

Monster, marvel, or just misunderstood

Denis J Murphy, Professor of Biotechnology at the University of Glamorgan, tackles the thorny subject of agricultural biotechnology...

In this brief article, I will argue that agricultural biotechnology (agbiotech) and its current treatment by both national and devolved administrations in the UK, are symptomatic of a more general lack of understanding of many important scientific issues that is sometimes coupled with an over willingness to play to the populist gallery. The latter tendency is especially apparent in some aspects of political treatment of one particular aspect of agbiotech, namely GM crops. Here, I will focus on the treatment of GM crops in Wales as an example of the collision of new technologies with public concerns and political action. The aim is to bring out some wider lessons that can be learned for future science-public dialogues, and especially the often problematic discourse with local politicians.

What is agbiotech?

Agbiotech is hugely misunderstood, not only by the vast majority of the general public and politicians, but also by many scientists. Most people equate agbiotech with the much maligned GM crops, as promoted by a few large multinational corporations. As such, it is regarded as the antithesis of organic production of crops, which is popularly (and often wrongly) imagined as the domain of small local suppliers. This apparent dichotomy has led to an official policy of GM rejectionism in Wales, coupled with the active promotion and public subsidy of the organic business sector. And yet, when I started doing research on crop improvement in the 1980s, the UK was one of the centres of a new agbiotech movement that was largely driven by small local start-up companies in places like Belgium, the Netherlands, and the UK. At this time, many of us in the research community looked forward to a future when our new crop varieties, some of which would be GM, could provide a renewable, environmentally-friendly source of a huge range of more nutritious foods, as well as a host of non-food products from cheap vaccines to biodegradable plastics. In addition, none of us saw any

reason for conflict between the aims of crop breeders; whether they used radiation mutagenesis (non-GM) or transgenesis (GM) and the ideals of organic producers.

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These early dreams never quite died, but the events of the past two decades have reinforced the often unpredictable connections between science and society, which scientists, business people, and policy-makers ignore at their peril. We have learned that, just because a new technology works well, its success in the marketplace is by no means guaranteed. Indeed, inferior technologies can sometimes displace better ones, as we have seen with Betamax vs. VHS video recorders, or Macintosh vs. Windows computer systems. In the case of agbiotech, the





new technologies are not necessarily superior to existing crop breeding methods, but they can extend their range and hold out new possibilities for crop production, which is especially relevant to developing countries. Moreover, many agbiotech methods have nothing to do with gene transfer ('genetic engineering') but are more akin to the kinds of DNA fingerprinting that are now in such common use in forensic science and medical diagnostics. Even today, by far the most effective use of agbiotech, and one with which I have been involved in Southeast Asia, is MAS, or Marker Assisted Selection. Here, molecular markers and other hi-tech tools are used to speed up and widen the scope of crop breeding around the world, and no GM methods are involved.

Things go wrong for agbiotech

As late as 1998, UK agbiotech seemed to have weathered the initial protests of the nascent anti-GM movement. At this stage, UK consumers were still relatively accepting of GM food products, and an openly labelled (as GM) tomato paste (made by Zeneca and distributed by major UK retailers) was even a modest commercial success. Indeed, most of the earliest organised opposition to GM crop imports came, not from the UK, but from environmentalist pressure groups on the European Continent. However, the presence of unlabelled imported GM products in the UK soon heightened public unease here as well. This unease was then skilfully exploited by professional anti-GM campaigners. There is little doubt that there was a highly organised and well funded international campaign against GM crops by professional bodies, such as Greenpeace in the late 1990s.

However, the fact that the anti-GM campaign largely succeeded in Europe was more to do with the consumer related deficiencies of the GM business model than to the efforts of the anti-GM lobby. In the wake of the backlash from the Brent Spar incident, where Greenpeace had misjudged the environmental and PR consequences of halting the disposal of an offshore oil platform in the North Sea, environmentalist groups were looking for new targets for direct action that would garner them more public sympathy and much needed support. It was partially the weakness of the GM paradigm that attracted the attentions of such activists in the first place. Unlike the family automobile or imported consumer electronics, GM crops were perceived as having few friends among consumers, retailers, or politicians, and were therefore seen by lobbyists as an easier target than arguably equally monopolistic multinational companies that supplied consumers with their petrol or consumer electronics. The result was a remarkably successful anti-GM campaign in the late 1990s that still resonates with the public and politicians alike, especially in local government.

Agbiotech and the devolved administrations

It has been interesting to see the way official reaction to agbiotech has varied in devolved administrations across Europe. In the UK, the Scottish Executive has generally

remained aloof from active involvement in the GM issue but, in contrast, in Wales the GM issue became a prominent matter of public policy almost from the start of the life of the new Welsh Assembly. Following intensive and skilful lobbying by local pressure groups, a 'GM-free Wales' policy was adopted in 2000 by the administration.

