Chapter 7

From principles to policy

Principles: recapitulation

7.1 The introduction of genetic modification (GM) technology needs to be assessed by the principles according to which we would judge any policy or practice, the principles of welfare, rights and justice. So much is a matter of general agreement. However, there are also those who argue from religious or other fundamental beliefs that genetic modification is inherently unnatural and should be forbidden; or as a fall-back position, that they should be protected from having any such modification in their own food and environment. This argument is in conflict with the view that public policy on the use of genetic modification in plants should be guided by the same kind of risk assessment and cost–benefit analyses that are applicable in many other areas of public policy. There are also many intermediate strands of opinion. Some people find some types of genetic modification unobjectionable, but regard others as going 'too far'. This is, however, slippery territory as there do not appear to be any clear dividing lines in the science that would provide a generally acceptable *a priori* boundary to what constitutes going 'too far'. Therefore, those who are prepared to accept any genetic modification at all are effectively driven into the second camp of examining each case or type of case on its merits, using risk assessment and weighing up costs and benefits.

7.2 Modification of existing stock to breed new plant varieties and combinations has been practised successfully for centuries, and techniques have evolved for creating, selecting and promoting successful variations and eliminating unsuccessful ones. Such conventional breeding methods have themselves over time produced large modifications in the genetic inheritance of all cultivated plant varieties. Changes brought about by the new techniques for modifying genes directly, rather than through selective breeding, do not appear to us to be so fundamentally different in kind that they should all be banned outright as a matter of basic principle.

7.3 We also recognise the theoretical potential of the genetic modification of plants to bring substantial benefits to the world. Crops of many kinds could be improved so as to increase yields and quality in various ways. Properly managed increased yields could, in turn, help to lessen food shortages and malnutrition in the poorer parts of the world, as discussed in Chapter 4. There are, however, some risks which need to be guarded against carefully. But, in our view, it would a mistake to allow fear of the possible risks to rule out the potential benefits of a well-managed development and introduction of the new crops.

7.4 This does not, however, mean that we consider the concerns about genetic modification to be misplaced. There may indeed be no fundamental ethical difference between the new GM technologies and all the other ways in which humans have modified plants and their environment over time. But the introduction of GM technologies is clearly one of the most far-reaching technological changes in agriculture of our generation. This change needs careful handling so as to minimise risks and optimise benefits.

7.5 GM techniques have the potential to bring about novel changes to plants and crops more easily and more quickly than conventional breeding methods. This is the source both of potential economic benefits and of concerns. Special features include:

- the novelty and power of the techniques employed;
- the extent of cross-species genetic transfers that are made possible by genetic modification;
- the potential irreversibility of some modifications to the environment and the food-chain;
- the speed with which modifications will become possible, and once possible, may become universal in parts of agricultural practice, if seen to have an economic advantage;
- the completeness of control of agronomic aspects of plant cultivation which GM techniques offer;

- the extensive scientific and economic control of GM technology which major multinational companies appear to be establishing.

7.6 The economic effects also need to be considered. There is concern that some GM plant varieties may be so commercially successful that they rapidly become dominant or universal in the market place, and marginalise unmodified competitors. Although this is unlikely to occur in the United Kingdom (UK) (paragraph 3.10), adoption of GM soybean and cotton varieties in the United States (US) has increased substantially over the past two years. There are fears that introduction of GM material in foods might reduce consumer choice. Yet, this has been the normal way in which food production has developed, and the continuing fall in food prices that development has brought has been of great benefit to the consumer.

7.7 To respond to these concerns, as well as to take advantage of the opportunities that this new technology offers, there must clearly continue to be strong and effective regulatory controls. These controls must ensure that the introduction of GM plants and crops is only allowed after careful risk assessment, and under conditions which allow appropriate levels of monitoring of their impact on health and the environment. There must also be the possibility of appropriate sanctions such as revocation or modification of consent if problems were to emerge. The introduction of GM crops is being led by a group of major multinational companies who have the potential to bring about very significant changes in agricultural practices and in the economic and social structures of agriculture, initially in the developed world. It will be important to try to ensure that the benefits are spread widely, and that the risks are not discounted because of commercial pressures.

