys indicate positive impact of commercialized GM crops

Summary

A large-scale analysis of farmers experience with GM crops concludes that

Farmers all over the world have benefitted from GM crops.

Farmers report:

- greater yields
- improved economic performance
- Smallest farmers benefit most

GM crops benefit the environment through:

- Decrease in tillage operations
- Decrease in insecticide applications



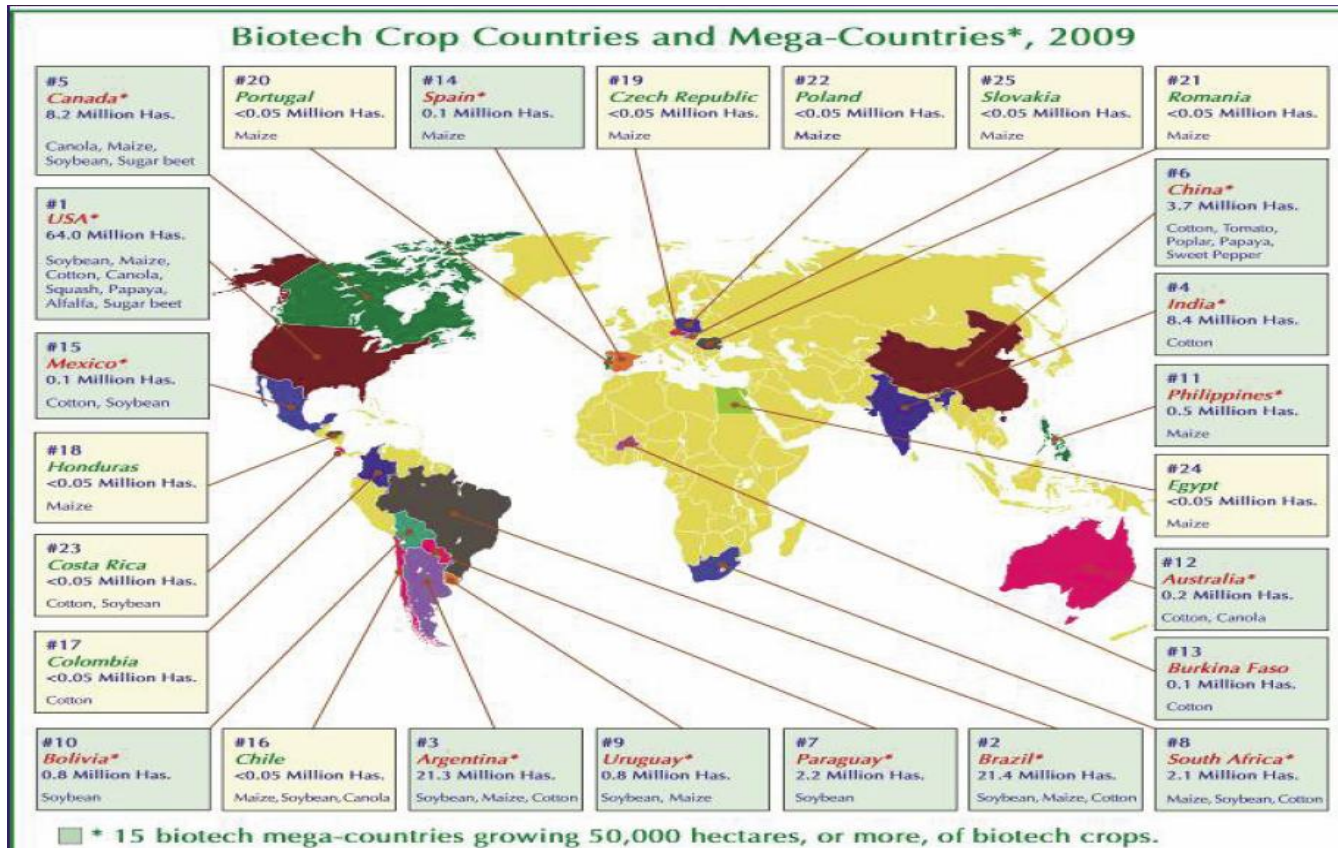
Methodology

- 49 peer-reviewed studies reporting on farmer surveys
- Farmers from 12 countries both in the developing and the developed world
- The farmer surveys made a comparison on yields and other indicators of economic performance of GM and non-GM crops.
- The main GM traits evaluated are insect resistance and herbicide tolerance.
- First time that at this scale farmers experience with GM crops is brought together and compared.



