PG Economics Limited

Briefing note: 16 February 2009

Friends of the Earth report inaccurate and mis-leading

PG Economics[1] has reviewed the Friends of the Earth International (FOE) latest release *Who Benefits from GM Crops? Feeding the biotech giants, not the world's poor*, and concluded that the public, policy makers, stakeholders and media need to be aware of the inaccuracies and use of inappropriate and unrepresentative data in this report.

The inadequacies of the FOE propaganda document are highlighted below through a combination of critique of the FOE report and presentation of the key real impacts of GM technology. For those reviewing the issues examined in the FOE report, the following should be noted:

- *Lack of credible data:* The so-called 'fully referenced, fact-based' FOE document includes many press releases from anti GM activist groups and press articles. There is a fundamental lack of credible data drawn from peer reviewed analysis

- *Inaccuracies*: It contains many inaccuracies that do not equate with evidence from a wide body of peer reviewed analysis. For example, the FOE conclusion *'it is widely accepted that GM crops do not increase yield, and in some cases yield less than conventional crops"* The evidence says otherwise; for example across the countries using insect resistant biotech crops, the average positive yield impact of the technology (1996-2006) has been +5.7% and +11.1% respectively for insect resistant maize and cotton

- *Misleading:* There are many misleading statements such as the conclusion *'the vast majority of GM crops are not grown by, or destined for, the world's poor. They are used for animal feed, biofuels, or highly processed food products in rich countries'*. Whilst important volumes of biotech crops are used in the feed and non food sectors in developed countries, over 90% of farmers using GM traits are resource poor farmers in developing countries. Also half of the $33.8 billion increase in farm income derived from biotech crops (1996-2006) has been by farmers in developing countries, with farmers using GM cotton in China and India obtaining the highest levels of income benefit on a per hectare basis

- *Inappropriate use of official data:* The FOE report states, for example that *"official data from major producer countries – US, Argentina and Brazil – confirms that pesticide use increases with GM crops*. Whilst official data on the total volume of herbicides used on crops like soybeans, in the US, Argentina and Brazil has increased in the last ten years, this largely reflects the substantial increase (nearly +60% 1996-2007) in the total areas planted to these crops. Across the area planted to biotech crops, total pesticide use fell by 7.8% (1996-2006) compared with what it otherwise would have been if GM technology had not been used

- *Use of unrepresentative data*: an example here relates to FOE's claim that *'insect resistant cotton fails in Asia'*. This claim draws on 'observations and reviews' of impact in small areas that are not representative of impact experienced by the vast majority of farmers. If insect resistant cotton 'had

[1] As authors of a number of peer reviewed published reports and papers on the impact of agricultural biotechnology

failed' in Asia it would be reasonable to assume that farmers would not use the technology. Reality is, however, different, for example, in India the GM insect resistant share of total cotton plantings has gone from zero to 77% (2002-2008) because of the substantial economic benefits derived by the vast majority of users. If the technology had failed, adoption levels would be very low.

- The FOE report states on the front cover that it was produced *'with the financial assistance of the European Commission'*. Given the inaccurate, incorrect and misleading claims made in the report, a reasonable question to ask is whether this is an appropriate use of EU tax-payers money?

A summary of key real impacts of GM technology and comments on the main claims made by the FOE report are presented below.

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The real impact of GM crop technology

1. Peer reviewed research in scientific journals[2] consistently shows that agricultural biotechnology has delivered substantial economic and environmental advantages. In the first eleven years of commercial use (1996-2006), incomes of the 10.25 million farmers using the technology increased by over $33.8 billion and pesticide use is 7.8% lower (a saving of 286 million kg of active ingredient) than it would otherwise have been if this technology had not been used. The reductions in the use of insecticides and herbicides, coupled with a switch to more environmentally benign herbicides, have delivered significant net environmental gains. Important savings in carbon dioxide emissions were also made, equivalent to removing over 6.5 million cars from the roads in 2006.

2. Biotech crops, through two main traits of insect resistance and herbicide tolerance[3] have, since 1996, added important volumes to global production of corn, cotton, canola and soybeans (Figure 1) - adding 53.3 million tonnes and 47.1 million tonnes respectively to global production of soybeans and corn. The technology has also contributed an extra 4.9 million tonnes of cotton lint and 3.2 million tonnes of canola.