First Minister Rhodri Morgan stated: "Our policy... is to restrict any intention to grow GM crops commercially in Wales, as far as is lawful according to European Union legislation. We also intend to continue to market Wales as an area of the European Union where the agricultural produce is GM-free."

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This very public stance was vigorously promoted despite the fact that Wales has an overwhelmingly (90% by area) pastoral economy and less than 0.4% of its agricultural area had even the remotest chance of being planted with GM crops. In contrast to its treatment of GM farming, organic farming has been strongly promoted by the Assembly, with the Welsh Agri-Food Partnership setting a target (unfulfilled) of 10% of the agricultural sector by 2005.

The seeming preoccupation of the public and the Assembly in Wales with GM crops and organic crops is strikingly at variance with the current priorities of farmers themselves. For example, in November 2006, the Home-Grown Cereals Authority published a survey of 1,200 UK farmers, in which, GM crops and organic crops were joint bottom of their wish list of the 27 research topics they wished to see funded. On the other hand, the widespread vilification of agbiotech, because of the GM crops issue, has driven many companies and researchers away from Wales and the wider UK, as well as effectively halting any development of the considerable amount of world class basic plant science research that is still being carried out in our universities and institutes. What this means is that academic researchers are being increasingly isolated from the application of their discoveries for wealth creation and social progress, both locally and in developing countries, many of whom greatly need such expertise.

An isolated public research sector

We should remember that, during the 20th Century, public sector researchers in universities and institutes made

many significant scientific discoveries, such as antibiotics and Green Revolution crops that soon became widely available as non-patented 'public goods'. In the plant science sector, the paradigm of publicly funded research designed to be exploited both as public goods and for private profit, started to unravel in the 1980s, as the UK privatised or closed many of its leading crop related research centres. Since then, the dwindling band of remaining research institutes have tended to focus more on basic aspects of plant science and, with a few notable exceptions, there is almost no practical plant breeding research in the UK public sector.

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One of the consequences has been a loss in our capacity to exploit basic research for long-term use as public goods, especially in developing countries. Instead, new technologies like GM crops have been exclusively captured by the private sector and used for short-term commercial gain, eg. to produce herbicide tolerant crops. The remaining UK plant research centres tend to focus on model plants like *Arabidopsis*, and on short-term (one to three year) government contracts rather than on practical crop-related research¹. Such contracts often address current public concerns, such as GM crop segregation, rather than more considered longer-term projects aimed at topics like crop improvement for the growing amount of saline or arid soils where public good research could really make a difference².

What can we do now?

Does any of this matter? I think it does. Firstly, the UK taxpayer might question why they are funding basic research in plant science while the country has lost the capacity (and seemingly the will) to exploit its future benefits³. Secondly, we will still have to feed ourselves in the coming uncertain decades of possible climate change and now we have largely lost our ability to breed new crops for this purpose. Thirdly, the public sector needs to 'recapture' technologies like genetic engineering for use in public good programmes that are of little interest to commercial companies⁴. As with previous crop improvement technologies, such as mutagenesis or wide crossing, the key to the future success of GM might lie in its application as a public good rather than exclusively for private profit.

Rather than simply vilifying agbiotech and GM crops, we need to foster a greater understanding of the wider opportunities (and possible risks) that they might bring, especially in the context of public 'open-source' – like ownership of some of the newer aspect of such technolo-



gies. We should also embark upon the renewal of the practical public good mission of plant science research that was responsible for most of the outstanding achievements of agriculture over the past Century, as, it increased food production more than 10-fold to keep pace with the expanding world population. With the likelihood of another three billion mouths to feed over the next four decades, we cannot afford the luxury of ignoring potentially useful new technologies. It is the responsibility of scientists to be more proactive in explaining their research and its implications, but we also need a greater sense of vision and leadership from politicians across the board.

- ¹ In 2004, a BBSRC Working Party stated that: "BBSRC should make the transfer of knowledge between plant and crop science a high priority." www.bbsrc.ac.uk/news/reports/crop_sci_review12_05_04.pdf.
- ² This point was made in a 2004 House of Commons Science and Technology Committee Report into BBSRC, www.publications.parliament.uk/pa/cm/cm200304/cmselect/cmsstech/6/602.htm.
- ³ In a report published in June 2006, the House of Commons Science and Technology Committee castigated the UK Research Councils for a perceived lack of effectiveness in the promotion of knowledge transfer from basic research into its wider use in society. www.publications.parliament.uk/pa/cm/cmsstech.htm.
- ⁴ Such initiatives are now underway in the US and Australia, but not so far in the UK.

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