

Chapter 1

*Genetic technologies:
scientific possibilities
and ethical principles*

Introduction

- 1.1 The new technologies usually called 'genetic engineering' or 'genetic modification' (GM) promise to revolutionise medicine, animal husbandry and agriculture.¹ An optimistic view is that GM plants and foodstuffs will make a great, possibly indispensable, contribution to reducing mass hunger. Yet the development of GM crops has recently caused widespread unease in the United Kingdom (UK) and other European countries. The unease comes in diverse forms and in varying degrees of intensity. It is also based on a wide range of ethical beliefs. So it is worth setting out the perspective from which this report is written.
- 1.2 The development of GM plant technology raises two kinds of issues: the scientific and the ethical. Science is concerned with understanding the world in which we live and in particular the causal relationships that shape that world: for example, the association between genes as a molecular sequence and the characteristics, such as resistance to frost, that the genes express. Understanding such causal patterns is necessary if we are to alter or change the characteristics of plants in an informed way. Ethics, by contrast, is concerned with what we ought or ought not to do. Ethical principles provide standards for the evaluation of policies or practices, for example, indicating that it would be wrong to carry out a certain genetic modification because to do so would threaten human health or harm the environment. Although it may be scientifically possible to undertake a certain experiment or introduce a new type of crop for commercial planting, it does not follow that it would be ethically right to do so. Working out what it is right or permissible to do involves, therefore, bringing together our scientific understanding with our ethical principles to decide what we should do given the capacities for genetic modification that have been developed.
- 1.3 Few questions of practical reasoning about policy or practice can be dealt with in a simple form. Practical reasoning typically involves weighing up or balancing the benefits of a technology like genetic modification with its potential harms or disadvantages. Proponents claim that GM plant technology will raise agricultural productivity, assist the development of safer, more nutritious foods with a longer shelf-life, and contribute to the goal of increased food security for the poor in developing countries. Against these, we must set the claims of those who say that GM food technology is a threat to human health and/or the environment and that its introduction will raise the profits of private suppliers whilst at the same time depriving poor producers of primary commodities access to markets and to the new varieties of seed. Whether GM technology is morally acceptable is a matter of the plausibility of these factual claims and their importance in the light of moral principle.
- 1.4 There are three main types of principle that are relevant to the evaluation of policies or practices. The first principle is a principle of *general welfare* which enjoins governments (and other powerful institutions) to promote and protect the interests of citizens. The second is the maintenance of people's *rights*, for example their rights to freedom of choice as consumers. The third is the principle of *justice*, and it requires the burdens and benefits of policies and practices to be fairly shared among those who are affected by them. When we consider the introduction of a new technology, such as that related to GM crops, we can ask a series of questions in the light of these general principles. Will the technology promote the general welfare by making for improved food safety or reducing the use of chemical pesticides in agriculture? Or does the technology pose unknown risks for consumers and the environment that we would be wise not to run if we are concerned about the general welfare? What implications does the technology have for the rights of consumers, for example the right to be informed about the food one is eating? What implications does it have for the rights of

¹ Genetic modification involves the direct introduction of desirable characteristics by artificial transfer of foreign or synthetic DNA (deoxyribonucleic acid, the genetic material) into an organism. A GM organism or GMO has therefore been altered in a way that does not involve mating and/or conventional genetic recombination. EC Directive 90/220/EEC (OJ L117) 8 May 1990, pp 15–27, Article 2.

scientists to be free to conduct their research in ways that protect their intellectual integrity? Finally, we can ask questions derived from a concern with the principle of justice. Who will be the principal beneficiaries from the introduction of the new technologies and what obligations do they have to compensate the losers?

