23

DIFFERENT WORLDS OR COMMON GROUND?

Understanding the social and ethical issues

KEY THEMES

- Two key areas of difference.
- Intellectual property rights.
- The difficulty of reaching common ground.
- Attempts to relocate the debate.

From battleground to common ground

The ferocious debate surrounding genetic modification (GM) has become polarised to the point of deadlock. Both sides, for and against the technology, argue their case with equal conviction and authority. Both make totally contradictory claims about the dangers or benefits of adopting GM. The two factions seem to live in different worlds. Finding a middle way through the debate is extremely difficult.

Bones of contention

There are several areas of difference. One is environmental: the development of superweeds, the levels of pesticides that need to be used with GM crops, whether GM agriculture reduces carbon emissions, and so on. Another argument concerns yield: do GM crops really deliver the promised improvements?

But undoubtedly the two issues that really matter to a world facing global food shortages and hunger through economic deprivation are:

- What are the socio-economic implications of GM crops and food?
- Do GM foods affect human health?

Both sides in the debate are concerned about the welfare of the poor, but they disagree over the capacity of GM to help matters. Advocates see the technology overcoming problems of food production in emerging economies, while opponents regard it as an exploitative tool in the hands of multinational companies.

Whatever their other views, opponents and advocates of genetically modified food are concerned about the welfare of the poor and food deficient.

Pros and cons

The socio-economic argument over GM concerns wealth creation and distribution. Its advocates argue that the technology will contribute to the productivity and livelihoods of farmers worldwide, especially poor smallholder growers in emerging economies. Opponents take a different stance. They believe that GM will not benefit those who need it most but rich multinationals, with knowledge and wealth being in the hands of a few.

The health debate runs like this. The pro-GM lobby argues that there is no evidence of harm to human health from GM foods. People have been eating them for many

years with no adverse reactions. The anti-GM campaigners say quite the opposite and point to cases such as tobacco smoking or asbestos use, where similar claims were made but turned out to be wrong.

Where do scientists fit into this polarised picture, alongside the multinationals and the non-governmental organisations (NGOs) with their black and white positions? In general, the scientific community supports the development of these technologies – a power for good that will bring benefits to humankind, alleviating hunger and helping to bring about global equity. At the same time, however, scientists believe that the fruits of their research should be not in private hands but

BOX 23.1 Birth of an industry

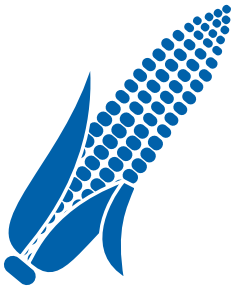
Today's biotech industry can be said to have started with the Californian company Genentech. In 1978 it brought the first commercial application of genetic modification to the market – a bacterium modified using recombinant DNA techniques to produce human insulin, the hormone needed to control diabetes.

But there was a problem. There was no protection for the intellectual property in the modified bacterium: the USA had a longstanding policy of not issuing patents for products of nature, including forms of life. In other words, Genentech's research and investment were not secure. Anyone could make use of – and money from – their efforts.

That changed in 1980, however, when the US Supreme Court narrowly found in favour of an appeal from a biochemist at General Electric – Ananda Chakrabarty – against a similar ruling from the US Patent Office on a bacterium engineered (not using GM techniques) to disperse oil slicks. Chakrabarty's organism was not considered a product of nature but a man-made living organism and so could be patented.

The way then was open for Genentech to patent their organism, and for industry to pour investment into research on novel organisms, without fear of plagiarism by competitors. In the following 20 years, biotechnology companies grew in size and number as they assembled the expertise, techniques and materials needed to put genetically modified organisms on the market.

Concurrently, scientists in universities and academic research institutes were also intensifying their efforts to create genetically modified organisms that would confer benefits to society, including crops engineered for improving health and nutrition in the developing world. Ingo Potrykus and Peter Beyer, in conjunction with the company Syngenta, with their Golden Rice to curb vitamin A deficiency, were among the most successful. Unlike some of the companies, though, their motivation was not for profit but altruism, as the new rice was and remains intended to be made available for use by small-scale farmers with a royalty-free licence.



Genetic modification, unlike hybridisation, produces seed that breeds true. So the producers of genetically modified seeds license their use by farmers subject to an agreement that any resultant seed will not be held back and used for the next year's crop.

with the public at large. They ask whether we, the taxpayers, should support plant breeding as a public good. So they share both the multinationals' interest in furthering GM technology and the NGOs' interest in global equity.

Multinationals and ownership

The early history of the biotechnology industry shows that, for a commercial company to invest and expand its activities, it has to make a profit by owning and protecting its products through intellectual property rights. In the case of GM seeds, ownership remains with the corporations that market them throughout the entire lifetime of those seeds and their descendants, and for the lifetime of the patent, which is some 20 years. Corporations do not sell the seeds outright but license them for a fee to farmers who then buy new seed each season. Of course farmers do not *have* to use GM seed – but many do because of benefits such as higher yield or pest resistance.

