Recent research by The Organic Center suggests that GM crops are now cutting into farmer’s incomes
In the face of a continued public relations onslaught by the GM companies, Emma Hockridge and Isobel Tomlinson look at new research on the growing costs of GM crops.

Few can ignore the growing scientific evidence of the problems associated with genetically modified (GM) crops. New research – published in the *International Journal of Biological Sciences* – reveals the negative impacts on the functioning of the kidneys and livers of rats fed GM maize for just 90 days. Another recent report highlights the development of glyphosate resistant weeds in the USA, presenting massive problems to producers and leading to an overall increase in herbicide use. Now a report from the Organic Center in the USA offers a new and stark warning to producers about the financial costs of growing GM crops.

GM crops have been grown commercially in the USA since 1996 and now dominate the production of maize (corn), soybeans and cotton. However, the *The Magnitude and Impacts of the Biotech and Organic Seed Price Premium* report by Dr Charles Benbrook reveals that GM seed prices have increased dramatically compared to non-GM and organic seeds, cutting average incomes for GM crop producers.

Between 1996 and 2008, over 941 million acres of GM herbicide-tolerant (HT) maize, soybeans and cotton were grown in the US. In 2008, GM HT crops represented 92% of the total of all soybean acres grown, 93% of all cotton and 63% of all maize. Over the same period, 357 million acres of GM *Bt* maize and cotton were grown. Producers in the US originally adopted the GM technology without any awareness of the possible implications. They then kept using GM crops partly because, at least in the early years, it provided significant advantages (mainly of time/convenience) and there were some cost savings – especially for very large farms.

However, once land had been used to grow GM crops, producers soon found they weren’t able to grow a non-GM variety of the same crop without it becoming contaminated. At the same time, non-GM seeds became increasingly harder to source as the GM companies controlled most seed production.

**Increases in the price of seed**

Dr Benbrook’s latest research contrasts the magnitude of the biotech and organic seed price premiums and examines the impacts on gross and net farm incomes. The results are surprising, to say the least.

Traditionally, US producers save soybeans for planting the next year, although they would generally buy a new variety every few years to grow on a portion of their land. This practice effectively capped soybean seed prices – at least until the GM era began in earnest in 1996. By 2005, 87% of soybean in the US were planted with Monsanto’s GM glyphosate-resistant Roundup Ready seed. But producers had to forgo the right to plant farm saved seed as part of the ‘technology agreement’ they had to sign. In the 25 years from 1975 to 2000, non-GM soybean seed prices rose a modest 63%. Since 2000, as GM soybeans came to dominate the market, the price rose by an additional 230%.

Monsanto recently announced a major increase in GM soybean seed prices for 2010: their new Roundup Ready 2 (RR2) soybeans in 2010 will cost 42% more per bag (about 150,000 seeds) than 2009. The $70/bag for RR2 is twice the cost of conventional seed. Organic soybeans, on the other hand, are now 7% to 23% cheaper than GM soybean seeds.

Incredibly, the price increases of GM soybean and maize have been dwarfed by that of GM cotton seed. Between 1975 and 1996, the price of cotton seed doubled. During the GM era – from 1996 to 2009 – the price rose from $73 to $589/one-hundred weight (CWT or about 425,000 seeds). Today, the latest GM cotton seeds costs $700/CWT – 5.9 times more than
conventional cotton seed. As very little organic cotton seed is sold in the US there is no basis to calculate an organic seed premium. The price increase of GM cotton seed has largely been driven by GM trait ‘technology fees.’ A GM ‘trait’ is a unique genetic characteristic added to the crop using GM technology. A trait can confer resistance to a specific pest or tolerance to a herbicide. In 2001, GM cotton seed contained about one and a half traits; this increased to nearly three traits in 2010. The more traits, the more the GM companies charge.

The tale is similar with GM maize. In 2009, GM seeds cost $235/unit (80,000 seeds) with conventional seeds priced at $139. Monsanto’s latest offering, the new ‘SmartStax’ maize, is even more expensive. It has eight ‘stacked’ traits – two for herbicide resistance and six for resistance to insect pests. Producers will pay twice as much per unit than those planting conventional seed. Organic maize seed is much cheaper than GM, costing about $170 a bag in 2010.

**GM seed and farmer incomes**

Of course, one must consider GM seed prices in relation to overall farm profits. Rising GM seed prices would make more sense if producers were making bigger savings by reducing pesticide use, for example. But recent research by The Organic Center suggests that GM crops are now cutting into farmer’s incomes.

Over the last 13 years, US producers applied 318 million more pounds (in weight) of pesticides as a result of planting GM seeds. In 2008, overall GM crops required over 26% more pounds of pesticides per acre than non-GM varieties. Similarly, the cost of GM seeds is now hitting gross incomes. From 1975 to 1997 the cost of soybean seed (before GM) accounted for 4-8% of the gross soybean crop income per acre. In 2009, conventional soybean seed accounted for 11.2% of gross income, while GM soybean seeds accounted for 16.4%.