7.8 Some of the present level of concern appears to stem from a lack of information about genetic modification and its possible consequences (paragraphs 5.34–37). There needs to be a much greater effort to spread knowledge and understanding about the processes of genetic modification, what it can and cannot achieve, what risks there are and how they are being guarded against. If it is to be handled successfully, it is important that there should be full public knowledge of the developments that are taking place. In addition, the public should so far as possible be consulted.

7.9 It is quite possible that fears will diminish as knowledge spreads and familiarity with these technologies becomes more widespread. The use of GM technologies under proper controls and safeguards would then become more generally acceptable. The Working Party considers it important, however, that this should not be regarded as a foregone conclusion that will eventually be arrived at, even if nothing were to be done. It is likely that, with proper controls, the kinds of GM introductions that are currently being contemplated have very small risks. But the risks are not zero, and the possibility cannot be excluded that new or more remote adverse consequences may only be discovered after a longer time.

7.10 The BSE (bovine spongiform encephalitis) debacle is still very much in everyone's mind. It shows that what initially seemed to be a very small risk can sometimes have devastating consequences in the longer term. It underlines the importance of open and rigorous regulation, free of political control and rigorous implementation of such controls. The BSE case also underlines the importance of listening to the public and the different groups within it, as well as disseminating knowledge. It has been impressed on the public that one cannot always rely on government departments to get the right balance of risk assessment by themselves alone, especially if they are perceived as being too much influenced by producers' interests. This indicates the importance of consulting wider groups about the operation of the regimes controlling the new techniques and practices which may affect everyone's food or environment.

7.11 Even with such strengthening of the regulatory regimes and spread of public understanding and involvement, there are many people who would at present prefer not to have genetic modification affect their own food or environment, either as a consequence of their beliefs or because of their

scepticism about the adequacy of the safeguards put in place against risks. It is not clear what their response would be if they were brought into consultation; some would undoubtedly remain opposed, but some, having listened to the arguments and made a contribution, might then be content for the changes to go ahead.

7.12 We do not think the views of those who strongly oppose the new technology are so widespread or based on such a well-founded risk assessment that they should themselves be a ground for a policy of banning outright the use of genetic modification in plants, or for a moratorium on their further introduction. A ban would stifle innovation, and frustrate those other groups who want to make legitimate use of the improved or cheaper products which genetic modification potentially offers. Given the existence of such fundamental doubts by some about the use of GM plants, and a degree of continuing uncertainty about their possible long-term effects, the protection of diversity and of choice is itself an important objective. We consider that there is a strong case for policies to preserve as much choice as possible. To enable such choices to be exercised effectively, some food products and environments that do not contain GM material would have to be maintained.

7.13 How far is this judgement consistent with acceptance of the precautionary principle? We noted in Chapter 1 that on a stringent definition of the precautionary principle there could be no balancing of the risk of harms with the benefits of innovation, since even a suspicion of possible harm, no matter how ill-founded, would be sufficient to prohibit a new technology. However, we do not hold that the precautionary principle is plausible in this stringent form. Its adoption would preclude almost any innovation, since there can be unknown or hidden risks associated with any technical change. There are no good reasons, deriving from a concern with the general welfare, to apply a more stringent test of acceptability to GM food technology than to any other innovation that carries health risks. Moreover, there is sufficient experience from field trials and commercial planting for us to say that some of the worst fears are exaggerated. In a less stringent sense of taking steps to guard against unlikely or remote harm, we believe that our recommendations are consistent with the precautionary principle.

7.14 The denial of a licence to a GM maize variety carrying an antibiotic resistant marker gene (paragraph 2.48) shows that regulations can be cautious in the face of risks that, though very unlikely, cannot be ruled out entirely. In such cases, the principle of precaution is properly invoked to guard against the low probability that harm will be caused. Similarly our recommendation for post-licence monitoring (paragraph 7.40) is in the spirit of the precautionary principle. Although pre-release tests provide good grounds for thinking that products are safe, the principle of precaution requires us to monitor to ensure that the assumptions on which risk estimates are made are borne out in practice.