3. Across the countries using insect resistant biotech crops, the average positive yield impact of the technology has been +5.7% and +11.1% respectively for biotech insect resistant maize and cotton respectively. Positive yield impacts have been highest in developing countries – eg, an average yield impact of +50% for biotech insect resistant cotton in India and an average of +24% for biotech insect resistant maize in the Philippines

4. In terms of contribution to feeding the world's population, the additional production arising from biotech crops (1996-2006) has contributed (after taking account of non food and feed use), enough energy (in kcal terms) to feed 310 million people for one year (similar to the annual

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[2] *Note to readers – the evidence presented derives from peer reviewed scientific journal articles and is representative of real impacts at the commercial and subsistence farm level. For further information see Brookes G & Barfoot P (2008) Global impact of biotech crops 1996-2006: socio-economic and environmental impacts, Agbioforum 11 (1), 21-38 – www.agbioforum.org and its extensive reference list*

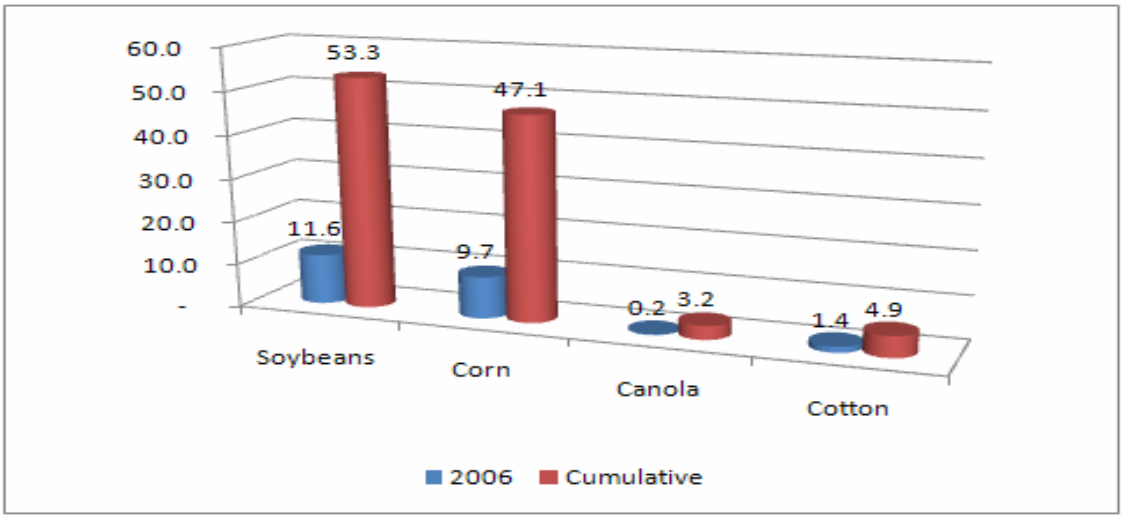
[3] Insect resistance in corn and cotton and herbicide tolerance in corn, cotton, canola and soybeans

requirement of the combined populations of Indonesia and Vietnam). The contribution of additional protein and fat was enough to meet the requirements of 920 million and 390 million people respectively.

5. In 2006, biotech crops contributed enough energy, protein and fat[4] to meet the requirements of about 67 million (similar to the population of Thailand), 207 million and 124 million people respectively.

6. Production of soybeans, corn, cotton and canola on the areas planted to biotech crops, in 2006, were respectively +20%, +7%, +15% and +3% higher than levels would have otherwise been if GM technology had not been used by farmers.

Figure 1: Additional crop production arising from positive yield effects of biotech traits 1996-2006 (million tonnes)



7. If biotech traits had not been available to the (10 million plus) farmers using the technology in 2006, maintaining global production levels at the 2006 levels would have required additional plantings of 4.6 million ha of soybeans, 2 million ha of corn, 1.8 million ha of cotton and 0.15 million ha of canola.

8. About half of the $33.8 billion increase in farm income has been to farmers in developing countries (in 2006, 53.5% of the total benefit went to developing country farmers). This has added to farm household incomes which, when spent on goods and services, have had a positive multiplying effect on local, regional and national economies. In developing countries, the additional income derived from biotech crops (of which insect resistant (IR) cotton has delivered the highest levels of income benefit per hectare in countries such as India and China) has enabled more farmers to consistently meet their food subsistence needs and to improve the standards of living of their households. For example, household income levels have typically increased by over a third for many farmers using IR cotton in India and for farmers using IR corn in the Philippines.

[4] After taking account of non food and feed use

9. 90% of the farmers benefiting from using the technology are small, resource-poor farmers in developing countries like China and India.

