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The ethical maze

Deciding what is right and what is wrong in biology

Key words

ethics
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GM crops



Dwain Chambers

Modern science raises many ethical questions. How can these be answered? Is ethics just a matter of making up one's own mind on issues? In this article, Professor Michael Reiss looks at how ethical frameworks can be used to address ethical questions and then applies them to the case of genetically modified food.

In 2004, European 100 metres champion Dwain Chambers was found guilty of using a prohibited drug (the designer steroid tetrahydrogestrinone, THG) and banned for two years. He has now controversially returned to athletics. Should this be permitted?

It sometimes seems as if almost every decision in modern science raises ethical issues. Should we use genetic engineering to boost food production? Should we build more nuclear power stations? Should we use stem cells from embryos to try to find new cures for diseases? What, if anything, is wrong with athletes taking performance-enhancing drugs?

Answering such questions requires two things. First you need to have a valid **ethical framework**. An ethical framework is a sort of toolkit. It gives

you a generalised way of tackling ethical problems rather as a saw gives you a generalised way of cutting wood. The second thing you need is a good understanding of science so that you can apply the ethical framework to the question you are interested in.

Just to make things a bit more interesting, there isn't a single ethical framework that everyone accepts. There are several different ones. You may find that you prefer one of these. That's fine, but it's a good idea to understand something of all of them. That way you'll appreciate how other people may see the same ethical issue in science differently from you.

First we will look at three of the major ethical frameworks and then we will see how these could be applied to the issue of GM crops. We will end by referring to some other ethical issues in science that can be addressed using these frameworks.

Cost-benefit analysis

Perhaps the most common ethical framework is to carry out a **cost-benefit analysis**. What you need to do is to consider all the costs (i.e. disadvantages or harms) that might result from a course of action and then compare these with all the benefits. If the costs outweigh the benefits, then it's best not to go

ahead with the suggested course of action. If the benefits outweigh the costs, go for it.

Suppose, for example, you were trying to decide whether or not to cull (i.e. kill) badgers on farms with cattle so as to try to reduce the spread of bovine tuberculosis (a disease that infects both cattle and badgers and which they can catch from each other).

Benefits of culling badgers might include fewer cows getting ill and less money having to be spent as government compensation for farmers whose cows get bovine TB. Costs would include suffering experienced by badgers, the distress to all those people who like badgers, and the financial costs of killing the badgers.

As you can imagine, it is difficult to compare the benefits and costs in this case which is why the idea of culling badgers is controversial. Furthermore there are still disagreements as to some of the scientific issues. It is still unclear how many badgers and over what area would need to be killed to reduce bovine TB.

Rights and duties

A different ethical framework looks at whether there are any **rights** or **duties** in the case. Consider, for example, the proposal that 17-year-olds have the right to drive a car provided they have passed their driving test. Everyone would agree – no controversy here.

But pedestrians presumably also have rights – including the right to walk safely on pavements and across roads. This is one of the reasons why drivers have corresponding duties, including the duties to keep to the speed limit, have valid insurance and pay attention while driving (rather than using a mobile).



Alexandr Stepanov/Bigstockphoto

He's got the car, he's got the licence, he's got the shades – but what are his duties to other road users?

Virtue ethics

A third ethical framework doesn't look so much at the results of particular actions but at the character and motivation of the people in question. Hence the rather quaint term **virtue ethics**. The issue is whether people are acting virtuously or not. Virtues include characteristics like honesty, truthfulness,

kindness and loyalty. Think back to the case of drivers and passengers. A virtuous driver would keep to the speed limit, have valid insurance and pay attention while driving even if there was no chance of being caught breaking the law. As the saying goes, virtue is its own reward.

The case of GM crops

Now let's consider **GM crops**. First, some science. 'GM' stands for 'genetically modified'. GM crops have had their DNA altered so that they contain some of the DNA of another species.

For example, GM maize is widely grown in the USA and a number of other countries, though not in the UK. It has been genetically engineered so that it is resistant to an insect, the European corn borer. Despite its name, the European corn borer is a pest in the USA and in many other countries. When adult, it is a moth and does no harm. The problem comes when it is a caterpillar. It burrows ('bores') into the stems of maize and damages the crop.

GM maize has been genetically engineered to carry a gene from a bacterium. As a result, the maize makes a particular bacterial protein. This protein is fatal to the corn borer (and other insects) when they eat it, but harmless to humans.



Dave Hoisington/CIMMYT

Genetically modified maize looks like ordinary maize. It is grown in many countries of the world. Here, Kenyan farmers are examining an experimental plot.



Keith Weller, USDA

*The European corn borer *Ostrinia nubilalis* is an insect that attacks maize, reducing yields.*

See the article on badgers and TB in CATALYST volume 18 issue 1 in our archive, www.sep.org.uk/catalyst.

So, is it ethical to grow and sell GM maize or not? First of all, let's look at the question within a cost-benefit framework. Here are some possible benefits:

- The farmer gets a higher yield for the crop.
- Fewer insecticides are used.
- The company that sells the technology may make more profits.
- Are there any possible costs? Well, there could be some:
- Non-pest species of insects that feed on the maize might be killed.
- The farmer has to pay more for the new varieties of GM crops.
- The GM maize might hybridise with wild maize (in Central America) leading the introduced gene to escape into the wild.