- 1.5 This report discusses the social and ethical implications of GM crops. We do not intend to draw a sharp distinction between ethical concerns and social issues. On the one hand, ethical principles concern the social framework within which we live. On the other, we need to be aware of the social and technological background against which we discuss ethical issues. Scientific, ethical and social issues cannot be wholly separated from each other; nor should they be so. In particular, we accept the point made by many of the respondents to our consultation: it is, in a broad sense, an ethical choice to employ scientific knowledge in the hope of improving the human condition. Different societies have set different values on the acquisition and use of scientific information; trying to use scientific knowledge for what Francis Bacon called 'the relief of man's estate' may seem an obvious choice, but it is not an inevitable one.
- 1.6 It is the ethical basis of the regulation of commercial development and production of GM crops and the promotion of genuinely useful research by government action that mostly concerns us. For most individual consumers, the choice whether to consume or not consume GM food is not a matter of ethics. A consumer who thought GM food unsafe would be unwise but not wicked to eat it. Only if consuming GM food is thought to be intrinsically wrong, as eating non-kosher food is for orthodox Jews, is its consumption ethically wrong, and directly so. The consumption of GM food would be ethically problematic, but in an indirect fashion, if its production did harm, violated rights, or caused injustice. The claim that the production of GM crops does one or all of these things is frequently made by their critics.
- 1.7 In setting out the three main types of ethical considerations that we think are relevant to the evaluation of GM technology we have so far avoided one major issue, namely the ethical status of the natural world itself. GM crops do not raise questions about the rights of plants, in the way that animal experimentation raises questions about the rights of animals; nor do they raise questions about the welfare of plants. They do, however, provoke a reaction that is difficult to place within arguments about welfare, rights and justice. Some perceive GM crops as 'unnatural' and those who disapprove of their development and use for this reason are among the strongest critics of GM crops. Many individual respondents to our consultation expressed views of this kind. One said 'I grieve at what seems to me a violation of the fantastic and incredible world in which we live' and this was not an uncommon sentiment.² For all the decline in formal religion, there remains a deep-rooted belief that we 'tinker' with nature at our peril.
- 1.8 Others have argued that it is unethical to treat nature in an 'industrial' fashion, not simply because of the unfortunate consequences of so doing, but because they believe it is intrinsically wrong. Whereas the first of these concerns can be accommodated under the principle of the general welfare, the second makes 'the environment' an object of ethical concern, regardless of how the environment affects the interests of human and other animals. GM crops thus raise ethical issues about the rights and wrongs of the ways we affect the environment that are especially difficult to analyse and resolve.
- 1.9 The government of a modern democratic society is obliged not merely to accommodate the deeply held moral convictions of its citizens, but to treat them with respect. But these convictions – on such vexed problems as euthanasia, for example – are usually held by minorities no more numerous than those who hold the opposite conviction. The task of governments cannot be to legislate or regulate by making these convictions the basis of law, but it is rather to pursue policies that can command

² Response by Mrs M Lee to the Working Party's Consultation.

something close to a reflective consensus. This is why safety, health, economic well-being, and the avoidance of environmental degradation are commonly the goals of policy. To say this is not to ignore what some of our correspondents describe as 'intrinsic' ethical considerations, but it is to say that they must enter policy in more complicated ways than for example, considerations about safety and health.

- 1.10 Most people, and the majority of philosophers, believe that there is no single principle that should determine our conduct or the making of policy. We cannot assume that considerations either of welfare, or of rights, or even of justice taken on their own should be decisive in deciding what we are to do. Consequently, we need to consider the meaning and implications of each of these principles as part of our overall assessment. This is the task of the remainder of this chapter. However, even though we consider that the principles of welfare, rights and justice exhaust the principles that are relevant to the formation of public policy, we need to understand the concerns that lie behind the claim that GM technology is somehow unnatural or intrinsically wrong. We also seek to elucidate these concerns in this chapter, although we end by noting that the world into which GM crops are being introduced is one in which farming is already in many ways a decidedly 'unnatural' activity.

Welfare and the role of government regulation

- 1.11 One fundamental purpose of public policy is to protect and promote the welfare of citizens. In this context, the concept of welfare is normally understood in terms of a list of basic securities: access to safe and nutritious foodstuffs, protection from environmental harms, and enhancement of research and development (R&D) to provide the knowledge on which the provision of such securities can be built. A fundamental question about GM crops is whether and how they promise to increase human welfare and whether their introduction may damage human welfare directly, by injuring the consumer, or indirectly, by damaging other things we value, such as a diverse environment and wildlife. Arguments about human welfare are so familiar that they are sometimes dismissed as hardly ethical arguments at all. However, the impact of human behaviour on the welfare of others imposes stringent requirements on us. Endangering the health or safety of other people is morally wrong, and in severe cases almost invariably illegal. The health and safety of citizens are also at the heart of the greater part of government regulation. Since questions about human welfare frequently raise questions about the probability of the risks and benefits involved, the ethical issues are often obscured by the scientific problems of risk assessment. But it is always possible, in principle, to distinguish between the two distinct questions of 'how bad?' and 'how likely?' That is, we can and should separate the reasons for regarding an outcome as an evil from the likelihood of its occurrence.
- 1.12 The concern of government with the welfare of its citizens underlies much current regulatory practice. One of the duties of companies introducing GM crops, whether in experimental trials or for commercial use, is to ensure that they do no harm or that any harm is so slight as to be generally acceptable. The regulatory system for GM crops and their products in both the UK and the European Union (EU) is predicated on this simple proposition. The prevention of harm is sometimes extended to promote the adoption of the so-called 'precautionary principle'.³ This puts the avoidance of harm to consumers and the environment at the head of the list of regulatory goals. The blanket adoption of the precautionary principle risks an imbalance between the avoidance of harm and the achievement of a positive good. This is because some interpretations of the precautionary principle require us to give an absolute priority to the first goal before we attend to the second.

