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Genetically Modified Food

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Church and Society Commission, Conference of European Churches

Bioethics Working Group

GENETICALLY MODIFIED FOOD

This report seeks to evaluate the ethical and social issues raised by genetically modified crops and food, against the integrated perspectives of a Christian understanding. European churches have been addressing these since the early 1990's, and we seek to reflect areas of general consensus and also points where we differ. In the current controversies over GM issues, the churches have also played an important role in providing neutral space to bring different sides together in dialogue, and in helping clarify the value positions of stakeholders.

The report was produced by the working group on Bioethics and Biotechnology of the Church and Society Commission of the Conference of European Churches. The Conference is the regional ecumenical organisation for the whole of Europe comprising 126 churches of all traditions (Protestant, Orthodox, Anglican, Old Catholic) except for the Roman Catholic Church.

In January 2002, the Executive Committee of the Church and Society Commission commended this document to the member churches of CEC for study, reflection and, where appropriate, action.

Its working group on Bioethics and Biotechnology consists of specialists in areas such as medicine, genetics, bio-chemistry, theology, ethics and law.

Executive Summary

(Final)

1. The GM crisis revealed a series of ethical issues which challenge the technology of genetic modification and its consequences. We have examined these in turn.
2. We consider various arguments by which some within our churches would oppose genetically modified food in principle. Whilst we do not find sufficient grounds for intrinsic opposition to GM, neither could we endorse an uncritical acceptance of all aspects. We propose a theology of creation that seeks to balance permissible human intervention through biotechnology with due restraint arising from care for our human neighbours and for the rest of God's created order.
3. In this context, we would not agree that GM is intrinsically unacceptable because it is more "unnatural" than selective breeding. While species integrity is important, it does not seem to us to represent an absolute limit. Some concerns about GM food seem to apply also to selective breeding. Rather than draw a line between the two we would set ethical limits within both.
4. The uncertainties involved in switching of genes without reference to normal constraints of species, however, calls for caution. Exaggerated technological optimism and commercial pressures to develop GM as fast as possible should therefore both be resisted.
5. On the other hand, the safety conditions required for GM crops should be proportional to what can be fairly expected of human actions within God's creation, where absolute safety is illusive.
6. The uncertainties merit a generally precautionary approach towards environmental and health risks, but a complete rejection of all GM crops on risk grounds would not seem justified. GM applications should only be done if they confer significant human or ecological benefits. It is prudent to avoid applications that are more likely to spread their genes or threaten biodiversity.
7. In response to the excesses of industrial agriculture, organic methods offer many advantages, but should not be seen as the exclusive solution. Priority should be given by the EC to a wide range of sustainable methods of agricultural production. These may include some GM applications.
8. An especially great concern among the churches over GM crops is the injustice in the power structures which control the technology, and the failure to make it publicly accountable. The open disregard for public values by both multi-national companies and the EC in allowing unlabelled and unsegregated GM food products on to the European market should never happen again.
9. Despite the high moral claims made for sweeping human and ecological benefits, GM crop technology has been primarily directed to corporate commercial benefits in food production. This economic mind-set was one of the main underlying causes of the GM crisis, yet it is perpetuated in the

- draft EC strategic vision for biotechnology. The primary justification for GM is presented in economic terms above any public or environmental benefits. This view must be reversed.
10. Only the food biotechnology which finds common cause with EC citizens will produce economic benefits. For GM crops to have any future in the EC will depend on the extent to which the public is given an effective say in policy development and true choices in labelling.
 11. An essential precondition for public acceptance is a mandatory labelling of all GM derived foodstuffs by process, not merely by measurable content. We welcome the recent EC proposals for this and for segregation and traceability. We recognise the difficulty in implementation and risks of abuse, but these are far less important considerations than the present unacceptable labelling situation which gives no effective choice either way. Ethically, any burden of cost should properly fall on the GM innovator, not on the producer of existing, accepted non-GM food.
 12. GM crops may offer more potential benefits for the developing world than for the EC, but we share the concern of many Christians at the power of multi-national corporations in impressing their technologies on vulnerable farmers in the South. GM developments should only be applied if they are genuinely the optimum solution, and can be done within the context of providing sustainable livelihoods for their own farmers, in enabling the poor to feed themselves.
 13. If the EC's claims for GM as a tool to help 'feed the world' are to be taken seriously, they require a radical reorientation of its priorities of GM research, to redirect skills towards addressing real hunger problems in the developing world. As the vitamin A rice example shows, promising developments will only be realised if substantial additional funding is provided by the public sector, and if necessary technology is made available free of patent and other restrictions.
 14. The question of food for the world is part of a much bigger issue of global justice, which underlines the need for the EC to play a stronger role in the global arena to establish clear and fair rules aimed to enable the poor to feed themselves.

