debates 1 October 1998

Sceptically speaking...

Increasingly disturbed by potential risks and sceptical of the claimed benefits, green activists want an end to the scientific uncertainties in risk assessment. But, argues *Julie Hill* from the UK's Green Alliance, this also requires a broad consensus on what actually constitutes environmental harm.

JULIE HILL

The Green Alliance, one of the United Kingdom's leading environmental-policy organizations, has had a biotechnology programme since 1987. We have never been against genetic modification in principle, and we accept that there are potential benefits, including environmental ones, of the technology. These might include higher yields of staple food crops to meet the needs of the hungry. Crops might be produced that require lower inputs of energy, water and chemicals or that can grow in impoverished soils. Lastly, genetic modifications might prevent spoilage between harvest and market. But we say that society needs to be highly discriminating about the use of genetically modified crops and other organisms.

We are becoming increasingly concerned about the potential environmental risks and are sceptical that benefits of the kind mentioned above will be realized. We are also dismayed that present UK government regulations and policies have consistently failed to respond to the concerns of the public and pressure groups, including the need to protect biological diversity and ensure continued consumer choice. We also see an important role for biotechnology companies in screening their products in line with public expectations and worries.

The regulation of release of genetically modified organisms (GMOs) into the environment in the European Union is based on the premise that organisms with novel genes might behave like other types of novel organism, notably those introduced from other countries and often termed 'alien' or 'exotic' organisms. It has been estimated that some 1% of such introduced organisms can become established in their new environment to the extent that they become a pest and disrupt native ecosystems. Critics of this analogy say that, with 'alien' species, whole new organisms are being introduced, whereas with genetic modification just a few genes are being changed in an otherwise familiar crop plant. This is true, and yet quite small genetic changes can have radical effects on plant phenotype. For example, single transgenes can render a plant sterile, make it tolerant to weedkillers that would otherwise kill it, or make it produce a bacterial toxin. These are all examples of present crop developments based on small but powerful genetic changes.

We are concerned that these changes could also affect the plant's ability to compete with other plants outside the agricultural environment, making it 'weedy' and able to invade 'natural' areas. Most of the countryside in the UK is, at best, 'semi-natural' and has been shaped by man at some time in our history, but this does not make it any less valued. A plant might become more invasive, for example, if the genetic modification made it grow more vigorously or produce more seed, if the seed survived longer, or if the plant could fight off natural predators particularly efficiently (pest resistance is the goal of many current modifications).

An associated concern is that crops will pass genes to near relatives, wild plants that might then take on 'weedy' characteristics. The scale of possible hybridization with near relatives and the development of 'weediness' are both difficult to predict, leaving large areas of uncertainty in risk assessments.

Invasion of natural areas is not the only way in which GMOs could affect the

environment. It is perhaps more likely that effects will be indirect rather than direct. GMOs designed to be used as a package with chemicals, such as herbicide-tolerant crops, will change patterns of chemical use. Yet, depending on the chemical and how it is used, these changes may not benefit the environment. We also have to think about simple cumulative changes, such as the more efficient eradication of weeds that is likely to result from developments such as herbicide resistance: cleaner fields mean less insect diversity, which means less food for birds. The numbers of farmland birds are already declining at an alarming rate throughout Europe.

GMOs could also alter patterns of land use if drought-resistant and salt-resistant crops were to become a reality. Such developments would allow agriculture to extend into what is at present marginal land. Yet marginal land, such as salt marsh, can have great ecological value.

It is difficult to assess these indirect effects. We know relatively little about the present state of the environment, particularly the ecology of the agricultural environment, so understanding how GMOs will change the situation presents several challenges in one. We have to develop techniques that enable a full environmental 'audit' of GMO technology, so that we can create a picture of all the possible effects, and build that into our decisions about the release of GMOs. At present, such decisions are based on too narrow a definition of environmental damage, have largely ignored the indirect effects, and are weak in their consideration of cumulative effects.

Perhaps the biggest gap in the present regulatory regime is any clear sense of what would constitute environmental harm. The EU Directive and the UK regulations that flow from it all avoid spelling out just what it is the system is seeking to prevent. We must be certain from the start whether such things as the extinction of a species of rare butterfly, the loss of a species of nematode worm, or the loss of a number of nematode worms in one area matters, and, if so, how much. Some argue that the spread of 'foreign' genes into the environment is always undesirable, even if they have no immediate deleterious consequences. What we need is a society-wide debate on just what we value in the natural world and what should not be threatened by genetic modification or any other new technology.

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