³ The 'precautionary principle' is incorporated in the **Maastricht Treaty**. It is the rule that permits governments to impose restrictions on otherwise legitimate commercial activities, if there is a risk, even if not yet a scientifically demonstrated risk, of environmental damage. Its interpretation is disputed and we return to it in subsequent chapters.

- 1.13 The precautionary principle can be understood as a simple welfare-based principle. As such it raises familiar problems, of which the most important is to define the conditions under which the avoidance of harm should take priority over the attempt to do good. Ordinarily, we balance the good we hope for against the bad we would wish to avoid, a process which economists have elaborated into 'cost/benefit' analysis. Common sense suggests that the development of crops that substantially reduce hunger or improve nutrition in the developing world would justify running the risk of modest damage to the interests of well-off consumers or the environment. Conversely, critics argue that GM crops will bring benefits only to the producer or farmer, not to the consumer, and that any risk of harm cannot be justified. Both views imply that it is right to balance the good achieved against the harm imposed.
- 1.14 A stringent interpretation of the precautionary principle would preclude such balancing. It may, however, be best interpreted, not as part of our cost/benefit calculation, but as a principle governing how we should engage in such calculations. Consequently, it is treated sometimes as a rule of thumb that regulators should adopt a wary attitude to new technology and sometimes as a reminder that if the harm anticipated is very great, we should be attentive to very small risks of it occurring. As some of our respondents have suggested, the precautionary principle may also be understood as a reminder that human beings are all too easily carried away by excitement and novelty, and need to be warned against hubris. However, other respondents have treated the precautionary principle as a distinctively moral principle, which emphasises the intricacy of the natural world and which urges us to take that intricacy with proper seriousness. Understood in either of these ways, the principle does not yield very definite prescriptions, but does urge caution upon scientists, governments and farmers. We agree that a precautionary approach to so novel a technology as that of GM crops is justified, as we say below, but we would not wish concerns about very small risks to the inhabitants of developed countries to inhibit the R&D that can benefit the inhabitants of the poorer world.

Consumer choice and rights

- 1.15 One way of promoting welfare is to ensure that consumers have a choice, since we generally set out to choose what is good for us and avoid what is harmful. But for some consumers in the UK and the EU, the avoidance of GM foods is itself the good that they seek; their demand for 'choice' is primarily a demand to be allowed to avoid GM foods. For others, the provision of choice acknowledges a diversity of views. If consumers are to have a choice, they must of course know which foods are and are not GM. In the United States (US) farmers, food processors and the Government have all agreed on the need to avoid exposing consumers to danger. However, they have resisted requests, mostly from Europe, to accept mandatory labelling requirements which would allow consumers to avoid GM products, especially when the two alternatives are not substantially different. Such labelling requirements protect choice as a value independent of consumer safety, but at a cost. A demand for consumer choice not based on avoidance of harm needs to be justified in the context of regulation to politicians, regulators and food producers. US producers have viewed elaborate labelling requirements, imposed to allow consumers to choose not to consume GM foods, no matter what their reasons, as restraints on trade under another name.⁴
- 1.16 Choice thus raises issues of rights as well as issues of welfare. Considered as a matter of welfare, the 'balance' to be struck is that between the cost to producers of offering the choice and the cost to consumers of forgoing it. Considered as a matter of rights, the 'balance' to be struck is that between the expectation of commercial firms that they will be able to operate in a predictable environment and the right of the consumer to choose what she or he consumes.

4 Cohen P (1998) Strange fruit, *New Scientist*, No 2188: 42-45.

- 1.17 It is sometimes said that consumers have an absolute right to choose what to consume and what not to. In one sense, this is undeniable. Nobody is obliged to shop in any particular store or to purchase any particular product. The right to reject goods that are offered to us, without giving any reason, is taken for granted. The right to choose presents difficulties only when it imposes costs on others and therefore diminishes their right to choose. It is, however, typical of rights that they impose costs. Even the seemingly modest right to know what we are eating will impose costs on others. To enforce a consumer's right to know what is in processed foods by requiring specific labelling imposes costs that initially fall on the producers. These costs may then be passed on to consumers in the form of higher prices or absorbed in lower returns for the producers or lower wages for their employees. There is no consensus to date on how substantial the costs of labelling GM ingredients might be or on whom they should fall. Such costs may be slight, or they may be considerable. This at least suggests that the argument for the consumer's 'right to know' through the imposition of labelling requirements on producers is less straightforward than many suggest.
- 1.18 A further question is the extent to which the consumer's right to choose implies duties on producers over and above the duty to label. If all brands of some processed foods now contain GM soya, the consumer of these foods is faced with Hobson's choice. The right *not* to consume GM foods has little meaning when there are no non-GM foods to be consumed in their place, or no way of knowing which is which. But does the consumer have the right to buy a range of non-GM products that other people would not otherwise have chosen to produce? To say the consumer has such a right seems extreme. Of course, if supplying such a demand is profitable, it is likely that the market would supply it anyway; but the assertion of a right to have such products available is more contentious than that suggests.
- 1.19 To claim a right is often contentious. The point of claiming rights is to limit other people's freedom. When we have a right, what other people may and must do is fixed by that right. Rights override, except in extreme cases, the preferences and even the well-being of those against whom the right exists.⁵ This means that the right to choose is unproblematic only when it is the right not to purchase a particular product. Claiming a right to have a product made available when the market would not otherwise have supplied it, presents grave difficulties. It is one thing to insist that suppliers guarantee not to poison the customer; it is another to insist that companies should supply any particular range of products. It is yet another to require that such measures should be accomplished at no cost to the consumer.