Bioethics and Biotechnology Working Group

Church and Society Commission

Conference of European Churches

19 December 2001

**Church and Society Commission, Conference of European Churches
Bioethics Working Group**

GENETICALLY MODIFIED FOOD

Main Report

1. GM Food as the Symbol of Underlying Value Questions

Genetically modified crops and food form one of the most hotly disputed issues in the biosciences. Because the way we grow our food affects everyone, this is where genetic engineering literally comes "down to earth". Although promoted by the EC as a driver of economic growth and technical progress in food production, it has been a significant point of contention in certain countries, notably in Germany, Austria and Denmark. It became a more general concern across Europe especially following the consumer and supermarket revolt against GM food which erupted in the UK early in 1999. Doubts about novel food technologies have now spread to many other countries across the globe. In North America, however, GM food issues have had much less public impact, and the European rejection of GM food has been criticised as hysteria whipped up by environmental NGOs, or presented, bizarrely, as a trade barrier on behalf of the European bioindustry. Misinformation and exaggeration have indeed affected all sides of the debate - in the media, in NGO campaigning, and in the advocacy by proponents of GM technology. Confusion has played a role in some of the public responses, but it would be wrong to discount them as a result. These concerns reveal a set of important underlying ethical questions, which GM food has brought to the surface, and for which it has become a symbol.

Genetic modification raises basic theological and philosophical questions about our human relationship to nature, the strengths and limits of human creativity, and the ways we may, or may not, intervene and innovate technologically. These express an unease felt by many, that scientific enterprise in biology has been too much driven by scientific or commercial motives without proper accountability to civic society. The urgency to promote GM technology, in order not to lose out to North America has come into conflict with questions about risk and safety of novel genetic applications. GM food have come to symbolise deep concerns

about the role of multi-national corporations in the control and direction of biotechnology and of food production in general. In some countries it has been an expression of a wider distrust in both national and EU regulation and decision making, which reveals a serious systemic failure in democratic accountability. This climate of unease has provided environmental groups an unprecedented opportunity to draw attention to their alternative agenda, and has given new impetus to the wider debate between industrial, organic and other forms of agriculture. In some countries this has become ideological in character, with rival claims being made for the moral high ground - for example that GM crops will "feed the world" on the one hand, or that organic methods are more "healthy and sustainable" on the other. Behind these claims lie fundamental questions about how indeed we should grow food for ourselves, and especially how the poor of the world can better be enabled to feed themselves, while at the same time conserving the environment with a rapidly expanding world population. Each of these questions represents a way of framing the issue of GM food. Many have a corresponding group of advocates, who maintain that their particular perspective is the right way to understand GM food issues. How does one seek to evaluate their often competing claims? In a market model, the outcome is left to the group which shouts loudest or exploits the political system best, for good or ill, but fails to find points of integration. We offer insights derived from a Christian perspective, in which we seek to do justice to the diversity of issues, but also stand back to assess them against a wider and more integrated view of the world.

The churches have been active in this debate for many years, but are not formally aligned with either bioindustry, farming or green lobbies. Indeed, Christians are to be found in all the sectors and groups involved in GM issues. In several countries, the churches have indeed provided an arena to bring both sides together, providing space for dialogue, standing back to highlight and clarify the value positions of the various stakeholders, and seeking how their different positions interrelate. Church ethical institutes and working groups in

Germany, Scotland and the Netherlands have since the early 1990's engaged with both proponents and critics of genetic engineering. They have produced several reports, formal statements, books and consultations, which have proved important in their national contexts. These studies show a complex picture of theological, ethical, environmental, economic and social issues, and varying positions and emphases are given. They also illustrate that differing views exist about genetic modification within and among the churches and traditions which we represent. The predecessor of the Conference of European Churches (EECCS) has examined wider issues of environmental sustainability and its relationship to economic and social issues.

Drawing on these and other insights, this working group report representing churches in over forty European countries, examines the main issues as follows :

- Human relationships with nature and switching genes between species,
- Risks from GMF crops and foods,
- The ideological and practical debate about sustainable and industrial forms of agriculture,
- Questions of justice, power and control in the direction of biotechnology and failure of public accountability,
- GM food and developing countries.

It seeks to evaluate them relative to the wider context of Christian belief, and to present an integrated view.

2. How far should humans intervene in God's creation?

Genetic engineering has been variously described in different countries as "playing God", or "tampering with nature", or as a Promethian endeavour. Such terms are rather loosely used but signify one of two ideas. It is either a forbidden intervention in nature which steps beyond the bounds of what humans are permitted to do, or we do not possess the necessary wisdom, insight or foresight for so fundamental a change in the way God has made things. In a post-modern climate where absolutes are called into question, there is an irony about citing God, but GM does indeed pose questions that are theological. What is perceived

to be "natural" and "unnatural"? What is the place and what are the limits of human intervention? To address such questions, we consider first what is the proper relationship between human beings and the rest of nature, which we find in the stories of human origins in the opening chapters of the Bible.

i. A Theology of Creation

These affirm how God is the ultimate creator of everything that exists, an orderly universe governed by God-given laws. When we refer to nature as God's "creation", this by no means excludes an evolutionary model of origins. Indeed the biblical picture of what God has caused to come into being is something ordered and yet dynamic, full of potential to change and to be changed. Human beings are unique in this order, simultaneously part of it and above it. On the one hand, we are formed from the "dust of the earth", the same chemical elements, and we share a common genetic nature with animals and plants. At the same time we are separate from the rest of creation by being made "in the image of God". This implies both a unique capacity of relationship with God and also a unique relationship over the rest of nature.