This system greatly concerns the opponents of GM. They contend that intellectual property rights in seeds undermine food security: they want farmers, or at least their nations, to own GM seeds without the need for perpetual licence fees. National food security depends, they say, on national ownership of the means of production. But we live in a capitalist society and companies have to make a profit to invest in research and for people to invest in them. The alternative would be for the taxpayer to pay for the research and make it freely available to society.

One solution might be to create public licences such as exist for free computer software, but it is hard to see the biotechnology industry agreeing to a measure that eats into its profits. For this reason, environmentalists such as Friends of the Earth cannot envisage GM crops (not, it should be said, biotechnology as a whole) ever contributing to global food security or sustainable farming.

Impacts on human health

The anti-GM movement's current position on the health risks of GM foods is well summarised in *GMO Myths and Truths,* an evidence-based examination of the claims made for the safety and efficacy of GM crops.

This cites several cases showing evidence of health risk, including that of biochemist and nutritionist Arpad Pusztai, which caused a worldwide furore both in the media and in academic circles. In 1998, Dr Pusztai, a distinguished plant scientist and a world expert on a group of proteins found in plants called lectins, publicly announced some

startling research results. These, apparently, demonstrated that rats fed genetically modified potatoes containing a lectin gene from the snowdrop plant suffered damaged immune systems and stunted growth of vital internal organs. GM food, it seemed, was potentially harmful to health.

This was a bombshell that reverberated beyond newspaper headlines and into the high-level political domain. Four days after Dr Pusztai's announcement, he was suspended from his job at the Rowett Research Institute in Aberdeen. But other scientists joined the controversy by springing to his defence. The distinguished medical journal *The Lancet* even published the research.

But Pusztai's career was over and, when the UK national academy of science, The Royal Society, carried out its own investigation, it concluded that the research was severely flawed and that the case for possible toxicity of GM potatoes had not been proven. What is clear from this episode, though, is the ferocity of the debate surrounding GM technology. In this case, conspiracy theories abounded. The anti-GM lobby, meanwhile, remained convinced that Pusztai's research revealed a valid representation of the dangers.

The anti-GM lobby also continues to worry a good deal about food crops genetically engineered to produce the *Bt* toxin from *Bacillus thuringiensis*. The toxin acts as an insecticide in crops such as Monsanto's *Bt* maize, rendering them resistant to pests. The obvious concern is that humans, in eating the toxin-containing maize, might damage their health. One Canadian study in an agricultural township in Quebec, for example, appeared to show that traces of *Bt* toxin from the maize were found in the blood of 93 per cent of women and in the umbilical cord and foetal blood of 80 per cent of them. Could the developing embryo be at risk from this?

Supporters of GM argue that the *Bt* protein breaks down in humans during digestion and there is no receptor for it in humans or animals so the fears are unfounded. Coincidentally, *Bt* bacteria are one of the few insecticides approved by organic farmers, and it is used as a commercial product by organic growers who spray it on vegetable and greenhouse crops. But still the arguments roll on, with one piece of research being put up only to be shot down by another.

For commercial companies to invest in biotechnology, they need to make a profit by owning and protecting their products through intellectual property rights.

Why is the debate so complicated?

It seems, on the face of it, as if the conflict between pros and antis should be resolved simply by applying objective scientific methods to examine their claims

and counterclaims. If one side believes, as a result of a scientific experiment, that a particular GM product is harmful to health, then it should, in an ideal world, be possible to test that finding with another experiment to replicate – or disprove – the claim.

However, with GM as with other contentious sciences and technologies, we do not live in an ideal scientific world. Here, a clutch of non-scientific interests are in play, which leads to different preferences about which claims are accepted. Indeed, in this debate, each side is keen to point out the non-scientific interests that motivate the other side and how these distort their understanding of the truth.

Many NGOs, amongst other groups, insist that GM is a technology that swells the profits of rich multinationals at the expense of the world's poor, and that the governments of wealthier nations support their local multinationals and their technologies out of economic self-interest. Its advocates, in turn, accuse the NGOs of

BOX 23.2 Golden Rice in the crossfire

By the time researchers Potrykus and Beyer developed their technique for producing Golden Rice – developed to alleviate vitamin A deficiency and blindness in the many millions afflicted in developing countries – the biotechnology industry had become a powerful force in seed production, controlling much of the technology required to produce it.

Needing a partner experienced in international product development, Potrykus and Beyer originally turned to the Swiss agrochemical company Zeneca (now Syngenta), and did a deal whereby the rice would be freely licensed to farmers whose annual turnover was less than US$ 10,000, but would be commercially licensed to large-scale industrial farmers. Poor farmers in developing nations would benefit, but so too would the company through licensing seed to commercial producers. Subsequently Syngenta gave up control so as to avoid any accusations of it not being a humanitarian project. The company now has no commercial interest and does not expect any return or income, although it retains the patents to prevent these humanitarian varieties being sold by others.

