PG Economics Limited

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The magnitude and impacts of the biotech and organic seed price premium: US Organic Center report assessment by PG Economics

Having recently evaluated an earlier Organic Center (OC) release[1], PG Economics[2] provides a similar assessment of the findings of this latest OC release *The Magnitude and Impacts of Biotech and Organic Seed Price Premium.*

The OC release presents an interesting view of developments in the US seed markets for corn, soybeans and cotton and of impacts on, and changes in, the profitability of growing these crops[3]. Its conclusions are highly dependent upon the assumptions used, and perceptions of the author, as to how seed markets work and farmers behave. We consider that the mainstream US market evidence does not support the OC report conclusions.

For those reviewing the issues examined in this OC report, the following should be noted:

- *Size of premia paid for seed with specific traits or characteristics*: The absolute amounts farmers pay for seed and the size of premia for additional traits, or organic versus conventional versus biotech seed costs are of limited relevance. *It is the size of premia or extra cost relative to the benefit farmers derive from the seed that matters.* During the period 1996-2007, the average net income gain (after deducting the extra cost of biotech seed) from using biotech rates in the US[4] were $17.4/acre ($43/ha) each for both herbicide tolerant (HT) soybeans and insect resistant (IR) corn, $8.9/acre ($22/ha) for HT cotton, $8.5/acre ($21/ha) for HT corn and $37.6/acre ($93/ha) for IR cotton. These net average gains provide a primary reason why in 2008, 80%, 86% and 92% respectively of the total US plantings to corn, cotton and soybeans used seed containing biotech traits;

- *Seed choice/use and profitability*: If farmers' fail to see benefits, usually in the form of higher returns and income from using (more expensive) biotech traited-seed, they won't use the seed. Farmers are likely to switch to conventional (or organic) seed, change to growing a different crop or take up a different activity/enterprise. For the

[1] Impact of GM crops on pesticide use in the US: OC report evaluation by PG Economics. www.pgeconomics.co.uk/pdf/ocreportcritiquenov 2009.pdf

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

[3] The OC paper portrays an image of US farmers being faced with limited seed choice (ie, very little non biotech seed alternatives and dependent on biotech companies), ever rising biotech seed prices because of limited competition in the US seed markets and decreasing levels of farm profitability for biotech corn, cotton and soybean growers. As a result, there is perceived to be an increasing net transfer of income out of US agriculture to the biotech seed sector

[4] Source: Brookes G & Barfoot P (2009) Global Impact of biotech crops: income & production effects 1996-2007, AgBioforum 12, 2, 184-208

OC report to suggest that US farmers are dependant on biotech companies, are increasingly transferring income to biotech companies and have little choice is disingenuous to the intelligence, management capabilities and business skills of US farmers;

- *Possible net transfer of income from farmers to biotech companies*: the evidence does not support the OC report's assertion '*that dollars once earned and retained (by farmers) are being transferred to the seed industry*'. 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), US farmers have received the majority (65%), with 35% retained by the supply chain in the 1996-2007 period (source: Brookes & Barfoot (2009)). This is broadly in line with historic divisions of benefits from the application of other input technologies in agriculture;

- *Reasons why farmers use biotech seed:* There are a number of reasons why US farmers have rapidly adopted biotech seed. The important and consistent increase in profitability has been a primary driver of adoption (see above). These improvements in profitability have arisen from a combination of yield increases (mostly associated with use of IR corn and cotton traits) and cost reductions (found both in HT and IR crops). These benefits are well documented in peer reviewed scientific literature[5]. As well as these direct farm income benefits there are more intangible benefits such as greater management flexibility, convenience, more time to undertake off-farm activities, improved production risk management and better quality crops. These are more difficult to value in monetary terms but analysis by US researchers at North Carolina University[6] estimated these to be between $4.86/acre ($12/ha) and $10.12/acre ($25/ha) for HT crops and about $3/acre ($7.4/ha) for IR crops;

- *Recent market developments*: In 2008/09, the price of all agricultural inputs (including seed and crop protection products) rose, largely because of increases in the cost of production (notably higher energy costs). During this period, the part of the cost of seed specifically related to a biotech trait (seed technology premium) has, increased for some traits (notably HT traits) but remained largely unaltered for others. In addition, the price of glyphosate rose more significantly than prices of other herbicides resulting in a net reduction in the cost saving associated with adoption of biotech HT technology relative to conventional alternatives[7]. Nevertheless, the continued use of biotech traits by US farmers in the last two years reflects the significant benefits that most of them continue to derive from using the technology relative to the additional costs paid for the technology;

- *The future*: the OC report makes projections about likely seed premia for new biotech traits and forecasts further erosion of farm profitability for farmers using biotech

[5] See for example, the references in Brookes G & Barfoot P (2009) Agbioforum 12, 2, 184-208. Despite this evidence the OC report claims that US farmers have derived little or no yield or income gains from using biotech traits (page 11)

[6] Marra M & Piggott N (2006) The value of non pecuniary characteristics of crop biotechnologies: a new look at the evidence, North Carolina State University