The book of Genesis in the Bible paints two contrasting pictures of this role. The first chapter casts the role in strong terms, "subdue the earth and fill it" and of ruling over the other creatures. The second chapter uses softer imagery, likening nature to a garden which human beings are to "work and to care for". These represent two facets of human relationship to nature which are held in dynamic tension. In each new situation, an appropriate position has to be worked out. Different attitudes to genetic modification may reflect which side one naturally inclines towards.

If either side is emphasised to the exclusion of the other, imbalance results. Two secular trends illustrate this. One is the anthropocentric model of human progress which has overstressed our *intervention* to overcome and tame nature. It typically dismisses any notion of sacredness in nature and is restrained by economic or safety factors but not by ethical limits. It has lacked an adequate

moral framework to direct technology as stronger forces are harnessed on ever larger scales. On the other side is the stress on human *conservation* of nature from further exploitation. This has many different expressions. Most often it emphasises the need to redress the balance against what is seen as too much intervention, and to recover the value of approaches modelled from nature. In its more radical forms it results in "deep green" ecocentric models, in which we should intervene only minimally in nature. These may draw from pantheistic and other roots which treat nature as a quasi-divine with which we should not tamper for fear of the consequences.

A Christian model sees the validity of both intervention and conservation, but would avoid either a crude conquering of nature or a superstitious fear of altering it. It seeks to find a proper balance, for which the now familiar notion of stewardship of nature, derived from models in Old and New Testaments, is often cited. This asserts that nature belongs to God. It is not sacred and untouchable, nor is it merely a resource for human exploitation. It is given by God to be used responsibly and within limits, because we are answerable to God, as stewards to an owner. Stewardship sets intervention which is constrained by the context of relationships - with God, with fellow humans and the rest of creation. Thus we are also companions with the natural world, not mere users, and have a solidarity with it. This leads to affirmations of the need also to recognise the intrinsic value of God's creation, to respect the plants or animals we use, to seek to uphold the biodiversity written into the evolving creation, and to refrain from interventions which would seriously compromise these values.

Food also has a special importance for Christians. It is the product of human labour in God's creation, and of human ingenuity in its cultivation, husbandry, processing and preparation. It reminds us of God's generous provision for human needs when Christians give thanks before they eat. The meal table provides a place for meeting and fellowship in community. Supremely Christians see its liturgical significance in the Eucharist, in which bread and wine are seen to

become or to represent (according to our different traditions) the body and blood of Christ, given to redeem all humanity and all creation.

In our previous EECCS reports on sustainable development, we revealed how biblical principles relate practically to both people and the environment, raising questions of justice, power and equity. For example, an owner must not merely extract the maximum economic yield from the land but allow some for the poor and disadvantaged. The Sabbath is a reminder of the need to find a due balance in agriculture between the exploitation of resources and allowing rest for the land and its creatures. The notion of Jubilee recognises the reality of the driving force and momentum which is generated by economic and technical power, and the need for restraint in the light of the rights and benefits of those who stand to lose out.

Implicit in this analysis is a realism about human finiteness and fallibility. The Bible stresses that human beings are both limited in knowledge and morally and spiritually flawed. We are not all knowing in our science nor all wise in its application. The web of human relationships is spoiled at every level by pride and self-centredness. Technology has often become a tool for dominance of nature and human alike. On the one hand, human technological endeavour reflects God's creativity as an expression of our humanity, so that we may even say that there can be a right sense of "playing God", by acting in nature as God's representatives. But we can also play God falsely, by intervening in wrong ways, and misusing our skills to exploit each other and despoil creation.

Reflection on these insights leads to principles like foresight, justice, restraint on greed and domination, concern for the poor and oppressed, love for neighbour, and respect for all that God has created in the natural world. These act as guides which both set goals for technology, and also reveal moral reasons for which humans might refrain from pursuing some things which they could do technically, but ought not to ethically. We now apply these biblical and theological insights to the case of genetic modification. Do they provide good case to allow it, or would we conclude that it would step over ethical limits in God's creation?

ii. Is it Unethical to Mix Genes across Species?

Genetic science has brought humankind to the point where it can identify specific traits in plants, microbes, animals and humans, correlate them with a particular region of the DNA molecule, and then rearrange them to human designs, regardless of the normal constraints inherent in animal and plant breeding. Implicitly, it assumes an ethical judgement that it is valid to reduce the physical environment to genetic processes which may be manipulated into new combinations at will. It is seen as another step in the wider scientific enterprise, overcoming the restrictions of species. The validity of this assumption is the first issue we examine, whether mixing genes across species which do not normally mate is inherently right or wrong.

Two arguments of principle are made in opposition. One is that each living creature belongs to its own species, and to mix genes from elsewhere disrupts the *integrity* of that species, regardless of whether the modification is beneficial or deleterious. The second is more general - that switching genes across widely divergent species violates the inherent wisdom by which God has *ordered* the creation into different lines and patterns of genetic development, and the relationships among them. The separation of animals and plants into kinds in Genesis 1 is seen as a seminal pattern which transgenesis reverses, by mixing them up again. If God's pattern is differentiation, then to mix up what God has separated is not imitating God. Some also point for support to Old Testament texts which forbid sowing different kinds of seed in a field and mating cattle with other species. Others are dubious about drawing basic principles for all creation from ritual and dietary laws, arguing that these primarily reflect Israel's separation from its surrounding nations. For Christians all foods are declared clean to eat because Jesus Christ has superseded the ritual requirements of ancient Israel. The question is not ritually uncleanness but whether GM food is a violation of creation itself.