The objectives of public policy bearing on the use of GM plants

7.15 Public policies have already been developed around the world to deal with some of these concerns and objectives. The release of GM plants into the environment and of GM material into the human food chain is subject to regulatory regimes, so that products and releases are carefully assessed before consents are given. In the light of the above analysis, the Working Party considers that a broader view of the objectives of public policy in this area now needs to be taken. We suggest a reformulation of the principal objectives of public policy in relation to GM plants along the following lines:

- to continue to ensure that new introductions are subject to rigorous risk assessment procedures designed to identify from the outset, and minimise as far as possible, all risks both to the environment and to food;

- to continue to monitor the impact of the introduction of GM crops so as to ensure that both the individual and the cumulative effects of the introduction of GM plants on food production and on the environment are kept under review and that corrective action can be taken if any problems emerge;
- to maximise consumer choice, so that consumers are informed when GM material is included in food products and can exercise choice accordingly;
- to try to ensure that the introduction of GM crops into the developing world is handled in a way that brings true net benefits to the citizens of those countries and minimises adverse social impacts;
- to maximise the dissemination of reliable information;
- to determine ethical desirability.

7.16 Many groups and sectors of society are concerned with these issues and have a legitimate interest in the outcome. Some groups have doubts about the adequacy of the present regulatory regimes to handle all their concerns, and have varying degrees of mistrust about the ability of the regulatory bodies and those who advise them to deal with all the issues or to bring a wide enough perspective to bear. The Working Party concludes that it is important that a wider range of stakeholders in society should be consulted about the introduction of GM crops and the monitoring of impacts.

7.17 So far, regulatory controls have focused primarily on the assessment of each new GM crop and its proposed use under the legislation covering the first two items above. Environmental impacts are assessed both within the field or area where the plants are used and for potential for any wider spread from the area of planting. Impacts of the use of such plants in the food chain are assessed separately from a food safety perspective. There are also European measures concerning the labelling of food containing GM material.

7.18 We believe that such types of control were quite appropriate in the early stages of GM plant development, when criteria were being established, when every case needed individual attention, and when GM material was still only being used in a few cases in agriculture and in food. The controls are now in danger of giving us the worst of both worlds by slowing down the introduction of potentially beneficial new varieties, thus leaving the commercial advantage to countries, such as the US, which have streamlined procedures; and at the same time failing to adequately safeguard our environment. Moreover, by concentrating on the impact of the individual GM crop introductions, we may not focus properly on the combined impact of several GM crops on the environment and the food chain. There is a risk that the broader picture is not perceived.

7.19 **We therefore recommend consideration of a more integrated policy stance. We suggest that wider policy measures to address the broader consequences of the spread of the use of GM plants in the environment and of GM material in food should be considered. In particular, we recommend consideration of:**

- **a broadly-based environmental audit of the likely cumulative impact of GM crops on agricultural practices and the environment;**
- **measures to ensure appropriate labelling of GM and non-GM food and to encourage food producers to produce lines of non-GM food, and retailers to stock them.**

7.20 Currently, in relation to food supply, there is clearly public demand for food that does not contain GM plants (see paragraphs 5.11–20) and also for organic foods. In the longer term demand may not be strong enough to support significantly higher prices, especially if GM foods become more acceptable to consumers. Maintenance of a viable non-GM sector in the shops and in the supporting

supply chain might therefore eventually require more explicit support from Government through agricultural subsidies and other means if it is not simply to be overwhelmed. Maintaining areas or regions of non-GM planting could be of some help here as a source of non-GM foods for those who wish to avoid them.

7.21 Some people are arguing for a moratorium on any further GM planting or use of GM material in food in the UK or Europe until additional research and monitoring has provided further reassurance that some of the risks are illusory or can be managed safely. We do not consider that such a moratorium would be the right stance. **The Working Party recommends that the next step should be to allow some commercial planting of the most promising GM crops, on a limited and closely monitored basis, designed to identify and contain any adverse environmental and safety effects. At the same time we recommend that steps are taken to ensure that appropriate amounts of non-GM planting continue with a segregated production chain to support the availability of non-GM foods in the shops to satisfy that demand**. In the next section we review the present regulatory regimes in the light of the above objectives and consider other policy instruments which could contribute to achieving the general objectives.

The regulatory regimes

7.22 The release and marketing of GM organisms (GMOs) into the environment is governed in the UK by European Directive 90/220/EEC with various subsequent amendments, Part VI of the Environment Protection Act 1990 and regulations made under that Act. The use of GM material in food is governed by EC Regulation 258/97 on novel foods and novel food ingredients and by UK regulations detailing how the European regulation is to be applied in the UK.[1]

7.23 The central purpose of the directive is to ensure that GMOs should not cause harm to the environment. It provides that such organisms cannot be released into the environment without the approval of a competent authority acting on proper scientific advice. The UK legislation contains more detailed rules and procedures for implementing the general purposes of the European directive. Similarly, the purpose of the novel food regulation is to ensure that GM foods should not present a danger or be nutritionally disadvantageous for the consumer, and should not mislead him or her.

