

GM crops in developing countries: economic & environmental impact 1996-2005

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Coverage

- Presenting findings of 2005 report (peer review version in journal AgbioForum) updated to include information in forthcoming publication
- Cumulative impact: 1996-2005
- Farm income impact: focuses on farm income
- New environmental impact analysis covering pesticide spray changes & associated environmental impact
- New environmental impact analysis: greenhouse gas emissions

Methodology

- Literature review of economic impact in each country – collates & extrapolates existing work
- Uses current prices, exch rates and yields (for each year): gives dynamic element to analysis
- Review of pesticide usage (volumes used) or typical GM versus conventional treatments
- Use of Environmental Impact Quotient (EIQ) indicator
- Review of literature on carbon impacts – fuel changes and soil carbon

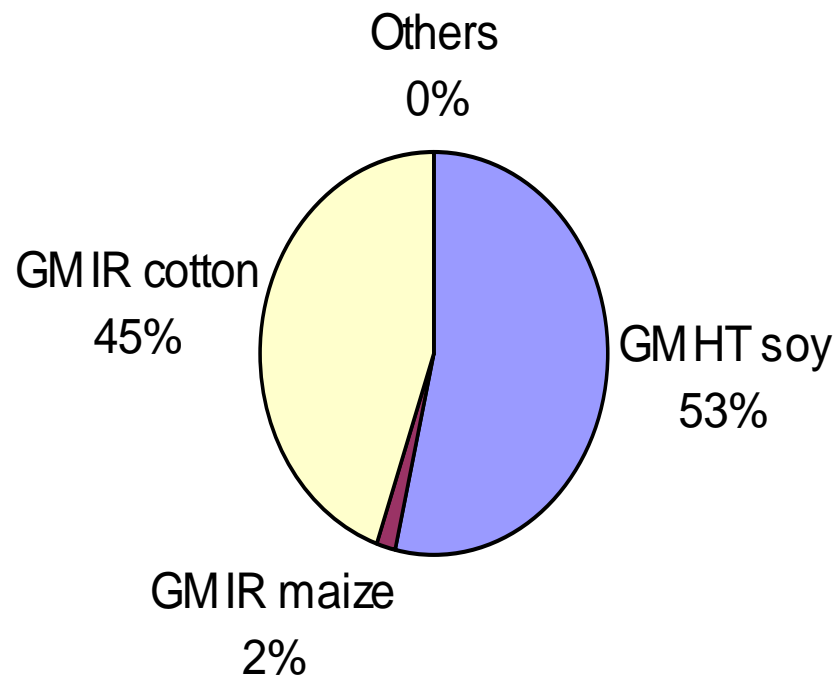
Methodology: EIQs

- From Kovach et al (1992)
- Integrates various env impacts of indiv pesticides into a single field value/ha – allows for comparisons between products
- Is consistent and fairly comprehensive
- Compares level of use on GM with conventional crop usage to deliver equal level of efficacy
- Is an indicator only (does not take into account all env impacts)

Developing country farm level economic impact

- 2005: farm income benefit \$3.01 billion
- 2005: 55% of total global economic benefit
- Since 1996, farm income gain = \$12.7 billion

Developing country economic benefit 2005 by trait



Farm income gains: by developing country: 2005 million \$



Other farm level benefits

GM HT crops	GM IR crops
Increased management flexibility/convenience	Production risk management tool
Less knock back	Energy cost savings
Facilitation of no till practices	Machinery use savings
Cleaner crops = lower harvest cost & quality premia	Convenience benefit
Less damage in follow on crops	Improved crop quality
	Improved health & safety for farmers/workers

Impact on pesticide use

- Significant reduction in environmental impact of production agriculture
- 2005 global environmental impact (EIQ measure) of pesticide use on GM crops down 26%: 54% of which in developing countries
- Since 1996 global impact of pesticide use (EIQ measure) down 15%: 48% of which in developing countries

Impact on pesticide use in developing countries 2005

- Largest gains in cotton sector: 2/3rds of all env gain from reduced insecticide use
- Major gains with GM HT soy: 32% of total env benefit
- Greatest gains in China & India (GM IR cotton), Argentina (GM HT soy mostly)

Impact on greenhouse gas emissions

Lower GHG emissions: 2 main sources:

- Reduced fuel use (less spraying & soil cultivation)
- GM HT crops facilitate no till systems = less soil preparation = additional soil carbon sequestration

Reduced GHG emissions globally: 2004

- Reduced fuel use (less spraying & tillage) = 400 million litres fuel saving & 1,082 million kg less carbon dioxide =
- Facilitation of no/low till systems = 9,423 m tonnes of carbon dioxide not released into atmosphere



Equivalent to removing 4.7 million cars — one-fifth of cars registered in the United Kingdom — from the road for one year

Reduced GHG emissions: developing countries

- Some gains from less fuel use
- Main gains from additional soil carbon sequestration associated with facilitation of no/low till in South America
- Overall about 55% of global carbon savings (2005) from GM crops probably in developing countries

Concluding comments

- Technology used by 8.5 m farmers on 87 m ha (2005)
- Delivered important economic & environmental benefits to developing countries
- + \$12.7 billion to farm income since 1996
- In 2005, majority of global economic benefit to developing country farmers
- 54% of global reduction in env impact associated with pesticide use in 2005 in developing countries

Concluding comments

- GM IR technology: improved profits & env gains from less insecticide use
- GM HT technology: combination of direct benefits (mostly cost reductions) & facilitation of changes in farming systems (no till & use of broad spectrum products) plus major GHG emission gains