These basic arguments for integrity and order are substantial but they are not universally held by Christians. There is a lively debate. Some ask why these should *necessarily* represent a prohibition, given that there are many legitimate human interventions in God's creation. For example, since biblical times humans have mined, crushed and dissolved rocks, to extract metals and create alloys like bronze, which never existed in nature. These are quite violent reshapings to make new chemical combinations, but they are not usually seen as wrong in themselves. Thus we need to consider specifically what is different about creating new genetic combinations in plants. These are living organisms and not inorganic matter, but it is the self-replicating nature of genetic changes which makes perhaps the most significant difference. While this certainly points to a need for caution, it is by no means self evident to all Christians that it would imply prohibiting genetic engineering on principle. While species distinctions in God's creation are important, they may not necessarily constitute unchangeable rules in a creation that is constantly evolving. They also point to the fact that micro-organisms exchange genes readily, that small amounts gene flow can sometimes occur amongst different plant species and that inter-species crosses occur in nature. It is only possible to splice a gene into a crop plant from another class of creature like a bacterium because the same genetic processes are common across all species.

A key question is what constitutes the "integrity" of an organism. If it is the genetic blueprint of the animal, then switching genes could be seen as a violation of integrity. On a more holistic concept of the integrity of the organism, it is not so clear that to add a gene from another species is *by definition* a violation. Is a sheep no longer a proper sheep if a human gene has been added? Stress might instead be put on whether the genetic modification had a detrimental effect on some fundamental *characteristic* of the organism.

iii. Is Selective Breeding More Natural?

Another inherent objection to genetic modification is that it is unnatural or even "violent" compared with the more natural process of selective breeding, in which genetic changes are done slowly in the context of a single species, and give opportunity for deleterious traits to be selected out again. On closer examination, however, this distinction is harder to argue consistently. Most cereal crops we use today have had very different traits introduced into them than were originally present in the species. Some of these were done by chemical or irradiation methods of gene mutation which are also strong interventions. Logically, serious questions would also have to be asked about some widely used methods of selective breeding. Some would indeed object to these methods, but this would shift the objection to industrial methods in agriculture, rather than "GM" as such. Damaging changes can also occur by conventional breeding - sometimes minor sometimes more serious. Selecting intensively for certain production traits in poultry have caused serious animal welfare problems. Beneficial changes can also be performed with both methods. For example, a mutation in wheat which produces smaller stalks has been selectively bred into various other cereal species. The relevant gene has now been isolated. The question then arises whether it would be wrong to introduce this gene directly into cereals by genetic modification, on the basis that a "GM" method was used to do so?

Other common objections to genetic modification are that it tends to narrow the gene pool by standardising crops, or because it is irreversible. These may be true, but both concerns also apply to selective breeding. These are not intrinsic objections but one of risk and degree. It appears quite difficult to argue a simple case that because selective breeding is acceptable because it is more "natural", but that GM is unnatural and therefore unacceptable. Some indeed see a rigid moral line being passed. We ask if it is not so much a case of drawing an intrinsic moral line of acceptability *between* selective breeding and genetic engineering, but to draw lines *within* both technologies.

3. Is Genetic Engineering Too Risky?

The uncertain and unforeseen aspects of genetic modification is the second focus of concern. Many who might not consider genetic engineering to be inherently wrong, would question it on the grounds of risk. Molecular genetic modification is done more readily, rapidly, and without reference to the relationships amongst varieties and species which generally set a constraint on selective breeding. The uncertain consequences of doing this have aroused much concern, questioning if humanity sufficiently understands what it is doing in bringing about such changes. Do humans have the skills, insight and foresight needed to manipulate such deep matters as the genetic structure of creation? Would our lack of understanding lead to the creation of new problems for health or the environment? A second general doubt is that this type of genetic modification is too fast, because it makes sudden interventions in a process of development which has evolved slowly over countless millennia. To some extent the same may be said about selective breeding, so this is perhaps a matter of degree.

The impression often given by scientists of moving a single gene from one organism into another with laser precision does not reflect some of the uncertainties involved. The location and manner of gene insertion is not usually a carefully targetted process, but rather random. Specificity is achieved only by selecting out all variations except for the desired one. Moving genes across species removes the context in which the genetic sequence was located in the original organism to a different one in the new organism. This might lead to unexpected interactions, and cause adverse effects. There is much debate about how significant this uncertainty might be. It is also present in selective breeding, where mixing two complete genomes may lead to unexpected effects, as for example when two varieties of celery were crossed by conventional means and produced a new and unexpected allergen. The fact that it has proved possible to achieve viable transgenic traits indicates that genetic modification does not inevitably cause a major functional disruption of the organism.