7.24 The essential elements of the UK regime for release of GMOs include:

- definitions of GMOs;
- a brief definition of damage to the environment or harm which is to be avoided;
- a general duty of care;
- requirements for persons proposing to release or market any GMO to conduct comprehensive risk assessments first and report them to the Secretary of State;
- a consent procedure for the Secretary of State to allow release in appropriate circumstances and on appropriate conditions;
- a requirement to report to the Secretary of State the effect of such releases;
- an Advisory Committee to assist the Secretary of State in deciding on such consents;

1 For a more detailed description of the regulatory regimes and comments on them see: House of Lords Select Committee on the European Communities (1999) **EC Regulation of Genetic Modification in Agriculture** (Session 1998–99 2nd Report), The Stationery Office, London.

- requirements for a register and publicity for releases, and for consents and conditions to be made available to the public;
- the normal procedures for inspections, prosecutions and enforcement.

7.25 In the UK there are three competent authorities, the Department of the Environment, Transport and Regions (DETR), the Health and Safety Executive (HSE) and Department of the Environment (DoE) (Northern Ireland), but DETR takes the lead in dealing with applications (see Appendix 2). They are advised in doing this by the Advisory Committee on Releases to the Environment (ACRE). To date 373 trial releases of GMOs have been authorised in the UK, some 12 products have been approved for regular use (primarily processing) with some 15 in the pipeline.

7.26 The Novel Food regulations have similar consent procedures, but are administered by the Ministry of Agriculture, Fisheries and Food (MAFF), and the Department of Health (DH), and a separate advisory body, the Advisory Committee on Novel Foods and Processes (ACNFP). A new GM variety intended to be planted as an agricultural crop for production of human food needs consents under both regimes and arrangements are in place for appropriate consultation between the relevant competent authorities in such cases.

Weaknesses of the present regulatory regime

7.27 The present regulatory regimes have ensured that systematic checks are carried out before any new GM plant releases or any introduction of GM material into food. Having regard to the objectives identified above, the present regimes can, however, be criticised on a number of grounds. The way in which risks and benefits within the regulatory regime are weighed up is not explicit. Neither advisory committee has been charged with the responsibility for monitoring impacts, although consents can be withdrawn if adverse effects are detected. Nor is ACRE required to take account of the cumulative impact of multiple releases of many different GM plants. Although it has recently been asked to consider the environmental impact of changes in agricultural practices that GM plants may bring about, ACRE does not have any responsibility for safeguarding any areas of non-GM farming or environments. The ACNFP has, underpinning its decisions, the very considerable powers of the 1990 Food Safety Act. This Act provides the authority to maintain the safety of all foods that are sold to the public, and through this power, authority over the processing and manufacturing of food. The Food Advisory Committee (FAC), a committee which, like the ACNFP, has consumer representation, carries the responsibility for food labelling, an important way to preserve choice, but labelling decisions are controlled by EU legislation.

7.28 The legislation controlling the release of GMOs has been criticised for not taking such concerns sufficiently into account, either in the legislation or in the administration of the case work. Similar criticisms have been made that GM food products are being introduced into the food chain without giving people sufficient information or choice of alternatives to enable them to choose non-GM food if they wish. There is also the view that there are some aspects of the judgements that need to be made which are not purely scientific, but involve value judgements in which consumers will wish to be involved.

7.29 It is fair to ask how far it may be possible to address these problems by modification of the existing regulatory regimes and how far it may be necessary to consider solutions going wider than the scope of the present regulation. We consider that it should be possible to amend the current regimes to strengthen the risk assessment process in ACRE and to introduce extended monitoring of effects. It might also be possible to widen the acceptability of the processes by involving a more broadly based group of stakeholders in reviewing consents for releases by ACRE. Managing the cumulative or

indirect effects of GM plants on the environment, or ensuring the continued availability of non-GM food in the longer term requires quite different types of measures which we have not explored.