There has been resistance to genetically modified crops from non-governmental organisations throughout, so unfortunately Potrykus, despite his good intentions, has been caught in the crossfire of the conflict between the biotechnology industry and its critics. However, the latter have themselves been charged with opposing the humanitarian aims of the project.

manufacturing crises in order to raise money. Or say that they have some sort of misplaced idealism about the nature of food and farming, and an ill-defined sense of what is in the public interest.

Once we look at the non-scientific bases for the debate, it becomes clear why it cannot be resolved by simple empirical and scientific means.

"Individual GM foods and their safety should be assessed on a case-by-case basis ... it is not possible to make general statements on the safety of all GM foods."
World Health Organization

Asymmetric logic

The opponents of GM foods and crops, in attempting to establish health risks, need to demonstrate concrete examples of health hazard. But they do not need to show that *all* GM foods are dangerous, only that *some* are. GM advocates, on the other hand, want to be able to claim that there is no evidence at all of health risks. A universal claim like this can instantly be falsified if just one instance of health damage results from eating GM food.

It may be, of course, that some GM foods are safe and some are not: both sides are right up to a point. But the only way to ascertain this is by adequate testing – which engenders another controversy. What is adequate? What methods should be used to ascertain GM food safety? The bottom line, for the World Health Organization, is that one cannot categorically say that GM foods are safe. Its 2012 publication *20 Questions on Genetically Modified Foods* states: "Individual GM foods and their safety should be assessed on a case-by-case basis ... it is not possible to make general statements on the safety of all GM foods."

Finding a middle way

If the GM debate is ever to be resolved, probably the best solution is to relocate the discussion to an acceptable middle ground. Here are two attempts to do this.

The UK Government Office for Science

In 2011 the UK Government Office for Science published the results of one of its in-depth Foresight studies: *The Future of Food and Farming – Challenges and Choices for Global Sustainability*. This argued that new technologies such as genetic engineering should not be excluded on ethical or moral grounds. At the same time it does not (over)emphasise the value of GM (or any other innovative technology) at the expense of existing practices – GM is not a panacea for all food production problems. Biotechnology as a whole is highly rated as a means of increasing output, but GM crops are grouped along with cloned livestock and nanotechnology as potential sources of improvement.

The report stresses the value of modern genetics in developing new varieties and breeds of crops but, over 200 pages, it only specifically mentions genetic modification eight times. It suggests that GM is a means of achieving faster or more efficient advances than other methods, but should be used when necessary and appropriate, rather than as the first choice of technique.

The IAASTD

Another important initiative (also discussed in Chapter 22) is the analysis by the International Assessment of Agricultural Knowledge, Science and Technology for Development – IAASTD. Its 2008 report puts biotechnology in a broad context of world agriculture, arguing that it can certainly contribute to agricultural science and knowledge but forms only a part of the solution to world hunger.

Scientific discoveries should not, it suggests, distract us from the social and environmental consequences of using new farming technologies. Managing global agriculture needs to take into account local indigenous knowledge: biotechnology is just one of many contributions to sustainable farming. And it places great emphasis on improving the productivity of small-scale farmers to alleviate poverty and hunger among rural populations. Biotechnology will play its part alongside local knowledge and best practice through developing partnerships between farmers and scientists.

Both the UK Government Office for Science and the International Assessment of Agricultural Knowledge, Science and Technology for Development suggest that while genetic modification can contribute, it only forms part of the solution to world hunger.

The IAASTD report also reminds us that biotechnology is not confined to GM but takes in conventional fermentation, plant and animal breeding techniques, as well as recent advances in tissue culture, irradiation, genomics and marker-assisted breeding and selection. It recognises the controversy over inserting transgenes into plant genomes but is not, in principle, opposed to using GM techniques. Indeed, it acknowledges that both the anti- and pro-GM claims can be true as long as they are not regarded as universally true.

The need to acquire mutual respect

Why is it so important to break down the antagonism and distrust in the GM debate? One strong reason is to avoid throwing out the baby with the bathwater. Genetically engineered foods and crops are just a few of the offerings of modern biotechnology. Even if the health risks posed by GM foods were to prove significant, there are other innovations flowing from biotechnology that can be safely and fruitfully deployed to increase crop yields or nutritional value. Let us not dismiss the whole enterprise out of hand.

If the two opposing forces could take a broad view, stepping aside from their different positions to discuss all points of view sympathetically, they might find common ground and end up realising the best of both their worlds.

They live after all on the same planet, one that faces significant problems. Exploring diverse, even conflicting evidence and listening to other viewpoints is arguably the best, if not the only way to resolve them.