An essential part of both breeding and GM methods is the lengthy process of evaluation and testing of the new variety or the new gene construct. Any unacceptable combinations have to be eliminated first, before a trait is found which is stable, which does not seem to have deleterious physiological effects on the plant, and which does not make toxic or allergenic products. The question is, however, raised of "unknown unknowns". Could genetic modification give some unexpected harmful effect happen for which no test had been considered? The creation of unusual genetic combinations makes it easy to conceive that something could go wrong, causing a problem either for human health or the environment. In recognition of this, genetically modified crops often have stronger regulations than a similar crop produced by selective breeding.

In relation to health, various risks have been postulated including unusual allergenic proteins or the effect of antibiotic marker genes on bacteria in the human digestive system. To date there are no substantiated case of a significant health problem specifically caused by genetic modification, after several years of being eaten on a very large scale in North America. One can never rule out any effect but one problem is that it would be difficult to prove, with so many other variables with food in the population. The same is true of food risks from any form of agriculture, not just GM.

In general, environmental risks are thought to be more important. Two environmental concerns are that the gene construct might become transferred to another plant species, or that a modification aimed at eliminating certain crop pests might also damage other organisms in the local ecology. It is scarcely possible to know all possible effects of switching genes on complex ecological systems in crop agriculture, for example the effects on biodiversity of eliminating weed and insect competition for the desired crop. Some genes may transfer to unintended plant varieties by cross pollination, and, once transferred, one cannot simply call back the genes. Again, many of these problems are not specific to genetic modification, however. Herbicide resistant crops have also been developed by selective breeding, and can also pose similar gene flow questions,

but do not have to pass such rigorous tests. Biodiversity loss is a trend over many years of intensive agriculture and external pollution. The question is whether GM applications present additional problems, and whether they make existing problems worse or better.

On such questions, the environmental picture is complex. The data we have are limited and relatively short term. Risks vary greatly amongst different species, GM applications and environments. Under the right conditions, some improvements in biodiversity and chemical use have been reported for GM varieties compared with non-GM. Indeed some environmental agencies foresee certain GM applications which might improve the environment. Under the wrong conditions, however, GM crops can clearly make matters worse. Several present applications raise doubts because of their indiscriminacy. Gene flow from GM to non-GM crops and adverse effects on non-pest species are of ongoing concern. It is beyond the scope of this report and our expertise to evaluate each risk and draw conclusions, which would inevitably be provisional. We focus instead on the ethical questions which underlie the different responses made to these risks and the issue of precaution.

The general question underlying these various concerns is how far human actions should be constrained by their lack of ability to foresee all the results of their actions. It has been well known for many years that people's perception of technical risks does not necessarily correlate with a scientific assessment. Indeed sometimes it may differ very greatly. Perception depends on a great many complex factors. Non-experts may construct a safety question around very different and wider criteria from the reductionist methods on which scientific risk assessment depends. Both approaches are important in how a society evaluates risk. It is also important to be aware of cultural trends and media influence. In a culture of more technological optimism of the 1950's and 60's it was perhaps easy to underestimate unintended effects; in a current climate of scepticism in Europe we may exaggerate their significance. It is possible to err both ways. For

some Christians this is cause enough not to risk any genetic modification, for others it points to a need to proceed only with due precaution.

It is generally accepted that the uncertainties and novelty of GM technology merit a precautionary approach to the potential risks, but views are profoundly divided about what the "precautionary principle" means. The main scientific interpretation is that precautionary action should be taken only if there are grounds to believe a risk of serious consequences is probable but insufficient data exist to assess it.

Typically the point of view from scientific and economic progress would proceed with GM crops unless rigorous tests revealed unacceptable levels of risk. In the case of uncertainty, as with the effects of gene flow for example, precaution is applied only if there are reasonable indications that a serious problem really could exist. The risk has to be more than a remote theoretical hypothesis.

Environmentalists, however, argue that the precautionary principle should apply wherever there is an unknown risk. They define it in terms of a reversal of the burden of proof. A new technology should not generally go ahead unless the innovator has established its safety beyond reasonable doubt. The onus is on the innovator to demonstrate safety not the objector to show harm. The problem is that it is impossible to prove there is no risk; the absence of any evidence of harm is not proof of absence of harm. Should we refrain in the face of uncertainty, or should we proceed with caution? The question then becomes "What would constitute evidence sufficient to proceed with genetic modification in food and crops, if anything?"

The different sides are driven by underlying values which the church should not endorse uncritically. On the one side we speak against the technical pride which assumes "if anything goes wrong, we can fix it". On the other hand, there are problems with an ethic of risk aversion which says "if there is the least doubt, don't do it". God created a world in which risk is part of everyday experience. Because God made humans creative but not omniscient, there is uncertainty and risk in all human endeavour. Indeed the heart of the Christian belief involves living daily by the "risk" of our faith. To reject GM food unless absolute safety can

be guaranteed is not compatible with a Christian view of reality, because God did not create our world with such guarantees. To search for physical security by protecting ourselves from all external risks can even become an idol to replace trust in God. Our fallible human imagination is equally capable of ignoring risks which it ought to have addressed or of exaggerating minor risks out of all proportion.