A broader basis for risk assessment

7.30 Risk assessment of the environmental and food health impacts of GM plants is the central core of the regulatory regimes. The current Advisory Committees already ask such questions as: 'What do we know about the host plant and its behaviour in the environment, and in the food chain?' and 'What do we know about the function of the genes that are being inserted, and the organism from which they been derived?' On the environmental side, the questions are: 'Are these genes likely to alter the competitive ability of the crop?', 'Can they be passed to close relatives?', 'Do they involve viruses, and if so, is there a risk of their escape?', 'What is the nature of the environment in which the crop is being grown?' and 'Is the crop being managed in any special way that makes a difference to the risks, for instance by not being allowed to flower?' With regard to food, questions include, 'Could the modifications harm humans in any way, or their resistance to disease?'

Risk assessment for the environment

7.31 Risk assessment involves identifying possible hazards and then ascribing a probability to each of them. For GM crops, this raises two immediate problems: defining the hazard, and ascribing a probability. On the face of it, the dominant environmental hazard is clear: ecological disruption. But what exactly does this mean? Loss of a whole species? Loss of a large number of individuals in a species? Or loss of just a few individuals? The answer will depend on the situation and on the attitudes and values of the individuals involved. Ecosystems are rarely static in any case. If a GM introduction might have an effect on butterflies, and there are rare butterflies in the locality, then just a few individuals might matter. Alternatively, whole populations of beetles or mites might be wiped out before anyone notices. The habitat of rare orchids is likely to be considered more valuable and more vulnerable than the home of several species of grasses. Our notion of 'harm' or 'hazard' may therefore be dependent on the value attached to particular parts of the natural world. The difficulty of finding adequate articulations of harm is demonstrated by the fact that in the Environment Protection Act, it is more or less equated to 'change' leaving more detailed interpretations to be evolved through court cases.[2]

7.32 The probability of gene transfer in open fields is not easy to measure and requires carefully planned experiments, possibly extending over several years. For example, in order to determine just what is the probability that oilseed rape will pass its genes to near relatives, both laboratory and field tests are necessary, and since such transfer is a rare event, quite large areas have to be used. In recent work scientists using a nine-hectare plot and male sterile 'bait' plants placed 400 metres away from the GM crop to detect pollen transfer.[3] They found that, at 400 metres, up to 7% of the seeds were herbicide-tolerant – the trait that was being assessed. It should be stressed that the use of male sterile 'bait' plants will maximise the risk of cross pollination and that with normal, fully fertile, field crops of oilseed rape the incidence of cross pollination is much lower. At 400 metres separation with normal, fully fertile, oilseed rape, extensive Seed Certification data shows that cross pollination is less that 0.1%. So it is possible, although not easy, to measure such probabilities.

7.33 Judgements about the likelihood of an introduced gene persisting in the environment rely on assumptions based on what we know about natural selection. If the introduced gene is for a trait

2 Environment Protection Act 1990, section 107.
3 Coglan A (1999) Gone with the wind, **New Scientist**, No 2182: 25 describes research carried out by Sweet J and Simpson E.

that is assumed to be 'selectively neutral', i.e. confers no competitive advantage, then it is judged that it will either persist at a low level in natural populations or die out. Such assumptions can now be tested in the ways described in the preceding paragraph and paragraph 6.25.

7.34 Critics have argued that the regulatory system takes a relatively narrow interpretation of the risks of GM plants, and is fragmented in its approach, because it relies on narrowly defined scientific considerations and leaves out broader views of risk that take account of a number of different issues together. Risk assessment, it is suggested, would be more robust if it were able to take more of an 'overview', or strategic view, of the technology. Many of the disputes that have taken place in the UK and elsewhere in Europe have been about how much scientific uncertainty in the assessment of risk is acceptable, and what should be done to mitigate that uncertainty. Those who see advantages in the introduction of the technology may be comfortable with a greater degree of uncertainty than those who see little benefit in it.

7.35 Some commentators argue that risks and benefits should be evaluated together. This would imply requiring a statement from an applicant about what benefit it will bring, and would help to make clearer to consumers or to those concerned with the environment why they are being asked to accept possibly novel risks. Many of the GM crops that have so far been developed are intended to enable the crops to be managed in a different way on the farm. Herbicide-tolerant crops may enable weeds to be controlled by reduced amounts of well-known broad-spectrum herbicides. Insect-resistant crops facilitate pest control with less use of pesticides. Such introductions must therefore include an assessment of the effects of these changes in farm management practices from a baseline of present agricultural practices. Until recently these effects were outside the scope of ACRE, and the assessments were to that extent limited. The Government has recently asked ACRE to review these wider impacts, and to consider how to take them into account in considering applications for approval of commercial plantings.

