

The response reproduced below was submitted further to an invitation to comment on the draft Discussion Paper by the Nuffield Council on Bioethics: *The use of genetically modified crops in developing countries*, during June to August 2003. The views expressed are solely those of the respondent(s) and not those of the Council.

**Dr Ulrich E Loening: Fellow and member of Board of Directors, Centre for Human Ecology, Edinburgh, UK**

I found this Report to be most valuable, especially in raising most of the major issues. Yet there are several worrying implicit attitudes that underlie the whole:

- The superiority of the richer nations; this leads to asymmetrical argument in many places and lack of comment about local culture, as well as underlying criticism of NGO's
- That GM technology is assumed to be valuable for agriculture at this stage of development
- A relative neglect of the relevant wider sciences; for example, there is an equal case to make for spreading newer understanding within ecology.

These worries led me to conclude from the arguments of the report, that many of the arguments against applying GM techniques to farming are stronger than those for. This is in spite of fair language and the implied stance taken in the report.

Following the earlier Nuffield report of 1999, I wrote a paper "The Science missing from the GM debate". This is available on the Centre for Human Ecology website at the Centre for Human Ecology website: [www.che.co.uk](http://www.che.co.uk)

My detailed comments are below, roughly in order by paragraph number. If all this is too long and detailed, please take especial note of comments on paragraph 38.

Box 1. The description seems to neglect the deep cultural differences between "the West" (mainly Europe and USA) and the various diverse cultures of "developing countries". Is the Nuffield Report to be taken as the views from "the West" and are there any other comparable studies made by others in poorer countries? This question has to be addressed to set a basis for this report, because of the long and continuing history of European and then USA dominance in science, attitudes and economic assumptions. Without judging the positive or negative values of these, the dominance of GM agriculture, invented in "the West" and powerfully promoted commercially, internationally, needs to be addressed symmetrically. There is no explicit mention of the values of local, 'indigenous' knowledge anywhere in the Report (other than in ref. 132).

Invitation to comment. "...that there was a moral imperative for making GM crops readily and economically available to those in developing countries who wanted them."

Of course, but this assumes that the matter is in the industrialized nations' control and implies that GM is somehow different from other applications of science.

Main Findings: "However, much of the current research on GM crops serves the interest of large-scale farmers in developed countries. There is also continuing concentration in the number of companies that control between them the provision of seeds, agrochemicals and important research technology."

- This is stated as though preventable, but it may be an inevitable consequence of GM technology, involving reduced diversity and simplification of the agro industry.

Impact of European regulations: "If a national policy that allows the responsible use of GM crops for domestic use is adopted, it might well be perceived as promoting

unsafe foods, and, in addition, could result in the loss of EU export markets.

**Developing countries may be reluctant to explore the possible benefits of using GM crops in particular instances because of the implications of EU policies.”**

• Again an indication that alternative improvements for agriculture tend to be neglected by promotion of GM crops.

Paras 8, 9 and 10. The potential risks should include the longer term problems of the increased intensification and reduced diversity of agriculture that would follow the development of GM. Indeed, alternative agricultural developments are likely to be short-circuited by concentration on GM. The need for questioning on a ‘symmetrical’ basis must be stressed – as is indicated in the executive summary: “*Highly restrictive interpretations invoke the fallacy of thinking that the option of ‘doing nothing’ is itself without risk.*” Doing nothing in respect of GM may promote doing many other valuable things.

Thus the points made in para 11 need to be strengthened. See also comment under para 38.

Box 3, The Green Revolution. This is an admirably short box, but see below, with para 24.

Para 13: in spite of the matters discussed in Box 1, the issues raised here do not include one of the major problems: that of international pressures that often operate directly against any form of self-reliance. The international control of coffee prices provides a clear example. Globalisation of the food supply has meant that developing countries now have little choice in how to provide for themselves, or compete on world markets if they wish to. This matter has been analysed and discussed extensively, e.g., by Susan George, by the World Development Movement and by numerous NGOs in developing countries. The newer efforts towards “Fair Trade” are minor ways to overcome the problem. Whatever the other features of the growing global food economy, good or bad, it remains the case that countries are not in a position to take their own decisions. The concentration of provision of GM seed and chemicals in so few companies indeed itself exacerbates this situation.