10. Biotech crops have also delivered a number of other more intangible benefits to farmers. These include:
    - Herbicide tolerant crops have facilitated a switch from a plough-based to a no/reduced tillage production system which has helped reduce soil erosion (and cut carbon dioxide emissions)
    - Insect resistant crops have resulted in improved quality of food (eg, less cancer-causing mycotoxins in corn) and reduced exposure to insecticides for many farm workers in developing countries where use of protective equipment has traditionally been limited
    - Shortening the growing season allowing some farmers to plant a second crop in the same season (eg, maize following cotton in India, soybeans following wheat in South America). This has made an important contribution to increasing production levels of crops like soybeans (see 2. above)

Inaccurate, misleading and incorrect claims by FOE

1. The FOE report makes numerous inaccurate and incorrect claims. Information sources cited are not based on peer reviewed scientific journals/research, are not representative of actual impacts, are often based on inappropriate assumptions and use of official (eg, USDA pesticide usage) statistical data and show poor understanding of agronomic and socio-economic issues. Much of the material drawn on is also out of date.

2. FOE claim that *'GM crops cannot, and are unlikely to ever, contribute to poverty reduction, global food security or sustainable farming'* There is a growing and substantial body of objective and representative evidence assessing the impact of biotech crops published in peer reviewed journals that disagrees, As indicated above (real impacts of GM crops):

    - Developing country farmers have, on average, seen the highest increase in incomes from using GM technology on a per hectare basis;
    - The additional income has helped farmers feed their families, improved their standards of living and contributed to the generation of income and employment in the wider economies;
    - GM technology has directly resulted in important additional production volumes of the crops soybeans, corn, cotton and canola. This has contributed to global food security;
    - GM insect resistant technology has made a significant contribution to reducing farmers production risk;
    - GM technology has led to important reductions in the volume of pesticides used, reduced the associated environmental impact of pesticide use on biotech crops and facilitated the adoption of environmentally friendly production systems like no and reduced tillage (that reduce carbon emissions and soil erosion). These effects have contributed to making these production systems, both more productive, and environmentally sustainable relative to alternative production systems

3. FOE claim *'the real beneficiaries of the GM system are biotech companies which profit from patents, expensive GM seeds, and increased pesticide sales. Poor farmers in contrast are squeezed by escalating costs'.* Reality is different - in terms of the share of the total 'benefit cake' between farmers and the supply chain (of technology companies, plant breeders, seed companies, seed producing farmers and sellers of seed to farmers), farmers have received the majority (72%), with 28% going to the supply chain. In developing countries, the farmer share was higher at 83%.

4. FOE claims that biotech insect resistant crops have '*repeatedly failed farmers in Asia'*. The facts are however fundamentally different. Farmers using the technology in Asia have experienced the highest levels of yield increase (eg, an average of over +50% for insect resistant cotton in India, where adoption of the technology reached 77% of the total cotton crop in 2008). Farmers in Asia have also derived the highest levels of average farm income gain on a per hectare basis from use of the technology. For example an average of +$294/ha and +$220/ha respectively for the use of biotech insect resistant cotton in China and India over the period in which the technology has been used in each country.

5. Pesticide use has <u>not</u> increased as a result of the adoption of biotech crops – it has fallen significantly relative to levels of use that would have occurred without using biotechnology. More importantly there have been significant environmental gains associated with this reduction in pesticide usage and switches to use of more environmentally benign herbicides – see for example, Brookes & Barfoot (2008) referred to above.

6. Farmers are <u>not</u> being subjected to limited seed choice and high prices. The price of all agricultural inputs (including seed and crop protection products) has risen in the last couple of years, largely reflecting increases in the cost of production (notably high energy costs). During this period, the part of the cost of seed specifically related to a biotech trait (known as the seed or technology premium) has, on average not increased. Furthermore, the continued rapid adoption of GM technology reflects the significant benefits that continue to be derived from using the technology relative to the additional costs paid for the technology. If the technology failed to deliver benefits, farmers would not use the technology. There remains plenty of choice in seed markets and the dominance of seeds containing biotech traits in some countries reflects market demand at the farm level. If competition is perceived to be limited in any seed market this is an issue for competition policy not technology approval processes.

7. There has <u>not</u> been a steep rise in the development of weed resistance to glyphosate as a result of the adoption and use of herbicide tolerant crops. All weeds have the ability to develop resistance to all herbicides and there are hundreds of resistant weed species confirmed in the International Survey of Herbicide Resistant Weeds (<u>www.weedscience.org</u>). Reports of herbicide resistant weeds pre-date the use of biotech herbicide tolerant crops by decades. Currently, there are 15 weed species that are resistant to glyphosate, compared to 97 resistant to ALS herbicides, or 67 weed species resistant to triazine herbicides such as atrazine. Several of the confirmed glyphosate resistant weed species have been found in areas where no biotech herbicide tolerant crops have been grown. Control of glyphosate resistant weeds is achieved in the same way as other herbicide resistant weeds, via the use of other herbicides in mixtures or sequences. GM herbicide tolerant (GM HT) crops have no effect *per se* on weed control as it is the herbicide programme used with them that provides the selection pressure. The effect on the environment of having to control the limited incidence of herbicide resistant weeds in GM HT crops is very

small and still produces a significant net environmental gain relative to the conventional alternative form of production.