7.36 The idea of weighing up risks and benefits for a technology that has a wide range of applications and implications seems intuitively right to many people. It is extremely difficult to do this comprehensively, since it almost impossible to assess all the future benefits or risks of a new technology at an early stage. Who could have predicted the scope of the World Wide Web at the time of its genesis by a group of theoretical physicists? But as technology develops both benefits and risks become clearer. GM crops will change some agricultural management practices, and any potential indirect impact of these changes on the wider environment and on wild life is one of the particular points of concern, at least in the UK. Therefore, we consider it is desirable that those proposing to introduce new GM crops should spell out those benefits and risks that are assessable for that particular application at the time, so that the advisory and regulatory bodies can take account of this information in making judgements.

7.37 **We recommend accordingly that all applications for GM crops to be approved for commercial planting should be accompanied by a statement of the way in which the planting is expected to be managed in the field, and an analysis and assessment of the wider environmental impact that is anticipated**. The advisory bodies should take these impacts into account in considering their recommendations. **We further recommend that the regulators and the advisory committees should also explore the pros and cons of adopting a more explicit risk/ benefit assessment in advising on cases**. Such assessments are likely to involve judgements that are not purely scientific, and involve issues on which different people may legitimately take different views. The Working Party therefore considers that a more broadly-based group of advisers representing a wider range of interests should form part of the regulatory structure giving advice on the balance to be struck before decisions are taken. From this perspective we regret the lack of consultation about the recent Government proposal to exclude industry and environmental group representatives from membership of ACRE when new appointments to it are made. We return to this point in Chapter 8.

Risk assessment for food safety

7.38 In relation to the safety of GM food, the professional methodology for assessing risks and the probability of harm is better developed. But because food is of such intimate importance to all of us there may be a similar reluctance to accept official reassurance at face value. Here too, a more broadly-based advisory body with a wider range of stakeholders could help to restore public confidence in the decision-making process. But since the Advisory Committees still have to carry out a rigorous science-based evaluation of each case, membership of the Committee will have to balance these requirements.

The case for monitoring

7.39 Environmental concerns of the kinds discussed above have given rise to arguments for post-commercialisation monitoring. At present, the system implies that once consent has been given, the release is safe and needs no further monitoring, or consent should not have been given. But since the initial risk assessment is inevitably based more on basic assumptions and deductive logic than it is on empirical evidence, this is not a wholly satisfactory position. Once releases have been conducted on a large scale, monitoring is needed to check that the original assumptions are borne out in the field.

7.40 The recognition that there are environmental concerns about the introduction of GM crops has led the National Farmers' Union, SCIMAC (paragraph 3.18) and others to develop proposals for post-release monitoring. The EC has stated that it has now adopted the principle of post-release monitoring to 'verify the non-appearance of any harmful effects on human health and the environment' by modifications to EC Directive 90/220 on deliberate releases of GMOs into the environment. Details of how this is to be done have not been decided. **The Working Party strongly endorses these developments and recommends that the Government should plan to make regular post-commercialisation monitoring of the impact of GM releases a general condition for all releases, with inspection of the results by regulators, public access to the monitoring results and provision for modification or revocation of consents if the monitoring results show that this is necessary**. This monitoring should include impacts on biodiversity.

Cumulative and indirect impacts on the environment

7.41 The present regulatory system reviews applications for consent for release of GM crops on a case-by-case basis. It has not been asked, nor is it well suited, to take into account and regulate the cumulative impact of a succession of releases of the same or different GM plants. This potential problem, which of course did not exist until a number of releases had taken place, cannot be solved by modification of the regulatory regime alone. It needs a broader policy approach.