Lack of recognition of this is so fundamental that it would not be an exaggeration to say that the Nuffield Council report has failed to face the issue of who chooses, why and how, and therefore risks losing much of its value.

14, b. does just indicate awareness of the above problem; but it follows that since the international organizations do have globally over-riding effects, some “*broad, often sweeping, generalizations*” might be justified!

15. The question posed here is vital: ‘*How does the use of a GM crop compare to other alternatives?*’ As part of an answer, which should be incorporated somewhere in the Report, is that alternatives are necessarily less spectacular, not generally patentable, and not of much interest to the international corporations who sell GM materials.

Box 3 and Para 24 “*Where, as in the Green Revolution, small-scale agriculture has been a major*

*beneficiary, it has been associated with unprecedented reduction of poverty.”* This omits two important down-sides to the Green Revolution: the need for increased fertilizer has the physiological consequence of increased susceptibility to pests and diseases, requiring increased use of pesticides. These agronomical matters mean that the new varieties are not readily available to poorer farmers. Every Indian colleague I have met has confirmed the serious limitation of Green Revolution farming to the wealthier farmers.

This point raises the question of whether the new varieties could flourish under other farming practices, with increased re-cycling of nutrients etc as in organic farming. It appears to me that unfortunately, NGO's reject green revolution crops for the above reasons, and there is ignorance about organic crop nutrition among the instigators and promoters of green revolution crops (one senior former researcher had no concept that organic farmers fed their crops!). There is therefore a case for further exploration of the options. While this is not within the remit of the present Report, the existing wording in effect excludes such alternatives, and counters the good point made in para 15.

Para 25, Yes strongly agreed, however the following in

Para 27. *“Moreover, the quality of soil is in many places poor or actually decreasing, due to erosion, salination, loss of micronutrients, and accumulation of heavy metals”*

would not be ameliorated by resort to *“genetic modification could be used to express traits that allow crops to grow on less fertile, or saline soil.”*

Again, the options of alternatives (para 15) that do more to improve the soil, seems to be relatively neglected.

Para 28. It should be noted that these potential benefits are preceded by *“could”*; this contrasts with known benefits of many existing if often innovative farming practices. The need for public support however is clear and should be stressed further.

Para 30. Yes, but this paragraph might be linked to the ones on the green revolution.

Para 33. *“Marker-aided selection”* Indeed this can be a useful tool. But it has nothing whatever to do with the last sentence of this paragraph: *“Genetic modification is the latest technology which breeders hope to employ in their quest for ever-improved crops for commercial or subsistence agriculture..”* Similarly, none of para 32 is concerned with DNA engineering. What therefore is being said in these paras?

Para 38. This is a dangerously contorted argument because of the use of the popular term *“genetic modification.”* In any scientifically sound paper, the term GM covers numerous possible genetic changes, most of which have existed since life started, and man-induced ones since domestication started. The question of *“naturalness”* or otherwise of GM crops cannot be addressed without definition of terms and so this paragraph is misleading. There are indeed uncertain boundaries between breeding and using forceful techniques such as radiation-induced mutation. With extreme selection it is even possible to change the meiotic and mitotic process, as seen in pesticide-resistant mosquitoes which developed extra-chromosomal amplified copies of the genes that code for the relevant enzyme. But the assembly and transfer of stretches of DNA is a wholly different process.

