

Why is there such a fuss about the genetic engineering of crops?

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Genetic engineering, and particularly genetic modification of plants, has been much in the news lately. Some see it as an opportunity and some as a threat. Why is this?

The first two products that came to the market in the UK - the tomato puree and 'vegetarian cheese' offered the consumer both advantage and choice. For example, both Safeway and Sainsbury sold 170 g of the modified tomato puree at the same price as 142g of the conventional product - because there is so much less loss in transporting the tomatoes from the field to the processing plant, and the GM puree outsold the conventional product - for they were offered side by side on the shelf. The same is true of the 'vegetarian cheese' which is made by use of an enzyme, chymosin, made in bacteria by genetic modification, rather than extracted from calf's stomachs.

In contrast, the flour from the herbicide-resistant soya, from Monsanto in the US, offers no obvious advantage to the consumer, but rather to the producer, and the consumer has not been offered choice because of the lack of separation of flour from modified and unmodified soya in the United States. This has led to substantial consumer resistance in the UK, which retailers are trying to meet by offering choice between the two, and if that is not possible, by clearly labelling the product.

But are these new foods safe? Specifically, is this new soya safe? Herbicide resistant soya was genetically modified by the introduction of a gene from a soil bacterium to make the plant resistant to the herbicide glyphosate. This change brings real advantages for the farmer, and the new crop, which accounted for only 2% of the crop in 1996, was up to 15% in 1997 and was up to 60% in 2000. Putting it another way, the global area (excluding China) of transgenic crops was 1.7 million hectares in 1996, 11.0 million hectares in 1997, 27.8 million hectares in 1998, 39.9 million hectares in 1999 and 44.2 million hectares in 2000. The five principal transgenic crops grown in 2000 were soya, maize, cotton, rape, and potato, with soya and maize accounting for 54% and 28% of the global area.

The principal benefits reported include more flexibility in crop management, decreased dependency on conventional insecticides and herbicides, higher yields and cleaner and higher grade of end product. In the US in 1997, the economic benefit to growers was estimated at \$81 million for Bt cotton, \$119 million for Bt corn and \$109 million for soya, with a collective total of \$315 million, up from \$92 million in 1996.

So farmers want to use it. But how do we know if it's safe? Now we do not eat soya beans but the flour made by grinding and defatting the beans. Both the added gene and the new enzyme are degraded by this treatment, and they then will be quickly broken down in the gut. Then before it can be sold in Britain, it needs Government approval and Ministers take the advice of the Advisory Committee on Novel Foods and Processes. This Committee, which includes a consumer representative and an ethical advisor, weighed the issues up very carefully, considered this new soya to be as safe as conventional soya, and so advised the Minister.

What about the effect on the environment? Will these crops lead to an increase in the use of herbicides? Will the modified genes escape into the environment to fill our fields with resistant rape, or will the genes spread to other species? These problems are regulated by the Advisory Committee for Release into the Environment. They too have worked on a case by case basis, but are now looking at the possible net effect of several releases and are discussing the introduction of post-marketing monitoring.

But is the current regulatory procedure, sufficient I believe, in the early days of releases, still adequate, now releases are coming through thick and fast? And is it adequate to deserve complete public confidence? Because of such concerns, the British Government introduced, in 1998 two new overarching committees, the Food Standards Agency and the Agriculture and Environment Biotechnology Commission - set up to increase transparency, public accountability and to pick up possible wider implications.

But if GM soya is as safe as unmodified soya, and we can control adverse effects on the environment, why do people not want to eat it? There are several reasons. The first is the deep conviction that certain sorts of genetic modification of plants are an unacceptable tampering with nature. It runs right back into the question of what people believe about the mechanisms of the natural world, and here scientists and non-scientists may disagree. Scientists, and many Christians, see the world as a unity, but a changing unity. So it doesn't seem odd to place a foreign gene into a tomato, although that would not have occurred naturally. There is, for all Christians, a separate issue of care and stewardship, but is it intrinsically wrong, even wicked, to move genes around in the way I have described? Does the genetic constitution of some or all species have a specially protected status? I do not think so.

The second ethical issue is a utilitarian cost/benefit analysis, balancing risks of the introduction of genetically modified crops against the likely benefits to consumers, to farmers, and to industry. The first step is to identify the risk of occurrence-a task for the scientist-while the second is to decide whether the risk is worth taking, and that must involve a wider community.

Finally there are issues of rights and justice, about the allocation of benefits and burdens, who stand to win, who stand to lose, whether the gains from new crops are likely to be distributed fairly. There are many issues here. What about the developing countries? Are the multi-nationals becoming too powerful, and if so, what should be done about it? Do consumers have an absolute right to choose not to consume genetically modified foods?

After all, we are not able to choose whether our electricity comes from nuclear power stations or not, however much we disapprove of them. Separation of modified from unmodified products will raise costs; so what about those who need cheaper and cheaper food? Is this all a middle-class indulgence? All these issues are raised by GM foods, but are they intrinsic to the technology?

Rather, I suggest that GM foods have become a lightning rod for many modern concerns; scepticism about the regulatory process, gusts of anxiety about our food, growing hostility to high intensity agriculture, and concern about the way in which the agrifood business has consolidated into five companies world-wide. So decisions about the future of our food are being taken in the US or in Switzerland. Consumers feel they have lost control and blame the technology, and some wish to ban it altogether. I do not believe that that is a sensible way

ahead, but that we should respond by regulating this coming change, so that it is the least harmful and the most helpful to us all.