The principle of justice

- 1.20 Behind both the balancing of the welfare of different people and groups, and the balancing of their competing rights, lie ideas of justice. When considering the welfare interests or competing rights of individuals, groups, industry or the state, we try to strike a fair balance or seek a just outcome. For example, if protecting the rights of consumers by providing adequate labelling was very expensive and was generally agreed to do nothing to prevent harm, most people would say that upholding the right to know would not be worth the loss of value to producers, particularly if the producers were poor. Conversely, if informative but inexpensive labelling was desired by the majority of consumers, it would probably command wide public support. The principles at stake are not complex but their implementation is. Securing a consensus is complicated by the fact that producers have an interest in exaggerating the difficulty of complying with new regulations and pressure groups have an opposite interest in exaggerating the public demand for them. Such questions about where the balance of burden and benefit is to be struck are the subject of everyday political debate.

⁵ For example, if I owe you £30, I must pay it even if you need it much less than I. You may forgive me my debt, but I cannot forgive myself the debt I owe you.

- 1.21 A further issue of justice discussed in several parts of the report is whether the larger seed and agrochemical companies possess excessive market power in relation to new entrants to the market, researchers, consumers and the unorganised businesses and consumers of the developing world. The cost of developing new products may inevitably be such that only substantial enterprises will have the resources to undertake it. Large companies naturally carry out research that is in their interests and gives them an advantage over their competitors. They also acquire patents in order to protect their technology and products. There may also be clear advantage to a few large companies to pursue a degree of vertical integration so as to tie in both their customers and their own suppliers. The significance of these concerns is of course contingent on the extent to which such imbalances of power exist. If non-GM seeds continue to offer advantages to farmers that are unmatched by GM seeds, the problem may not be acute. However, in some parts of the world such as the US, it seems likely that almost all the best varieties of the major crops will be genetically modified within ten years. If poorer countries are excluded from adopting GM seeds, their cash crops may become uneconomic and their domestic food supplies may be deprived of potential improvements. The gap between rich and poor might grow.
- 1.22 Complex questions about justice are also raised by two generally neglected aspects of the problems posed by GM crops. The first is whether the benefits of GM-based farming will be directed towards those to whom they will do the most good. This is certainly a question to debate within developed societies but, more importantly, it is a question about fairness between the richer and poorer societies. So far, the initial benefits of GM crops have largely accrued to some of the seed and agrochemical companies, US farmers and US food producers. Farmers who use less herbicide and insecticide will benefit from reduced costs; and those companies who market both seeds and herbicides will increase their returns.
- 1.23 Benefits to consumers are harder to find. GM tomatoes that can be processed more efficiently to produce cheaper tomato paste have been readily accepted by UK consumers.⁶ Apart from this example, however, little has happened to persuade the consumer that the quality of food will be enhanced in more sophisticated ways or that it will become cheaper. Since these are the two things that most affect consumers, GM crops are currently vulnerable to questions about their real usefulness and to questions about who benefits.
- 1.24 More important and yet frequently under-emphasised, is the disparity between the developed and the developing world in the effort they devote to agriculture. The prospect of a second Green Revolution, which extends the benefits of the first Green Revolution⁷ to crops and areas so far unaffected, is an immensely attractive one. Improved crops in the developing world would create productive work and provide cheaper and more reliable food locally, reduce mortality and malnourishment, and perhaps assist development in other ways. Can these hopes be taken seriously while research, development and the commercial introduction of GM crops are focused almost exclusively on the needs of industrialised agriculture in the developed world? Failure to answer such questions would be a failure to take justice seriously.
- 1.25 If GM crops are developed to benefit less-developed areas, they will have an impact on the kind of farming practised. Many of those who responded to our consultation have suggested that farmers in the less-developed world practise viable ways of farming that it would be unethical to disrupt. If the impact were disruptive, it would raise the question whether the gains of future producers and consumers amounted to just recompense for whatever disruption occurs. There are two things to be said about such a question. The first is that any disruption would not stem from the fact that the new crops were genetically modified but from other features, such as altered farming patterns. As

6 The University of Reading National Centre for Biotechnology Education (<http://www.ncbe.reading.ac.uk>) has an account of the origins and introduction of the new tomato.