GM Crop cultivating countries in 2009

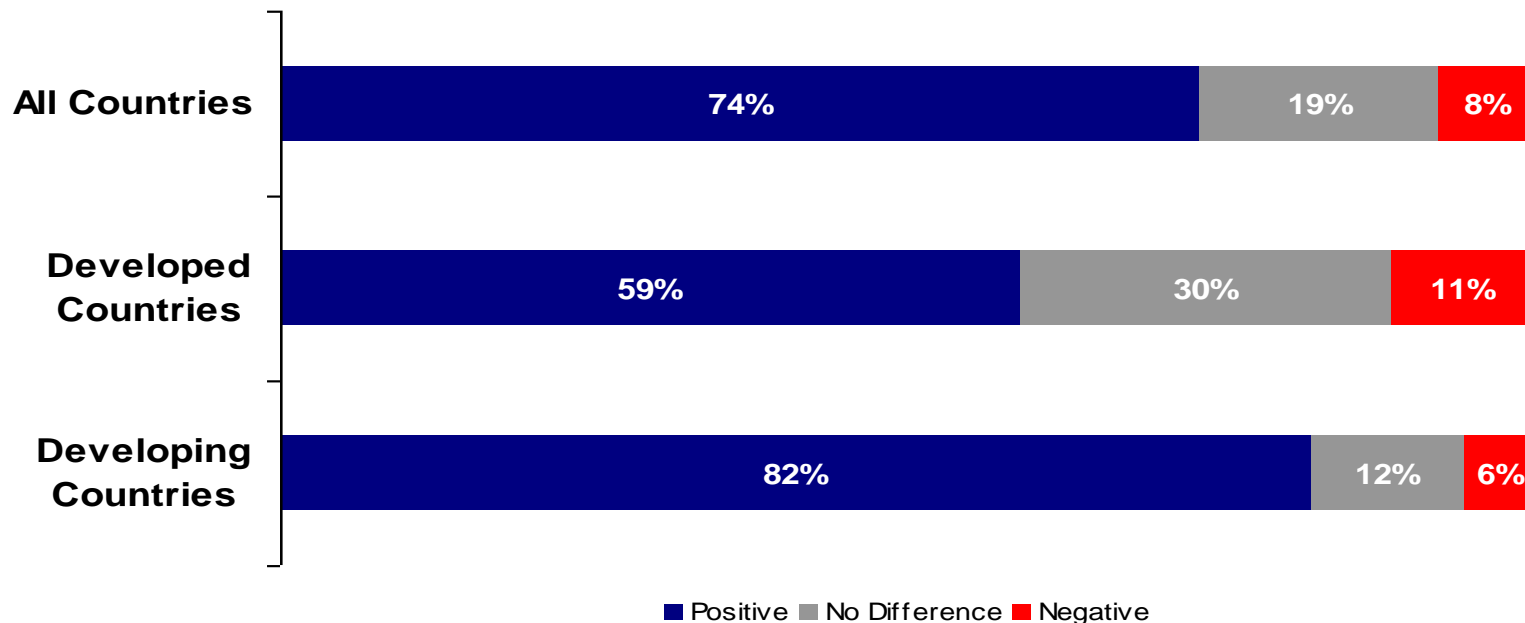
- In 2009, 14 million farmers in 25 countries grew GM crops commercially
- 90% of them were small farmers in developing countries



Comparison of GMOs to non-GMOs

Yield

- 74% of results comparing yields of biotech and conventional crops showed positive results for adopters of biotech technology versus non-adopters
- Farmers in developing countries are achieving greater yield increases (16-30%) than farmers in developed countries (up to 7%)
- The largest yield increases are reported by Indian Bt cotton farmers (up to 150%).