The sentence: *“in this context, genetic modification can be seen as a new means to achieve the same end”* can be correct only if a) the term GM remains undefined and broad, and b) *“the same end”* refers only to the known direct and singular activity of the gene in question and not to its interactions at the genomic, metabolic or developmental levels. Since genes, non-coding sequences, enzymes and cell development all involve pleiotropic and complex systems, the narrow view of single genes is deficient in biological understanding. If on the other hand the subject under discussion is properly defined as “DNA engineering” or some such term, this misunderstanding is corrected. However, this then draws a sharp line between conventional breeding even in the extreme versions indicated involving other biotechnologies, and the subject matter of this report, “genetic modification”, which must then be classed as “unnatural.”

Further, while genetic modification in its wide sense is natural, including radiation-induced mutation at a low rate, the speciation of life has involved the evolution of countless mechanisms that inhibit or prevent the direct transfer and re-integration of DNA. It is especially ironic that bacterial restriction enzymes involved in degrading foreign DNA provide the tools used for DNA engineering!

A relatively uninformed public cannot be expected to appreciate the above distinctions. Indeed it is misrepresentation, trading on ignorance, to use such undefined terms in discussing or promoting “GM” crops.

There is a deeper ethical issue with which the Nuffield Council might be concerned, which is whether success in overcoming a natural constraint is to be hailed as a valuable human achievement or yet another step in increasing the intensity and reducing the diversity of agriculture and of biodiversity. The Royal Society’s meeting of February 11<sup>th</sup> this year raised this question, both in the President’s introduction and in another contribution, but it was not followed up. It would seem to be the over-riding major issue for the future of agriculture and food security. It is as much a scientific as an ethical issue, whether “progress” is represented by the successes of genetic engineering or of the increasing understanding of ecological complexity.

In this context, the availability of alternative forms of highly intensive agriculture in which diversity and resilience are built in, become important in answer to the question posed in para 15.

Para 43. *“Thus, horizontal gene transfer, as this phenomenon is called, appears in fact to be a natural phenomenon.”* I accept this sentence as correct in spite of my comments on para 38; yet horizontal gene transfer remains exceedingly rare.

The question of “naturalness” can be simplified and clarified: as stated, all organisms affect their environments; that is indeed the nature of every ecosystem. It is “natural” for the human species to do likewise. It is when a technology becomes over-riding and reaches excesses far beyond the confines of a stretched ecosystem, that one can say it is “unnatural” and possibly more risky than can be justified. A simple example is the use of antibiotics. Evolved since probably billions of years, it took less than 50 years of over-use to create dangerous levels of resistant bacteria. Although the classic antibiotics are natural

substances, it is because of their excess use that the various organic standards do not permit their regular use. Thus it is not necessarily a material or even a process that might be considered unnatural – it is the degree of excess over ecosystems that becomes the vital criterion. Gene transfer intrinsically short-circuits natural processes, and is thus well placed to become ecologically excessive.

The example of the Bt toxin gene makes this clear – in place of widespread pesticide use, the use of “pest resistant Bt GM crops” in fact spreads this toxin throughout several crops. The result has to be resistance of the pest to Bt. The same mistake will have been made as with antibiotics, despite their undoubted usefulness.

Maybe such comments help to clarify the rather soft arguments in para 44 to 47. The stress on balancing the benefits with the risks in para 47 is sensible but insufficient because these are at different levels – the benefits are simple technical improvements while the risks are complex unknowns. They cannot be directly balanced against each other.

Para 65 on Bt resistance: the widespread use of a single (or closely related) poison engineered into several species is an example, not so different from the over-use of antibiotics, which is expected to lead to resistance. Natural plant poisons which protect are diverse. Use of GM Bt toxins therefore seems to be a poor longer term policy.

73 see my comments to Box 3 and Para 24 above.

paras 94-96 on organic farming:

there is again an implied asymmetry since organic farming is an approach and not a single technology.

Para 119. Taking precautionary principle on a case by case basis – surely a wise approach - still omits the risks of developing agriculture in ecologically inappropriate directions. As with many environmental impact analyses, each may be safe but the combined effects may be damaging.