7 For a discussion of the Green Revolution, see paragraph 4.4.

we show in Chapter 4, GM crops would in fact tend to create more work, but innovation inevitably produces changes which some people find disruptive. The second point is that if the reality of farming in sub-Saharan Africa and elsewhere is that yields are declining and the present way of life is increasingly unsustainable, there is less to question about the morality of adopting better yielding GM crop varieties. If, however, GM crops are adopted but later found to be harmful or have consequences that can only be righted by substantial investment, poorer countries might be substantially disadvantaged.

- 1.26 The problem of justice needs to be considered in the context in which general agricultural productivity, and therefore general welfare, is raised but where some people benefit and others do not benefit or even lose. One idea here that has been popular among economists concerned with the ethical appraisal of technical change is that of Pareto optimality (named after its original formulator, Vilfredo Pareto, the Italian economist). A situation is defined as Pareto-optimal when nobody can be made better off without making someone else worse off. If a technical change, like the introduction of GM technology, can be introduced such that productivity can be raised so that everyone is better off, then from an economic viewpoint, it should be introduced. A Pareto-optimal improvement would have been achieved.
- 1.27 However, there are few cases of technical change which produce an unambiguous all-round improvement in the welfare of everyone who is affected, without making someone worse off. Usually technological innovation produces some gains and some losses, and there is no reason to think that GM technology is likely to be any different. How might the justice of the change be assessed in this common type of situation? Economists have extended the notion of Pareto optimality to develop the concept of the 'compensation test'. The new situation is better than the previous situation if the 'winners' can compensate the 'losers', and still have something left over. There is some tension between the economist and the ordinary person however. Most people think that the fact that the winners *could* compensate the losers is not decisive, and that a change is unequivocally an improvement only if the winners *do* compensate the losers. Where the winners gain greatly, but there is no way of compensating the losers, our intuitions about whether the situation is an improvement are affected by the relative prosperity and misery of the winners and losers. The terms of trade may change in such a way that a rich person can buy a second Rolls Royce while a hungry person in Zambia becomes hungrier. It is clear that if some of the rich person's gain could be transferred, the poor person would be very much better off; if it cannot, it is not obvious how we can compare the relative losses and gains. The relevance of this thought is that when we ask consumers in prosperous countries to suppress their doubts about GM crops so that research relevant to the developing world is continued and encouraged, we are asking them to agree that their losses are smaller than the gains of the poor, even though there is no obvious way in which that sum can be done. This may be right, but it relies on our everyday intuitions about justice, not on ideas about economic optimisation that economists can help us with.
- 1.28 A last question about rights and fairness concerns responsibility for the consequences of GM crop introduction. Consider the possibility that the introduction of GM oilseed rape alters the environment, as compared with current agricultural practice. Who is to be held responsible? If such crops were to be prohibited, who is to bear the burden of doing without them? Between the scientist's laboratory and the altered environment lie many steps. If the scientist had not done the research, no company could have applied it. If the company had not developed it, no trials could have been held; without trials, no plantings by farmers could have taken place, and so on. Yet it has generally been accepted that the scientist had the right to do the research because any remote effects were indeed remote. We normally take the view that it is not the originators of the technology who are responsible, but those who seek to develop and implement it.

- 1.29 Should responsibility be allocated differently? Who is most responsible? The scientist, the development company, the government committee that approves field trials, the commercial seed company or the purchasing farmer? The temptation to pass responsibility up or down the line to someone else is not always unreasonable. The producer is not usually held to account for the misuse of the product. The scientist would not, in general, be held responsible for the misbehaviour of farmers. However, a scientist or entrepreneur who put into circulation hazardous materials of whose dangers he was fully aware would be blamed for doing so. Where a product cannot be used 'properly', we blame the producer along with the user. There is no obvious solution to such problems about the allocation of responsibility, but their existence places another burden on governments and regulators.
- 1.30 The ethics of developing and growing GM crops has been our central concern. But we have also been led to reflect on the ethical standards that ought to govern the debate, in particular the need for participants in the debate to be careful about verifying facts and restrained about both optimistic and pessimistic speculation. The views expressed to us by many of the consultation respondents⁸ and by those who talked to us directly⁹ made it clear how hard it has been for ordinary people to obtain an agreed view of the facts about GM crops. Many respondents were concerned with the hypothetical condition of a world in which GM crops dominated agriculture. Others pointed out that despite the rapid uptake of soya, maize and cotton in the US, GM crops were not expected to make much headway in the UK for at least five years. The fact that Monsanto supplies only three percent of the world's seed¹⁰ belies the image of a new industrial revolution sweeping through agriculture under the impetus of a few multinationals. A well-informed consensus on the facts would resolve some of the arguments and reduce some of the public unease.
- 1.31 Whose responsibility is it to secure such a consensus, and what are the ethics of public discussion? We say more in Chapter 8 about the need for an advisory committee to focus public discussion and enlighten policy. Meanwhile it is clearly deplorable, both on simple utilitarian grounds, and in terms of the violation of the public's right to be informed, for pressure groups, journalists, commercial concerns or others to put into circulation exaggerated accounts of what can be expected from GM crops. It would have been hard in recent months for anyone to discover from newspaper reports how GM crops were supposed to benefit or harm consumers or the environment. There are unknown dangers in all areas of human endeavour, but the debate on GM crops has too often appealed to hysteria and vested interests.