Comparison of GMOs to non-GMOs

Yield, by country

Country	Positive	Neutral	Negative	Total
<i>Developed countries</i>	36	18	7	61
Australia	0	2	2	4
Canada	7	0	1	8
Spain	3	6	0	9
United States	26	10	4	40
<i>Developing countries</i>	88	13	6	107
Argentina	5	1	0	6
China	15	0	0	15
Colombia	4	1	0	5
India	35	2	6	43
Mexico	2	0	0	2
Philippines	5	2	0	7
Romania	2	0	0	2
South Africa	20	7	0	27
Total	124	32	13	168

Significant yield increases are achieved with GM crops, especially in developing countries

Comparison of GMOs to non-GMOs

Yield, by technology

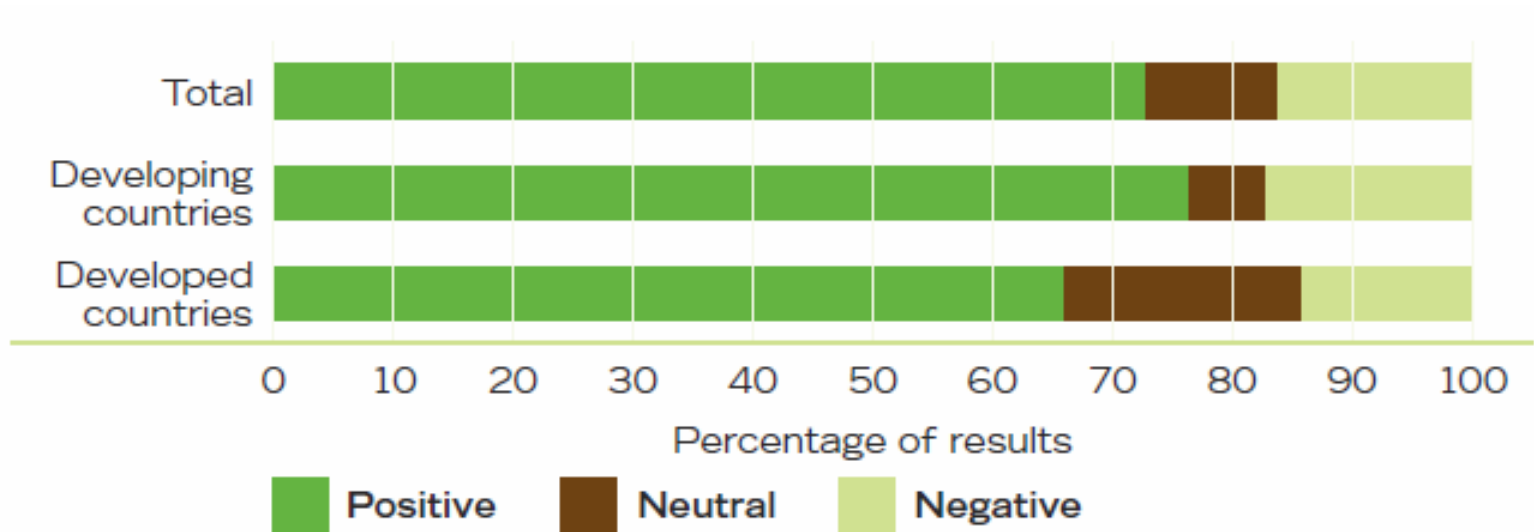
Technology	Difference in yield (%)	Number of results	Minimum (%)	Maximum (%)	Standard error of mean (%)
<i>Developed countries</i>	6	59	-12	26	1.0
Herbicide-tolerant cotton	0	6	-12	17	3.8
Herbicide-tolerant soybean	7	14	0	20	1.7
Herbicide-tolerant and insect-resistant cotton	3	2	-3	9	5.8
Insect-resistant corn	4	13	-3	13	1.6
Insect-resistant cotton	7	24	-8	26	1.9
<i>Developing countries</i>	29	107	-25	150	2.9
Herbicide-tolerant corn	85	1			
Herbicide-tolerant soybean	21	3	0	35	11
Insect-resistant corn	16	12	0	38	4
Insect-resistant corn (white)	22	9	0	62	6.9
Insect-resistant cotton	30	82	-25	150	3.5

Greater yield increases are achieved in developing countries, especially for herbicide-tolerant corn and insect-resistant cotton.