[7] Prices of glyphosate in 2009 have, however recently fallen back to 2007 levels for most brands

seed and greater transfer of benefits from farmers to the biotech seed companies. The assumptions used to arrive at this conclusion interestingly include no benefit will derive from using newly available biotech seed, only additional costs (from higher seed premia). This assumption is unrepresentative because a) biotech seed companies are unlikely to develop new seed that does not offer farmers benefits and b) farmers are unlikely to adopt such seed if there is no benefit. For example, the second generation of HT soybeans launched in 2009, is expected to increase soybean yields by 7% to 11% (based on trials) and in early harvest reports, has been delivering an average yield gain of about 7% in the first year of adoption[8] yet the OC analysis assumes this technology delivers no yield gains. Overall, farmers will determine whether to adopt the newer, more expensive biotech traited seed in 2010 according to the same sound financial and economic principles that they apply to the application of all technology. If they determine that the extra benefits from use do not justify the additional cost they will not use the technology or will rapidly drop adoption after trying it;

- *The seed market*: The dominance of seeds containing biotech traits in the US corn, cotton and soybean sectors reflects market demand at the farm level. If some farmers have found that the economic attractiveness of using biotech HT traits is less than it used to be, and wish to switch back to conventional varieties, the seed sector in a market economy like the US, is likely to put in place measures to supply such seed (if unforeseen changes in seed type demand occur this may lead to short term supply availability problems because of the time lag in multiplying up sufficient quantities of seed). Changes in the price, availability and effectiveness of seed and crop protection products are features of these markets. New seed and crop protection products develop market share on the basis of their effectiveness and financial attractiveness to farmers relative to alternatives. They are inevitably replaced in time because of declining effectiveness and/or the availability of better performing products. This 'product life cycle' occurred before biotech traits were available in seed, applies equally in today's marketplace, and will continue in the future;

- *Competition in the seed market:* If there is perceived to be limited competition in the biotech seed market this is a competition policy issue not a biotech regulatory approval issue. It should, however, be noted that the regulatory requirements for biotech traits tend to be significantly higher than the requirements for other seed. This adds considerably to the cost of bringing biotech traits to the marketplace making it more difficult for small and medium sized seed businesses to enter the market. Therefore this represents a regulatory driven barrier to entry into the seed market. In addition, it is important to recognise the rationale for, and role of patents. These play a key role in rewarding investment and risk in the development of new technology, not just in the plant breeding sector. Patents provide a period of market control over who can sell and licence a new product in order to reward the risk of investment. After patents have expired other plant breeders can take advantage and

[8] Source: AgBiotech Reporter 16 November 2009. It should be noted that there will be important variations around this average with some farmers achieving higher yield gains and some lower, including no yield gains

apply the same technological advances. In the absence of this type of market protection, the levels of new trait and product development are likely to be much lower resulting in lower levels of productivity and crop improvement.

- *Seed premia and profitability of organic production systems relative to biotech*: the OC report portrays an image of organic production being significantly more profitable than conventional (biotech) farming systems (drawing on USDA data from 2006 comparing returns in organic versus conventional soybeans). If this was a reasonable reflection of returns over a number of years for these differing production systems it is surprising that the organic share of total soybean cropping area is so low (less than 0.2% of the total US soybean area[9]). *The reasons for the unrepresentative (overstated) relative profitability position of organic soybean production versus conventional (biotech) soybeans by the OC report largely reflect selective use of the data and omission of important factors of influence presented in the USDA ERS analysis* (see reference below). More specifically, since 2006, the price of conventional soybeans has risen significantly improving the profitability of soybeans *per se*, fuel costs have increased, impacting more on organic producers than biotech producers because of the relatively higher fuel usage on organic systems (eg, greater reliance on ploughing and mechanical weed control) and capital/overhead costs tend to be higher for organic production systems than conventional (eg, higher use of resources like labour and machinery and the need to factor in a three year conversion to organic systems in which organic costs are incurred but organic price premia cannot be obtained). In total, McBride and Greene (2008) estimated inclusion of these costs resulted in the total economic costs of producing organic soybeans in 2006 being $186/acre ($460/ha) higher for organic production relative to conventional (biotech) soybeans. Overall, farmers choose the type of production (organic, conventional, biotech) most suited to them and factor in a number of issues and influence (of which profitability is a key element) when making such decisions. For some, the organic route is the preferred approach, whilst for others conventional and biotech production systems are preferred. The evidence of the relative shares of the different production systems in the US corn, cotton and soybean markets suggests that organic is attractive to only a small minority, with the vast majority preferring production systems based on conventional and biotech systems.

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[9] At about 122,000 acres in 2005, with the organic corn area at 131,000 acres or 0.16% of the total US corn area in that year (source: McBride W & Greene C (2008) The profitability of organic soybean production, Paper presented to the American Agricultural Economics Society in Florida, USDA, ERS. The organic cotton is presumably negligible given the OC report indicates there is a lack of organic seed in the market (reflecting no demand for such seed)