Between 2001 and 2010, conventional maize seed accounted for 7-11% of gross incomes per acre, while GM producers spent the equivalent of 10-19% on seed. US growers planting ‘SmartStax’ corn seed in 2010 will need high yields and prices to turn a profit. Based on recent USDA forecasts for a good yield and price, the net return on an acre of maize is $245 for the producer. At $124/acre, ‘SmartStax’ seeds will cost half of this return. Similarly, since 2001, conventional cotton seed has accounted for between 3-10% of gross income per acre. In comparison, GM cotton seeds have cost between 11-32% from 2001 to the present.

If these trends in GM seed prices and farm incomes continue the dollars that producers once retained will be transferred to the biotech seed industry. Hugh Grant, Monsanto’s chief executive officer, recently announced that the company is aiming to double its 2007 gross profits to $7.5 billion (£4.7 billion) by 2012. He stated that increases in the price of new RR2 soybeans and ‘SmartStax’ corn hybrids will create about one-third of this growth. The obvious concern is that net farm returns are likely to be the primary source of these new profits.

**Real alternatives**

Effective alternatives to GM do exist and warrant vital research funding. Marker Assisted Selection (MAS), which uses genetic markers to identify the genetic sequence for desired traits, has already been successfully used to produce disease resistant varieties in a range of crops – including barley, wheat and beans and drought-tolerance in aerobic rice. Researchers use a rapid DNA test to identify immediately which plants have the desired trait and which do not. These techniques offer far-reaching changes to our food and farming systems, based on agro-ecological and organic farming of which GM technology has no part.

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**Key facts**

- GM seed prices have increased dramatically. In 2009, GM maize seeds cost $235/unit, with conventional seeds priced at $139.
- Between 1975 and 1997, farmers spent 4%-8% of gross income per acre on soybean seed. In 2010, farmers planting RR2 soybeans will spend about 22% of gross income per acre on seed – a 42% increase since 2009.
- GM crops are actually pushing pesticide use up: farmers applied 318 million more pounds (in weight) of pesticides over the last 13 years as a result of planting GM seeds.
GM crops: an alternative view

Bob Streit is a US agronomist with over 34 years experience. He was involved in the development of the first GM crops but recent results have made him increasingly sceptical.

I grew up on a small farm in Mitchell County, Iowa. After graduating in agronomy and plant pathology, I worked in the seed industry for 20 years, working at Dekalb and Cargill/Mycogen seed companies as a tech service agronomist. I was personally involved with the first work on herbicide and insect tolerant crops.

The debate over GM crops and food is a very complex issue and a lot of good producers and agronomists have to work in both worlds. I’m not anti-GM and I believe that GM crops have solved some immediate practical problems – for example, they’ve helped control the European corn borer and weed control is less time consuming using the glyphosate programme. Initial yields have often reached high levels (although this probably would have happened through basic breeding improvements) and many operations have subsequently expanded in size. However, there have also been real problems – some predicted, some not.

In marketing terms, the grain trade and merchants were totally unprepared for all the GM contamination and all markets face many hurdles and issues as a result. Similarly, many foreign markets did not want – or were not equipped – to import GM grain, especially if their customers did not want it. In practical terms, risks of yield loss due to non-selective herbicide spray drift has increased dramatically. And with fewer varietal and conventional herbicide choices, glyphosate resistant or highly tolerant weeds have developed across many Midwest farms.

New scientific research now indicates chelation (tie-up) of micro-nutrients in plant tissue, with increased incidences of plant diseases. Some tests show very low levels of key minerals (Mn, Cu, Fe, and Zn) compared to previous years. Incidences of plant senescence two to three weeks before black layering have led to lighter test weights, a possible cause of very poor grain quality in 2009. Grain merchants, ethanol plants, vets and livestock operators are reporting problems with high mycotoxin levels in this grain and poor animal performance/reproduction issues. As of mid-February, Japanese grain buyers were moving away from US corn in favor of Argentina. Soil microbiologists are also finding reduced populations of four beneficial classes of microbes and a growth in six pathogenic species. Soil tests for nutrients such as Mn, Bo and Cu are generally very low compared to three to four years ago, possibly due to die-off of these bacteria.

Perhaps the biggest discussion point among growers at the moment is the cost of the Gm ‘traits’ imposed by the seed companies. The problem is that growers have to purchase three, four, or even seven-way stacked traits when they might only want one or two – or even no traits at all. The traits might give a positive return every third, fifth or seventh year, but growers have to pay every time they plant seed. There is no rebate if the pest or weed doesn’t appear. The cost of individual traits is not being fully disclosed to seed buyers anymore. The glyphosate trait in soybeans cost $5/bag in 1997; it now costs from $24–$40 per 50lbs (140,000 seeds). Three or four-way traited corn now costs about $250/bag, while ‘Smart stacks’ carry a list price of about $413/bag – or about $180/acre.

For a few years – especially where insect pressure was severe, the two or three-way stacks gave positive returns. But in 2009 the multi-traited hybrids often yielded no better or even less than their conventional isolines. The cause has perplexed seed developers and growers alike and, as a result, most growers are not rushing to buy these heavily traited Gm hybrids. But the problem is that a number of major companies only offer traited varieties and it’s increasingly difficult to source non-GM varieties.

Many growers have come to appreciate the ease of using the glyphosate weed control system but this is changing. Growers in my part of the world feel that a halter has been placed on them. They’re an independent bunch and they don’t appreciate such tethering. Over the next year or two they will vote with their wallets for the companies that best meet their needs for seed, herbicides and technology.