Note that the balance between these costs and benefits might depend on where the crop is being grown, and it might vary from year to year. For example, there is no wild maize in Europe so there is no risk of the introduced gene escaping into the wild. In Mexico, though, the situation is very different. Here there are still wild strains of maize.

Now let's examine whether GM maize is morally desirable within the ethical framework of rights and duties. On the one hand, crop breeders and farmers might argue that they have a right to carry on with their lawful business, developing new varieties to improve crop production.

On the other hand, those opposed to GM crops might argue that they have a right not to have GM food forced on them. At the very least, this would mean that food made from GM crops need to be labelled as such.

The framework of virtue ethics probably doesn't help much in the case of GM crops. It is often of more value in medical ethics, thinking about the right way to treat patients, for example.

Other ethical issues in science

Now let's return to the other ethical questions we referred to at the beginning of this article: nuclear power, stem cell technology, and performance-enhancing drugs. Hopefully, you can use the ethical frameworks introduced in this article to help you address these questions. Of course, you may not reach clear-cut answers but you should be able to examine the issues rigorously – and to detect when others are using poor arguments.

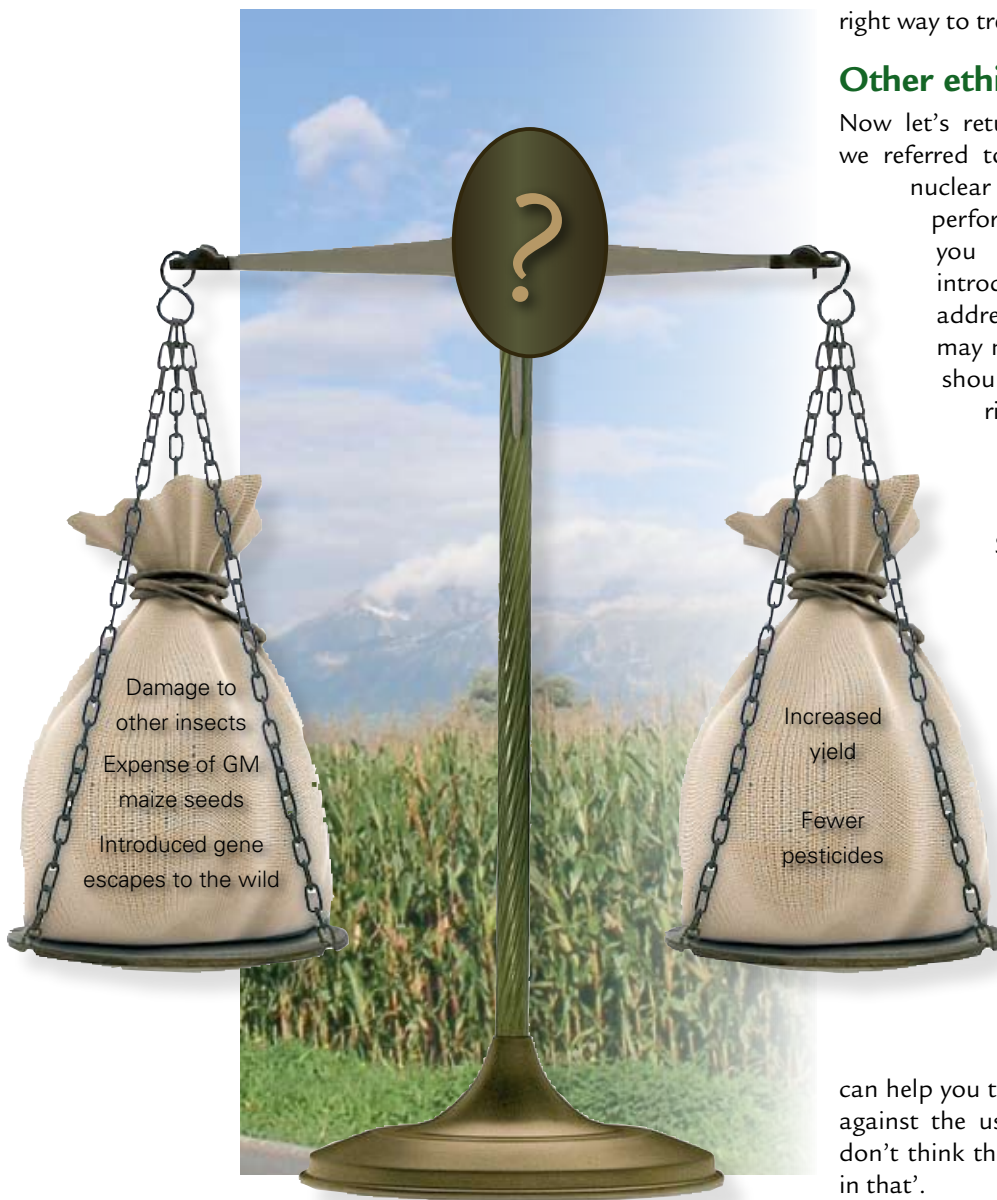
Conclusion

Sometimes ethical argument in science leads to agreement. Often, though, it doesn't – people may continue to argue about whether certain things are morally right or wrong till the end of time. This doesn't mean, though, that ethical analysis is irrelevant.

Ethical analysis can help to clarify where there are disagreements and to see whether certain scientific data can be obtained that would lead to the disagreement being resolved.

In any event, using a well established ethical framework can help you to produce better arguments for and against the use of science than simply saying 'I don't think that's a good idea' or 'I don't believe in that'.

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Do the benefits of GM maize outweigh the costs?