Comparison of GMOs to non-GMOs

Economic performance

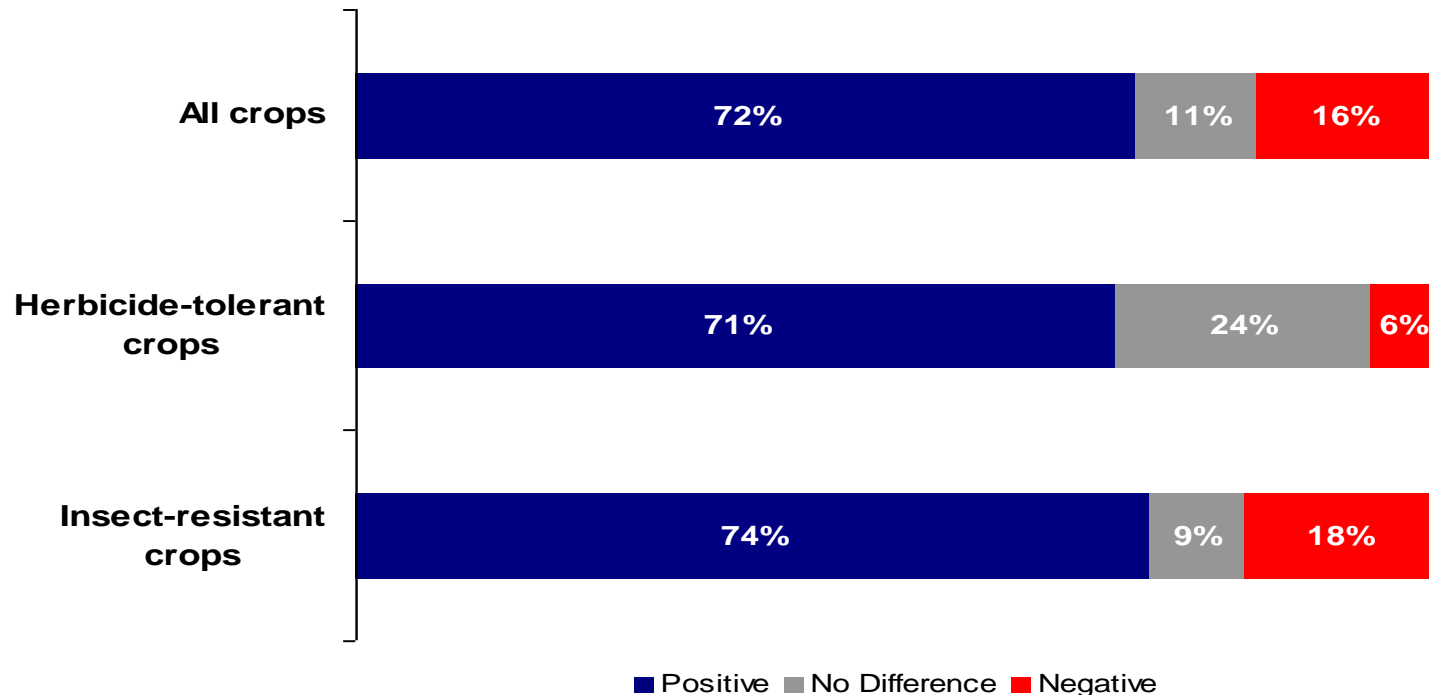
72% of the results indicate a positive impact for biotech crops on economic performance



Comparison of GMOs to non-GMOs

Economic performance, by technology

- Seed cost goes up, but this is offset by increase in yield and decrease in pesticide use.
- For herbicide-tolerant crops, 71% show a positive impact on economic performance
- For insect-resistant crop, 74% show a positive impact on economic performance



Influence of GMOs on the environment

Biotech crops help preserve the environment by facilitating conservation tillage and reducing the number of applications of insecticides.

- For herbicide-tolerant crops, two surveys (for soybeans in Argentina and the U.S.) report decreases of 25-58% in the number of tillage operations.
- For insect-resistant crops, the number of insecticide applications used on Bt crops compared to conventional crops was reduced by a range of 14% to 76%.