8. FOE claims that the EU market has *'resoundingly rejected GM foods'*. This is an interesting interpretation of a market in which only 10% of total soybean and derivative use (about 3.5 million tonnes of soybean equivalents) is required to be certified as being derived from conventional soybean production. The vast majority of soybeans and derivatives used in the EU come from GM soybean growing countries and are derived from biotech soybeans.

9. The FOE report promotes a *'return to biologically diverse farming methods'*, largely based on organic production systems, and eschewing the use of biotechnology, as the way forward for reducing global hunger, malnutrition and poverty. An IAASTD report[5] is cited as justification for this stance; a report which is fundamentally flawed and is anything but the *'evidence based report'* it claimed to be. For example, the IAASTD report claims that *'there is uncertainty with regard to the effect of GMOs on human health'*. There is no evidence to support this claim and numerous reports from most national Academies of Science and over 150 scientific organisations[6] that have reviewed the evidence have all concluded that there is no evidence of ill effects from the consumption of foods containing GM ingredients. The IAASTD report also states that '*there is growing evidence that organic farmers are able to sustain their livelihoods...'* and advocates the wider adoption of wholly organic production systems. This may have merits in some locations, but is evidently not applicable on a global scale, where there are currently 6 billion mouths to feed. In fact, these are the very farming systems that dominate in many developing countries and regions such as Africa, and which are primary contributors to the poverty, food insecurity and malnutrition that plague such regions. As organic agriculture, on average yields only 70% of the yield of conventional agriculture, if we were to adopt wholly organic production systems as espoused by the IAASTD report, the world would have to plough up the rest of the world's wilderness locations just to produce the same amount of food the world currently produces. At the same time the ploughing up of current wilderness areas would have a major negative impact on biodiversity and the environment.

10. The claims made by FOE about the impact of GM insect resistant maize in Spain are wholly inaccurate and do not reflect peer reviewed analysis[7], which shows consistent positive impacts on yield and farm income, coupled with reductions in insecticide use and reduced levels of mycotoxins in the grain. In addition, the Spanish market adequately segregates biotech and conventional maize, where there is a requirement, without problems. Claims of adventitious presence of GM maize material being found in the minute (less than a quarter of 1% of total plantings) Spanish organic maize crops (2005/06) and alleged financial losses suffered by organic growers have never been independently verified.

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[5] IAASTD (2008) Agriculture at a crossroads, a synthesis report – International Assessment of Agricultural Science and Technology for Development

[6] See for example, ICTU (2003) New genetics, food and agriculture: scientific discoveries-societal dilemmas,, Paris, France, International Council for Science. www.icsu.org

[7] For example, Gomez-Barbero M & Rodriguez-Cerezo (2006) The adoption of GM insect resistant Bt maize in Spain and its economic consequences for farmers: an empirical approach, Paper presented to the 10th International Conference on Agricultural Biotechnology: facts, analysis and policies, Ravello (Italy) and Brookes G (2008) The impact of GM insect resistant maize in Europe since 1998, International Journal of Biotechnology, vol 10, 2/3

11. FOE makes spurious use of agricultural statistics to portray the global adoption of GM technology as being of limited significance (eg, relating total biotech crop plantings in the four crops in which the technology is mostly used to the global area of all crops). The true test of significance and relevance is the level and rate of adoption of a technology relative to the area of crops that suffer from pest damage or weed problems that the technology targets. In this context, the level of biotech trait adoption, in the crops and countries where use has been permitted to date, has probably been amongst the most rapid of any new seed technology in the history of agricultural development. For example, GM HT soybeans reached penetration levels in excess of 80% in most adopting countries (the US, Argentina, Paraguay and Uruguay) and levels of use of GM IR cotton are within a range of about 50% to 85%. Overall, across the four crops of soybeans, maize, cotton and canola, in the countries that allowed the commercial plantings of biotech traits in 2007, the share of total plantings accounted for biotech traits was just over 75%

12. FOE accuses both the biotech industry and the International Service for the Acquisition of Agri-Biotech Applications (ISAAA) of exaggerating and fabricating information on biotech crop plantings, both globally and in the EU. The statistics presented by both sources are, however, entirely consistent with official sources such as national government statistics (eg, United States Department of Agriculture, Spanish Ministry of Agriculture)