The natural/unnatural boundary

- 1.32 Issues involving general welfare, rights and justice, although complex, are unequivocally ethical issues. There are other issues that arouse great passion, which are 'ethical' in a different way. They arouse feelings, less of moral concern than of disgust and revulsion. The idea of genetic manipulation of human beings seems to provoke such reactions. Is it plausible to claim that some kinds of GM plants are also 'unnatural' in the same way?
- 1.33 If the 'unnaturalness' of genetic modification is to be admitted as a reason for disapproving of GM crops, even though health and environmental risks have been eliminated, the process must violate some important boundary. The cloning of Dolly in 1997 set off a wave of unease about the possibility of human cloning. Those who thought that if it worked, it might be a useful extension of

8 Appendix 4 summarises the views expressed by respondents to the Working Party's Consultation.

9 See Appendix 3.

10 Merritt C and Walters S (1999) Personal communication, Monsanto plc (CM) and Monsanto Europe SA (SW).

ordinary human reproduction met with the charge that it would be an extension that simply went too far. Recent debates over GM crops have aroused exactly these sentiments.

- 1.34 Unease has been aroused by the thought of breaches of the 'species barrier', so that 'fish genes' may be put into strawberries, for instance. Many respondents to the Consultation thought that such breaches represent an improper tampering with nature.¹¹ In what way is a gene that is found in a fish and which might be very similar in structure and function to one found in a micro-organism, plant or animal, a 'fish' gene? Some would say that it is no more than a defined stretch of DNA in a fish cell. But that does not seem to help. What lies behind such concerns?
- 1.35 It is unclear how widespread this sentiment is and it is not obvious what its source might be. The BSE epidemic is widely thought to have been caused by feeding meat products to cattle and by most definitions it is 'unnatural' to feed meat to herbivores. To take one example, when the UK food retailer, Iceland Frozen Foods, asked the general public whether they wished to purchase products containing GM ingredients, the response was broadly negative (paragraph 5.15).¹² Since consumers have a right to choose what not to purchase, Iceland had both a commercial and an ethical reason to accede to their wishes. However, Iceland also asked respondents how they viewed GM soya in their food. Interestingly, only a minority said that their main reason for disliking the idea was the feeling that GM foods were 'unnatural', and that this was 'interfering with nature'. The 23% who 'just didn't like the idea' may in fact hold similar views or may be worried about safety.
- 1.36 Indeed, most of the objections to GM foods in the Iceland Frozen Foods' study seemed to be on safety grounds.¹³ Although these consumers were not clear about how GM foods might add to existing risks, they did not wish to run additional risks without receiving any obvious benefit. Again, that raises no special ethical problems. Life cannot be risk-free, but consuming GM soya may not be a matter of substituting one risk for another but rather of possibly adding a new risk. The consumers made a prudent decision to avoid a new unknown risk. The ethical demand fell squarely on the company: to respect their choice, to acknowledge the right of the consumer to say no or to provide an obvious benefit, such as a conspicuous price reduction.
- 1.37 The more complex question concerns the minority of respondents in Iceland's survey who disliked 'unnatural' tampering with food. Some people claim to have no sentiments about nature and the unnatural at all. It is often said that it is only from a theological perspective that it makes sense to treat the naturalness of nature as a moral value. This is plainly not true, although people with religious beliefs may well derive their beliefs about the impermissibility of certain kinds of genetic modification from those beliefs, just as they would derive many of their other moral beliefs from the same source. From a Judaeo-Christian perspective, it is an important truth that God created nature for His own purposes, not merely for our use, and that these purposes are important, indeed that it is mandatory for us to respect nature as part of that creation.
- 1.38 Biblical premises yield positive duties as well as restrictions on what we may do with the world, however. We have been impressed by the emphasis placed by our Consultation respondents from the Church of Scotland, and the Office of the Chief Rabbi, among several others, on the duty laid on humanity to 'cultivate and reorder nature'.¹⁴ God's gift is a grant of sweeping authority to use the raw materials of nature wisely, i.e. the stewardship principle.¹⁵ Indeed, it would represent

11 See Appendix 4.

12 The Gallup Organisation (1998) **Genetically Modified Food: Executive Summary Report (prepared for Iceland)** (unpublished). The research was carried out by the Gallup Organisation between 3 and 9 March 1998. Adults aged 16+ were interviewed randomly by telephone. There was a margin of error of $\pm 3\%$.