Para 121. This is sensible and I agree – but in practice has not been applied and especially thorough R&D into all manner of improved farming has been relatively unsupported. Jules Pretty has documented many such

Para 122 “Substantial equivalence“ suffers from scientific inexactitude – unless restricted to narrow considerations, including health effects. In most ways, from the seed throughout growing, the whole point of the GM crop is that it is not equivalent. And the final consumer may be concerned about how a crop is grown.

Para 127 These conclusions are valid with one important omission: the thrust for GM may already have inhibited parallel R&D into other improvements such as covered by the terms “organic” and “regenerative” farming. As stated elsewhere in the Report, these are of little interest to commercial organizations. The symmetrical ethical imperative to further explore these alternatives therefore must be stressed. At present in the UK for example, it is much easier to obtain R&D funding for genetic engineering projects than

for organic improvements (e.g., the functions of mycorrhiza in promoting plant and animal health).

See comments below for all of the following from para 131 to 176:

Paras 131 132 133, the *Technical Barriers to Trade Agreement* (TBT) and the *Sanitary and Phytosanitary Agreement* (SPS).

Para 159: "The transfer of experience from advisory and regulatory bodies in developed countries to

the developing world, with suitable adaptation to its socio-political as well as physical environments, is urgently needed (see paragraphs 4.49-4.62 of our 1999 Report).

163 and 164: The transfer of experience from advisory and regulatory bodies in developed countries to

the developing world, with suitable adaptation to its socio-political as well as physical environments, is urgently needed (see paragraphs 4.49-4.62 of our 1999 Report).

...decides for themselves to grow GM crops, but in doing so affects the ability of others in the country to export crops of the same kind to external markets that have a restrictive policy towards GM crops."

For all of the above, one can ask: what of the reverse situation? What are the ethical arguments for NOT giving countries the options to reject GM in favour, say of organic farming. Again there is asymmetry: Alternative farming regimes have no impacts on others' options, while GM does.

Para 152: whether a product itself contains GM material or not, like oils, is irrelevant, The EU is correct in including all materials, because the major issue remains the techniques of the husbandry involved.

164. This does not tackle the further, fourth, worry: given global governance through the WTO and other institutions described, is there any remaining space, even with emphasis on subsidiarity, for a region or country to choose NOT to grow GM crops? What is the remaining room for maneuver? There seems to be an asymmetry between the positive and negative decisions. See also comments on Para 11.

Para 176 and 177: "The freedom of choice of farmers in developing countries is restricted severely by the agricultural policy of the EU. This policy has been developed primarily to protect European..."

"There is thus a considerable imbalance between the hypothetical benefits afforded by the EU policy for its own citizens, and the probable and substantial benefits that could be afforded to developing countries, if these were not impeded as a result of the EU regulations.."

- All of the above and **Sections 6** are thorough. Yet they underline the impossibility for developing countries to make their own choices, either for or against GM crops or to develop other farming options. There is a larger aspect also: one could envisage (an unlikely scenario) that the EU, by inhibiting GM progress as described and slowly encouraging organic farming, might in the longer term end up more independent of the dominant few corporations, have greater security of supply of (fresh) food, revitalize the rural economy and thus in many senses be richer. This is the symmetrically opposite view to that stated and implied by this Report. Since historically it is European policies that have led global developments, and since developing countries still have somewhat more flourishing rural economies (out of necessity) with a valuable inheritance of cultural

attitudes to food and land, they might be in a good situation to again follow and wealthy European initiative.

Para 196 “There may, for example, be no environmental or other advantages from *Bt* maize for small-scale farmers in Mexico, if they already practice integrated pest management, hand weeding, and dense mixed cropping of maize, squash and beans.

- This sort of comparison is valuable. It also highlights a further argument: that because of the many environmental and social problems in many developing countries, organic farming practices offer many opportunities for substantial increases in yields, which are not available to already high yielding Europe. The potential values of GM cropping may be lower in comparison. Miguel Altieri’s example may be one example, ref 211. There are many others and I have myself seen similar situations in Cameroon. But opportunity to follow these may be restricted by international regulation and pressures discussed in Sections 5 and 6.