Both conservation and intervention have a part in responsible Christian stewardship. An outright rejection of GM crops on risk grounds would be justified only if the ecological dangers were overwhelmingly great. This is a matter of judgement, with much rhetoric on both sides. Talk of the precision of genetic engineering and the use of expressions like "genetic pollution" both carry implicit value judgements. The former was discussed above. The latter presupposes that a gene in a place where it does not normally occur is by nature a harmful pollutant, regardless of whether it causes any ecological damage. In practice, unintended gene transfer is only a problem if the species to which it transferred was genetically stable and highly likely to cause serious ecological disruption. This is a relatively young science, however, and such eventualities cannot be ruled out. We are concerned that commercial pressures within the EU to develop GM as fast as possible have propelled genetic engineering more rapidly than was wise, have dismissed as irrational the valid concerns of ordinary people, and have underplayed some of the risks. On the other hand, some sections of the environmental movement have failed to sufficient judgement over what are and are not significant risks. Finally, there will still be uncertainty, no matter how much data are obtained.

4. What Constitutes Sustainable Agriculture?

Genetic modification in crops has brought to the public awareness a long standing debate about what is the best way to practice agriculture in a sustainable and healthy manner, and especially about the claims of organic or "biological" agriculture. This was why many in the environmental movement

rejected bioindustry claims that agronomic traits in GM crops would lead to less use of pesticides and herbicides on the land. GM was seen as a dubious technical fix which merely continued the industrial mind set which had been applied wrongly to agriculture for fifty years, and would produce ever more dependence on technological intervention. The push for GM diverted attention and investment away from the deeper issues about how we should produce our food.

In some countries there has been a tendency to present this issue as one of organic agriculture versus GM, but in reality the picture is more complex. There are many alternatives to high input, high output intensive agriculture which seek more environmentally sustainable methods, reliance more on natural systems than chemical inputs, and so on. Organic agriculture takes a more ideological view, on certain philosophical assumptions about nature, health and food. After some doubt the organic movement chose to exclude genetic modification as incompatible with its approach and ideals. There remain some who argue that appropriate GM crop traits could be used to advantage within an organic system, however. GM has become a rallying point in a campaign to ban all such crops because they constitute a threat to the purity and integrity of organic methods and thus the livelihoods of organic farmers. This could of course be argued both ways.

Against a climate of public opinion disturbed by the excesses to which industrial agriculture has sometimes led us, there is an obvious appeal of organic food. Whatever its merits pragmatically, the claim tends to be predicated on the assumption that what is natural is *inherently* better, healthier and less risky. Thus, the Soil Association argues that the insertion of foreign genetic material "disrupts natural genetic order and function." This is more problematical for a Christian framework which would see nature as an uncertain guide for ethical judgement. In a spoiled universe, nature is not pristine and immaculate, but morally ambiguous.

At present few data exist to make a fair comparison on health or environmental grounds, but the churches would advocate a move to the various more environmentally sustainable methods of agriculture. Whether these would include GM methods is a matter of difference among us. We will differ about where the balance of stewardship lies with regard to the risks from GM crops. For some, a permanent ban on all agricultural GM crop applications in the field is the only proper response. For others, a general moratorium would represent a compromise which gives more time to weigh up the effects and investigate options. For others again, such a moratorium is too indiscriminate if it is applied to all species. This is because it would fail to distinguish low risk applications from high, and is too imprecise about what is required to make a decision at the end of the due time.

The perspective on risk in a well fed European country may be quite different from that a developing country, where for example environmental risks may seem small by comparison with food insecurity. Some argue that since we do not know if, for example, 100% organic agriculture could meet global food needs, we should apply the precautionary principle and develop other methods, including GM. If GM crops are to be used, however, it would be prudent to avoid trial crops or applications that are more likely to spread their genes or threaten biodiversity, and to focus instead on applications likely to confer significant human or ecological benefits. The problem is that such needs have not been the main driving forces of GM technology to date.

5. Control, Power and Accountability

Perhaps the strongest and most sustainable criticism of GM crops is that inevitably, the way the technology operates tends to put increasing power into the hands of multi-national life sciences and chemical companies. In the area of food production this has already had many deeply disturbing results. The supremacy of the economic vision for GM has caused much damage by overriding wider public concerns, as we have seen. In the draft EC Strategic

vision for biotechnology, however, the lessons do not seem to have been learned. The first reason given for biotechnology is that it is a means of economic growth in the EC, and only secondarily is it desirable because it might be good for the citizens. This seems to us to reverse the true priorities. Only the biotechnology which finds common cause with its citizens will produce economic benefits. The priority is thus to listen to the people, more than to the companies. Many potential benefits of GM foods and crops were claimed by science, bioindustry and governments, as justification to go ahead and to invest large sums in research and development. These include improving the environment by reducing chemical inputs in agriculture, growing productive crops on marginal land, improving the nutritional composition of food, and producing novel materials like vaccines and non-polluting biofuels. In reality, however, the primary focus has been on agronomic traits which enhance large scale industrial crop production. The major beneficiaries are the few seed and agrichemicals companies. The benefits to farmers and the environment to date are somewhat ambiguous. Consumers have seen few tangible benefits. This and the lack of choice were major causes of the 1999 UK consumer revolt. A GM tomato paste had been on sale since 1996, and was clearly labelled following consumer advice. Consumers turned against GM food after the EC allowed US GM soya and maize on to the market without segregation or labelling. They are both commodity crops, used primarily as ingredients in many common processed foods. Once people realised they had no choice about "eating GM", the rejection was predictable and soon became Europe-wide.