7.42 The 'case-by-case' approach assesses the possible impacts of each application to release a GM crop, whether experimentally or commercially. Each application is unlikely, alone, to have much effect but once the majority of crops are pest resistant and/or herbicide tolerant, and grown on a large scale, there may be cumulative effects. Such effects may be, for example, on the insect populations of the crop itself or indirectly on the environment. The regulatory system in the UK is beginning to consider how to assess such cumulative and indirect effects but its case-by-case structure is not well suited to dealing with such considerations. Are the first two applications to commercialise an in-built

pest resistance all right, but the third not? In how many different types of crop should herbicide tolerance be allowed? Can farmers be stopped from growing GM crops if their area is felt to have too great a concentration of such crops? Should they be required to have 'GM-free' areas? No answers have yet been given to these questions.

7.43 These problems might be tackled both through processes of consents and management – that is, some GM crops might not be allowed at all and others might be subject to strict conditions of use. One of the difficulties in imposing such conditions is that we need to be much clearer what it is we are trying to prevent, that is, what do we mean by environmental harm? This has never been clearly spelt out in regulation and is a value judgement which may be assessed very differently by diverse interest groups and individuals. How much farmland biological diversity is enough? Which species are we most concerned about? Are concerns specific to particular areas? We need some consensus on the answers to these questions before any judgements can be made about the cumulative and indirect effects of GM crops.

7.44 The introduction of GM crops on a large scale could have impacts on the environment either through escapes or gene flow from such crops into the natural environment or other crops, or through changes in agricultural practice which GM crops would permit. Discussion about the environmental impact of GM crops has outlined ways in which such crops may both benefit and harm the environment (Chapter 6). The Working Party welcomes recent announcements that DETR is commissioning further research into the impact of GM crops on wildlife. **The Working Party recommends that the comprehensive and ongoing research into the environmental impact of GM crops should continue to be carried forward, with the specific objectives of obtaining sufficient information from such trials to control the effects from possible interaction of the GM crops with both native plant species and other agricultural crops, including organic crops**.

7.45 In the UK, most people have always attached value to the diversity of our landscape and the natural environment and biodiversity which it supports. There is corresponding concern about the progressive intensification of agriculture, and the move towards cultivation of crops in larger and larger fields. These trends were already well established long before any GM plantings were planned. Some people fear that the introduction of GM plantings on a large scale may take these trends further, and that the consequent changes in agricultural practice may cause further loss or disturbance of habitat, wildlife and biodiversity. Others believe that GM planting could, on the contrary, enable land and farming to be managed in ways which would be better for habitat and biodiversity.

7.46 This raises the broader issue of how we assess and manage the overall effect of GM technology on agriculture. In what direction will GM crops take agriculture? In particular, will the widespread use of GM crops result in a further move towards intensive agriculture or the reverse? Will it lead to a decrease or an increase in the use of pesticides? Will it lead to the less suitable land being taken out of cultivation as yields elsewhere increase, or will this poorer land still be in use? Will water use fall? The multiplicity of possible effects and different GM/chemical scenarios that could result from introduction of the technology, point to the need for long-term careful monitoring as part of an ongoing 'environmental audit' of GM crops.

7.47 This would be consistent with emerging ideas about 'sustainable agriculture' where there is general consensus about the need to minimise inputs, particularly non-renewable ones, and minimise waste and pollution. There are already some data on how GM and conventional crops compare in these respects. There is less consensus as to whether agriculture should be more intensive or more extensive or which would count as being more sustainable. Should we produce crops even more intensively than at present from a smaller amount of land, risking this land being less hospitable for biological diversity but leaving land free on which greater diversity can be encouraged? Or should

we produce the same amount of crop from a larger area of land and allow biological diversity (to farmers this means weeds and pests) to flourish in conjunction with it?

7.48 The Working Party believes that it is first necessary for the Government to establish a broader policy on these wider issues. They cannot be answered by regulators dealing with individual applications for the release of GM plants on a case-by-case basis. But, once established, a broader policy could provide a framework within which individual applications could be considered. Thus, to take but one example, if a general policy were established to limit the use of GM crops in some parts of the country, individual applications could be assessed in the light of that policy. Incentive payments would be necessary to implement such a policy.

7.49 **The Working Party accordingly recommends that the Government should first undertake a broad environmental audit of the general implications of widespread use of GM crops and their impact on farming practices and the rural environment, using current agricultural practice as a base-line**. We suggest that the initial environmental audit study might include the six main elements outlined below.