13 In this study, of the 72% of respondents who were unlikely or very unlikely to purchase genetically modified food, 23% said they just did not like the idea, 24% said they didn't know enough to buy them and so were unsure, 29% said they didn't know enough about the long term effects and 30% said they did not like the interference with nature. Consumer opinions of GM foods are discussed further in Chapter 5.

14 See Appendix 4, Appendix 5.

15 **Genesis** 1.28.

ingratitude for God's bounty to neglect the materials placed before us. The parable of the talents is at home in both Jewish and Christian thinking, and God's injunction to 'be fruitful and multiply' is a moral injunction.¹⁶ So far is orthodox Judaism, for instance, from restricting scientific inquiry that we were told during the consultation that orthodox Judaism has no problem with GM crops; being kosher is not a question of biochemistry.

- 1.39 The concern that GM crops transgress natural barriers raises a question: how does nature set boundaries and why is their transgression wrong? Anthropologists have explored this question in discussing ideas of pollution. Some critics of GM crops talk of cross-pollination from GM crops as 'pollution'. The concept of pollution has been said by some anthropologists to refer to illicit boundary-crossings, and they have thought that all cultures seem to have some conception of pollution because all cultures have some conception of 'things in the wrong place'. Sometimes the undesirability of pollution has a simple practical explanation. Grit in the oil will wreck the engine. Coal dust in the air will give us black lung. Not all sorts of wrongness have an easy explanation of that kind. Racism is an extreme, though widespread, symptom of the desire for purity. Indeed, many of the yearnings for 'natural purity' have little or no justification. Tribes that kill twins at birth appear to do so out of a sense that human beings are rightly born singletons and that only animals have multiple births, but they seem to take these drastic measures without much thought about exactly what would go wrong if they did not do so. Is it possible that some of the fear of GM crops is of the same sort?
- 1.40 The 'natural/unnatural' distinction is one of which few practising scientists can make much sense. Whatever occurs, whether in a field or a test tube, occurs as the result of natural processes, and can, in principle, be explained in terms of natural science. When human abilities to transform the world are limited, the distinction between nature and artifice seems fairly clear. It has often made better sense to accommodate ourselves to the forces of nature than to fight them. Is a plant acceptably natural or 'organic' if it has been successively bred to have a particular gene complement, but unnatural and not 'organic' if precisely the same gene complement has been arrived at through laboratory processes? We can see no reason in ethics to draw a distinction.

Taboos and moral conservatism

- 1.41 If the point of drawing a line between the natural and the unnatural is to provide a sort of comfort in our dealings with the world, what is the source of that comfort, and how far can we do without it? Two answers to that question may be borrowed, one from Mary Douglas, the other from Martin Heidegger. The anthropologist Mary Douglas is one of the few writers to treat pollution and taboos entirely seriously but from a secular point of view.¹⁷ Her view of taboos is that they are reflections of attachments and cleavages in society. The Jewish prohibition on eating pork was a way of imposing order on a disordered world. Pigs have cloven hooves but do not ruminate; they were viewed as anomalous and therefore potentially dangerous.
- 1.42 This is, of course, speculative but, whatever the cause of taboos, the question then arises as to whether taboos should be given up whenever they are inconvenient. The 'defence' of taboo is complicated because it comes in two different layers which are not easy to separate. Societies with well-entrenched taboos are said to be happy, culturally coherent and religiously harmonious. Attempts to modernise such belief systems may cause more misery than good. This is the defence of moral conservatism in general. It infuriates rationalists and progressives, because it denies that

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Ibid.

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Douglas M (1973) **Natural Symbols**, Barrie and Jenkins, London; her earlier **Purity and Danger** (1966), Routledge, London, is more 'intellectualist' in approach. Both are thought-provoking discussions of dietary and other forms of taboo.

there are overwhelming gains to be made by throwing out what progressives and rationalists regard as superstitions. Conservatives reply that they agree that we pay a price for conserving the moral environment. There are things we could do but do not do, and maybe some of them would have good effects. We need not deny that progress is progress when we decide not to pay the price of it, because that price is too high.