This reveals deeply disturbing questions about who controls genetic developments and for whose ends. It revealed arrogance, unaccountability and undue power on the part of multi-national companies. The failure to offer to segregate modified and unmodified products was an unacceptably aggressive attitude, seeking to impose corporate strategies on the public of other nations. This took place with the express approval of the EC and governments, more

anxious to avoid a trade war than to take account of European public values. Together industry and government forced their agendas on to an unwilling public. The criterion of "substantial equivalence" was taken beyond its uses as a scientific tool for making comparisons to become an ideological weapon to dismiss any ethical or environmental concerns. If GM food had no detectable difference from non-GM, then it was "irrational" or "emotional" to see any moral taint to the food. This was a power claim of scientific rationality of an elite over the value-based rationality of ordinary people. It proved a gross misjudgement as well as a failure of democracy. The people's logic - why should we accept unfamiliar GM food, which profits foreign countries, offers us no benefit and may pose unknown risks - was entirely reasonable. This represents a third sense of "playing God" - the image of the tower of Babel, where human pride, greed and the will to power seek an inappropriate mastery by technology.

6. Labelling and Consumer Choice

Food and genetics are both areas of consumer sensitivity. For most people GM food is still novel and unfamiliar, and the BSE crisis and other food scares in Europe has bred a climate of distrust in the regulatory system. Scientific intervention in food was associated with potential danger. In such a context, the introduction of unsegregated GM commodity crops was most unwise, because these are all pervasive in the food system. The problems were exacerbated by the EC regulations on labelling. The need to label only if the food contains foreign DNA or proteins has been a serious injustice for many years. This fails to take into account that many people objected, ethically or environmentally, simply if genetic modification had been involved in the process. To be told if the product exceeded the current limit of detection in a genetic test was not the question, but rather "how was it made?"

We therefore welcome the new EC proposals in which labelling by process, segregation and traceability is required, and we urge that no relaxation be made on these points. The criterion for labelling should be that the food may contain

GM not that it is GM free. There is an anomaly over foods like GM hard cheese, but this is best addressed by recognising that this is not apparently an issue for consumers and focusing on the issues which are problematical. We recognise the many practical difficulties in enforcing segregation for commodity crops - further illustrating the point that this was the wrong place to start. The possibility of abuse if the systems set up for detection or traceability prove insufficient should not, however, become "the tail which wags the dog". We would judge that whatever the practical problems, the present situation of not offering consumers a real choice about GM, either pro- or anti-, is a far worse abuse for the Commission to avoid. The burden of segregation costs should not be placed on the non-GM producer, because this is normal food, as far as many consumers are concerned and so does not have to prove itself. If there is additional cost it should be borne by the GM food, which would be justified if it delivered beneficial traits for the consumer. If the only beneficiary is the seed company, and the consumer probably was not be willing to pay extra for it, then that is just the way of the market.

Some Christians regard the corporate political-economic context as an overwhelming case against GM food, too flawed by injustice and abuse to be morally acceptable, whatever the technical benefits might be. Others, however, ask if a redemptive aspect to GM food technology may still be found. There are some important questions to ask. Are there viable alternatives to corporate dominance of its direction and control? Such questions lead some churches, which express caution about GM risks and revulsion at injustices in how GM has been applied, to declare nonetheless that we should not "throw the baby out with the bathwater." In particular, many ask if the real benefits are not so much for us in the rich west as for the developing world.

7. Does GM have a Role for Feeding the Poor?

In the mid-1990's governments, industry and scientists claimed the moral high ground with the assertion that GM food was needed to "feed the world". With

global population likely to increase by half by 2050, they argued that GM would provide a second "green revolution" to improve the growth rate and yield from crops, and feed more people from the available land. This argument presents the problem as if it was primarily a technical one of ensuring enough gross food production. This view has been very widely challenged. At present, the causes of hunger are less about supply than the complex mixture of social, political, structural and economic factors, which result in a bias in favour of the rich. GM technology already shows the same bias as the problem it is intended to solve. In 1998, a Church of Scotland study examined this claim, but found disturbingly little evidence for effort directed to the needs of those who are hungry. A study of the Protestant Church in Germany (EKD) in 2000 confirmed this picture. To date the overwhelming emphasis has been on food for western supermarkets. Some improvement is evident, but three aspects stand in the way of a substantial change of emphasis - the technical difficulty of some intended applications, the relatively small research investment geared to developing countries, and the holding of key patents by corporate interests. For instance, it is difficult technically to develop genetically modified plants to grow on marginal soils prone to drought, high mineral or acid conditions. Most such research is targeted at the west, challenging the claim that the benefits of GM will simply trickle down to the poor.

Enabling the poor to grow food to provide for themselves is surely the key rather than creating greater dependency on rich countries. It is up to each country how to achieve this. Some are developing indigenous GM technologies geared to their own needs, others are importing northern products, others again see GM as a technology to avoid. Some western studies have been highly critical of GM in the third world context. According to the Christian Aid and the German church study, GM food would widen the gap between rich and poor countries, for whom high tech solutions are inappropriate, even supposing they could afford them. It would put poor farmers at the mercy of ruthless seed and chemical companies oblivious to ethical or regional sensitivities. It would narrow the abundant

indigenous biodiversity. These studies discussed alternative strategies in agriculture to obtain food safety for the global population, proposing organic solutions based on indigenous understanding of the local ecology.