- Step one is to agree what are the right parameters of environmental impact;
- step two is to agree what kind of information and expertise is needed to evaluate these impacts;
- step three is to agree what levels and kinds of uncertainty are acceptable in relation to any given parameter;
- step four is to agree, in relation to the agreed parameters, what kinds of harm should be judged 'significant';
- step five is to agree a set of conditions for management of the GM crop and surrounding land, that will minimise adverse effects on biological diversity and maximise benefits, and that could be applied in full or in part to any consent to grow a GM crop;
- step six is to agree parameters for post-commercialisation environmental monitoring of GM crops, taking into account all the factors in the original environmental audit.

7.50 The study should also consider the desirability and feasibility of measures that might limit any adverse overall environmental impact of large-scale GM planting and optimise any potential benefits. We suggest that special consideration be given to measures which encourage the maintenance of biodiversity alongside all crops (including GM crops) such as 'set aside' and through the timing of planting and cropping. The voluntary arrangements of this kind which are being developed by SCIMAC are a useful starting point, but would need to be developed further to include explicit measures aimed at encouraging greater biological diversity within GM crops. The study might also consider whether it would be desirable or feasible to seek to exclude GM plantings from environmentally sensitive parts of the country if this seemed a practicable way of protecting the environmental status of such areas. We believe there is already some interest in the farming and environmental communities in investigating action along these lines.

Food and consumer choice

7.51 The Working Party have carefully examined all the evidence that we have been able to assemble about possible risks to food safety from GM food. We have not been able to find any evidence of harm. We are satisfied that all products currently on the market have been rigorously screened by the regulatory authorities, that they continue to be monitored, and that no evidence of harm has been detected. We have concluded that all the GM food as yet on the market in this country is safe

for consumption. There is nevertheless widespread public concern about GM food safety. Some people do not want to eat food containing or derived from GM material either because they do not trust the regulatory process or because they dislike or object to food produced in this way or because they feel that they do not have enough information about the processes or consequences of genetic modification. We believe that four conclusions flow from this.

7.52 First, continuing vigilance is necessary for all GM food just as for other novel foods. Some of the recommendations we have made above for strengthening or broadening the regulatory machinery in respect of environmental impacts could be relevant to the machinery for assessing novel foods. **In particular we recommend consideration of:**

- **the possible value of a more explicit risk/benefit analysis in assessing GM foods being applied by regulatory bodies;**
- **a more extensive monitoring programme over a longer time of any effects of the introduction of GM foods;**
- **the involvement of a broader base of stakeholders in the consideration of GM cases, and the monitoring of impact.**

7.53 Secondly, nobody should be obliged to eat what they do not wish to. So it is important to ensure that a genuine choice of non-GM foods remains available, and that GM foods are properly labelled so that choice can be exercised. Thirdly, more efforts should be made to disseminate accurate and accessible information about GM food products and what is being done to test and monitor their safety. Fourthly, if effective choices are to be made it will also be necessary for food producers to segregate food from GM and non-GM sources and to label it appropriately. Segregation and labelling bristle with practical difficulties, as the current discussions on the European labelling directive reveal. For example, there needs to be an agreed threshold whereby GM presence below the threshold would not require the ingredient to be labelled. The threshold for the presence of non-organic materials in organic food is 5%. The detectable limit for genetic modification is currently 0.1%. It has been suggested that a practical threshold for GM foods might be 2%.[4] However, an unlabelled product containing a large amount of an ingredient below the threshold might actually contain more GM material than a labelled product containing only a little of the GM ingredient.[5]

7.54 The case for continuing the quest for a viable labelling system is overwhelming given the level of public interest and demand. In response to consumer pressure, several of the major retailers as well as the organic sector are themselves taking steps to identify the sources of all their food products, and to indicate which contain GM materials and which are GM free. Other retailers are going further and removing GM ingredients from their products. This market-driven solution is one way of securing an appropriate degree of choice for the public. But in our view, however, it will continue to need to be reinforced by statutory regulations requiring GM content to be specified in labels. **We recommend that labelling of GM products should only be statutorily required for foods and products that contain identifiable GM materials (DNA and proteins) above an agreed threshold**. We recognise that some people want to avoid GM foods because of how they are grown, not just because of what they contain. However, where products derived from GM sources are chemically indistinguishable from non-GM products we do not think it necessary nor practical to make universal labelling a statutory requirement (paragraphs 2.35–2.37).

4 House of Lords Select Committee on the European Communities, **EC Regulation of Genetic Modification in Agriculture**.
5 Ibid. p. 41–42.