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Another year of consistent and positive GM crop impacts¹

Crop biotechnology continues to provide substantial economic and environmental benefits, and allow farmers, especially those in developing countries to grow more, using fewer resources.

'In 2013, the 18th year of widespread adoption of crops using biotechnology innovations, the technology has continued to provide more productive agriculture, higher incomes to farmers and a better environment for citizens. A majority of these benefits continue to go to farmers and rural communities in developing countries' said Graham Brookes, director of PG Economics, co-author of the report.

Highlights from this comprehensive review include:

Global food security and reduced pressure on scarce land resources

- Between 1996 and 2013, crop biotechnology was responsible for additional global production of 138 million tonnes of soybeans and 274 million tonnes of corn. The technology has also contributed an extra 21.7 million tonnes of cotton lint and 8 million tonnes of canola;
- GM crops are allowing farmers to grow more without using additional land. If crop biotechnology had not been available to the (18 million) farmers using the technology in 2013, maintaining global production levels at the 2013 levels would have required additional plantings of 5.8 million ha of soybeans, 8.3 million ha of corn, 3.5 million ha of cotton and 0.5 million ha of canola. This total area requirement is equivalent to 11% of the arable land in the US, or 29% of the arable land in Brazil or 32% of the cereal area in the EU (28);

Higher yielding crops

- The insect resistant (IR) technology used in cotton and corn has consistently delivered yield gains from reduced pest damage. The average yield gains over the 1996-2013 period across all users of this technology has been +11.7% for insect resistant corn and +17% for insect resistant cotton. 2013 also saw the first IR soybeans grown commercially in South America, where farmers have seen an average of +10% yield improvements;
- The herbicide tolerant (HT) technology used in soybeans and canola has also contributed to increased production in some countries; by helping farmers in Argentina grow a crop of soybeans after wheat in the same growing season², through higher yields and improved weed control;

¹ Report available to download at www.pgeconomics.co.uk. Also contents available as two papers (with open access), separately, covering economic and environmental impacts, in the peer review journal GM Crops at www.tandfonline.com/loi/kgmc20 GM Crops 6:1, p 1-11 Jan-March 2015 (economic impact paper) and vol 6.2, 1-11, April-June 2015 forthcoming for environmental impact paper

² By facilitating the adoption of no tillage production systems this effectively shortens the time between planting and harvest of a crop

Better returns for farmers – especially in developing countries

- Crop biotechnology helps farmers earn reasonable incomes for their work. The net economic benefit at the farm level in 2013 was \$20.5 billion, equal to an average increase in income of \$122/hectare. For the 18 year period (1996-2013), the global farm income gain has been \$133.5 billion;
- The total farm income gain of \$133.5 billion was divided equally between farmers in developing and developed countries;
- The highest yield gains were obtained by farmers in developing countries, many of which are resource-poor and farm small plots of land;

Good investment returns for farmers

- Crop biotechnology continues to be a good investment for farmers around the world. The cost farmers paid for accessing crop biotechnology in 2013 (\$6.8 billion³⁴ payable to the seed supply chain) was equal to 25% of the total gains (a total of \$27.3 billion inclusive of the \$20.5 billion income gains). Globally, farmers received an average of \$4.04 for each dollar invested in GM crop seeds;
- Farmers in developing countries received \$4.22 for each dollar invested in GM crop seeds in 2013 (the cost being equal to 24% of total technology gains), while farmers in developed countries received \$3.88 for each dollar invested in GM crop seed (the cost being equal to 26% of the total technology gains). The higher share of total technology gains realised by farmers in developing countries relative to farmers in developed countries mainly reflects weaker provision and enforcement of intellectual property rights coupled with higher average levels of benefits in developing countries;

Environmental improvements

- Crop biotechnology has contributed to significantly reducing the release of greenhouse gas emissions from agricultural practices. This results from less fuel use and additional soil carbon storage from reduced tillage with GM crops. In 2013, this was equivalent to removing 28 billion kg of carbon dioxide from the atmosphere or equal to removing 12.4 million cars from the road for one year;
- Crop biotechnology has reduced pesticide spraying (1996-2013) by 550 million kg (-8.6%). This is equal to the total amount of pesticide active ingredient applied to arable crops in the EU 27 for two crop years. As a result, this has decreased the environmental impact associated with herbicide and insecticide use on the area planted to biotech crops by 19%⁵.

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www.pgeconomics.co.uk

³ The cost of the technology accrues to the seed supply chain including sellers of seed to farmers, seed multipliers, plant breeders, distributors and the GM technology providers

⁴ A typical 'equivalent' cost of technology share for non GM forms of production (eg, for new seed or forms of crop protection) is 30%-40%

⁵ As measured by the Environmental Impact Quotient (EIQ) indicator (developed at Cornell University)