There is substance in some of these concerns, but many Christians think the whole technology should not be rejected based on a worst case scenario. In some cases GM technology would indeed be inappropriate, but we should not cut off the possibility that it could bring real benefits to the poor. An Indian NGO representative has pointed to several areas where selective breeding has reached its limits, and where there was potential for GM to provide solutions, but only on strict conditions. The application should indeed be focused on the poor. Local farmers should have their livelihoods promoted and not threatened. It must avoid control by multi-national companies, about whose motives and practices there is very great local aversion.

Vitamin-A rice is a recent example. Vitamin A deficiency is a major factor in malnutrition and disease in many countries, but genes have been added to rice which produces a precursor to vitamin A and may also enhance iron uptake. If partnerships can be established to engineer this into local varieties, it might provide one means to help address a serious problem, with potentially less local costs than other methods like vitamin supplements. 'Golden rice' has become a political football, however. Some US biotechnology companies proclaimed it in an expensive advertising campaign as proving their point about the benefits GM, long before it has been proven. Many technical problems remain to be solved before the rice could be used in the field. This has also been criticised as manipulative 'PR', since the companies have had little to do with its development. On the other side, some environmental and development NGO's have criticised golden rice as a technical fix which will not work in practice and which deflects attention from addressing the social and economic root causes of malnutrition. They claim that the immediate problems can be addressed better by "sustainable" farming practices than high tech GM, or by better diets or supplying vitamin supplements. This can also be criticised. Changed farm practices and

supplements already exist but have not solved the problem. The complex underlying causes of poverty and malnutrition leading to vitamin A deficiency will not suddenly go away. This seems to be a case for applying the right solution to the right situation. Where indigenous agriculture can be helped to meet the nutritional balance, GM vitamin A rice would not be necessary. Where it cannot do so for the time being, this GM applications might in some cases make a life saving difference. It would seem unacceptable to oppose its application simply because it involves GM.

If claims to feed the world are to be taken seriously, they will require a radical reorientation of the priorities of the world's GM research, to redirect skills towards addressing real hunger problems in the developing world. This will only happen if substantial funding is provided by the public sector, and if the private sector is prepared to release key patents and inventions in open collaborative ventures in which they do not retain critical control.

8. Conclusions

We have sought to assess key value questions raised by GM crops and food, and to assess these against an integrated Christian perspective, looking at the main issues and arguments. Christians differ over these issues. While we have not found a convincing reason of principle against the idea of the genetic modification of food, there are many in the churches who would be opposed. We urge that instead of a polarisation into organic and GM approaches, steps be taken to draw from the benefits of a variety of alternative and conventional forms of agriculture. The risks of GM crops should be taken seriously, but food should not become subject to demands for absolute safety. This is not how we deal with other risks, and it is out of step with the reality of the universe which God has created and sustains. The uncertainties merit a generally precautionary approach towards environmental and health risks but a complete rejection of all GM crops on risk grounds would not seem justified. GM applications should only be done if

they confer significant human or ecological benefits. It is prudent to avoid applications that are more likely to spread their genes or threaten biodiversity. Our major contention, however, whatever its pros and cons, the way GM food has been implemented has been a cause of injustice and remarkable folly. Commercial and political imperatives have dominated governments and the EC, against public values, democratic participation and choice. For an aspect of human life of such immediate concern and sensitivity as food, there is an urgent need to redress the balance. We welcome the proposed EC regulations which would require mandatory labelling and segregation of all genetically modified foodstuffs, not merely by content but the means of production. Nothing less is acceptable in order to allow true choice of consumers. Notwithstanding the difficulties of implementation, this is a simple matter of justice.

Another essential requirement is to give the public a real say over present and future directions in food production generally. Public trust has been lost so badly that it remains to be seen whether, like irradiated food, GM will always carry too great a stigma of risk and of commercial and political power remote from the people. It lies in the hands of those who carry that power to make radical changes, to involve their people, which might make the difference.

The environmental advantages of reducing chemical inputs to the land, the possibility of growing crops in hitherto marginal regions of the Third World, and the improvements in nutritional qualities of food are excellent goals, and would be welcomed by many people. The problem is that the present applications have not delivered on these moral claims. The nature of the power structures which govern the development of GM food cast serious doubts on whether many of these will ever be delivered to a substantial degree. If genetically modified organisms were going to make the difference between people going hungry or having enough to eat, then there would be a clear ethical case for the risks to ecological balance or human health to be worth taking. This case is possible, but it is a very long way from being proven. It is also important to minimise the political risk that the development of GM food may widen the gap between the

poor and the rich in the world, and create a greater dependency of the poor on rich countries. This risk must be taken seriously. It underlines the need for the EC to play a stronger role in the global arena to establish clear and fair rules aimed to enable the poor to feed themselves.

Bioethics and Biotechnology Working Group

Church and Society Commission

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