- 1.43 There is a further defence of a morally conservative view of the environment to be considered. It stems from the notoriously difficult philosopher, Heidegger,¹⁸ but its appeal is wide. His idea is that the world possesses a meaning that we can only understand if we approach the world in a receptive mode, in the way the poet, the artist or the traditional peasant does, not in an 'industrial' way. On Heidegger's view, technology is a moral disaster. We become manipulators of things and lose touch with their sense. It does not follow that no use of the natural world is permissible or worthwhile, but many are not. All forms of industrialised agriculture are culturally impoverishing and GM crops would be another step further down an already disastrous road. This may be so, but there seems little justification in banning GM crops on these grounds when the rest of society travels so substantially in the direction Heidegger opposed.
- 1.44 The thought that animates many people when they object to the unnaturalness of one or another way of treating plants is that some relations with the world take the form of harmonious, satisfying, emotionally fulfilling interactions, and others amount to assaults on the world. Certainly, some of the case for organic farming seems to rest on that thought. Someone who holds that view can accept much of the sceptic's reminder that what we call 'nature' is for the most part the result of old technologies. The world bears many traces of what humanity has done to it in the past. The critic will think that some have gone with the grain of nature and some against it.
- 1.45 One view is that there is more to our interaction with the physical world than technical manipulation of it. That view does something to explain why some environmentalists would want an environmental audit to include a dimension that the most scrupulous and well-informed scientific inquest into the physical risks posed by the introduction of GM crops would lack. If new crops change the appearance of the environment, alter the wildlife in the terrain, demand new working habits and so on, they impose a kind of cost not easily captured by the usual cost/benefit analysis. We may doubt whether there is much prospect of living perfectly harmoniously with nature, no matter what form of agriculture we practice.
- 1.46 This report is largely concerned with the ethical implications of actual and potential government policy, and sees government policy as centrally concerned with human welfare, rights and justice. A government that puts in place regulations that enable innovation to prosper and commerce to flourish, encourages useful research, and which enables its citizens to do their duty by the poorest in the world as well as by their immediate neighbours, would be meeting high ethical standards as well as quite unusual standards of competence.
- 1.47 The world within which we are discussing these issues is already a world where human beings have transformed plants, animals and the soil itself. More narrowly, it is a world in which we have recently transformed farming from an occupation dependent on enormous quantities of animal muscle power into a sophisticated industrial activity. As with every other economic activity, this enhancement of productivity has brought many gains and many losses. It is necessary to remember that GM crops are, in the early stages of development in the developed world, a rather marginal addition to the scientific manipulation of nature over the past half-century.
- 1.48 Nor is it reasonable to blame GM crops for a tendency to industrialise agriculture. This is a process which owes its momentum to geopolitical and market forces. The industrialisation of agriculture was

18 Heidegger M (1977) **The Question Concerning Technology**, Harper and Row, New York, is the most notorious of his attacks on industrialised agriculture.

not something that farmers and scientists decided to 'do' for its own sake. Farming is the product of very many economic 'pulls and pushes'. On the one hand, the attractions of urban life and urban employment pulled workers off the land and made labour-saving farming more attractive. On the other, the low farm incomes of the first half of this century pushed workers off the land. War made agricultural self-sufficiency attractive; the availability of cheap food from the Commonwealth made it less so. Since the creation of the European Economic Community (EEC) and eventually the European Union (EU), an elaborate regime of subsidies has done at least as much to dictate what farmers are willing to produce as anything intrinsic to the soils and climates they worked on and in.

- 1.49 Modern food processing and the replacement of old-fashioned grocers and greengrocers with supermarket chains have had a great impact on what is produced. Consumers want and get uniformity and consistency of product, and a high value is placed not only on uniformity but also on storage qualities and those properties that make foodstuffs easy to warehouse and transport. It is these pressures that have accelerated crop monoculture. The dependence of the ultimate producer on both suppliers of seed and agricultural chemicals and on a monopoly purchaser in the shape of the modern supermarket chain does much to explain why the landscape is already one in which weeds have all but disappeared from cereal fields.
- 1.50 There is obviously a need to ensure that agriculture follows a sustainable path, so that the immense productivity gains that have been secured in the post-war period in the developed world are not purchased at the cost of loss of agricultural resources for the future. However, this is not the same as saying that it is possible to return to a previous, often highly romanticised, form of agriculture. Industrial methods, in some form or another, are here to stay. Concern for the poor and dispossessed in, say, Russia or sub-Saharan Africa, mean that the developed world must recognise that there are likely to be difficult choices to be made in the less developed world's search for the same productivity gains in agriculture that the developed world now enjoys.

Conclusions

- 1.51 We think that the general welfare of affected peoples largely determines the ethical acceptability of GM crops. In concrete terms, this means that their potential advantages are a matter of cheaper, more secure and less environmentally damaging food supplies, and their disadvantages, any risk to human health and environmental damage they may pose. GM foods raise issues of the right of consumers to choose what to consume and of the costs these rights may impose on producers and consumers alike. The way that the costs and benefits of agricultural technologies fall on the citizens of well-off and poor societies respectively raises questions of justice, as well as difficult issues of how policy makers can steer technological change so that it does good to those who most need it. We think that the decision about what is unnatural cannot be one for public policy, but that the freedom of choice of consumers must embrace the ability to refuse what they reject as 'unnatural' products. We do not believe GM crops will necessarily increase monoculture and conclude that there are no ethical objections to GM food other than any direct or indirect risk to human health or the environment.