

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.

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Congratulations on a lengthy process, I fully realize the amount of work a project of this magnitude requires. My comments are listed below by the paragraph number to which they relate. Please do not be offended by any of my more critical comments, I am aware of how close one gets to a work in progress.

15. The question is asked "How does the use of a GM crop compare to other alternatives?" Although this question is asked, it is not really explored in the report. I think it is a worthy and important question, but if you are not going to address it should it not be removed?

21. There is no discussion of the impacts of HIV/Aids the greatest impact of the working age population in Africa.

25. Concerning lowering trade barriers: This point has been repeatedly made at the WTO, but is it not an assumption? It may seem self evident, but do we have proof. Small holders do not export unless they are organized into cooperatives, which is rare. It is far more likely that corporations, such as Dole, will through large scale farming facilitate exportation, but at the same time may reduce many people's equitable access to land and food security.

28. Good point, bad assumption. Gordon Conway is a very loaded source to cite. To talk of the possibilities of GM technology is not discussing what is currently possible. To point out that GM technology will allow crops to be grown in saline soils does not solve the problem of saline soils; eventually the saline resistant crops will reach the same limitation of their conventional counterparts. What is needed is a discussion of how to solve agricultural problems, such as salinization, not how to mask them.

Good to point out the limitations of research funding etc.

32. This brief history of plant breeding is misleading it ignores the separation of Biometricians and Mendelians. Secondly, there is no discussion of the drawbacks hybridization has faced- limiting genetic diversity and crop failure due to susceptibility.

38. Repeatedly it is discussed of the speed and efficacy of modern GM and modern plant breeding techniques this may be true when compared with plant breeding along genetic lines. However, if it is to be compared to continuous breeding programs that develop to the evolving environment it is no contest. When quality seeds are adapted to their environment they are develop resistance naturally to most pests and the climatic stresses they face in that environment. As a result, seed improvement is a continuum within that environment. For a further discussion of these ideas see R. Robinson, *Return to Resistance: Breeding Crops to Reduce Pesticide Dependence*, agAccess, Davis, CA, 1996. This would coincide with the alternatives to GM technology, which you fail to discuss.

42. Yes, “man has been influencing natural order for a long time,” and sometimes with devastating consequences: Irish potatoe famine, southern corn blight etc.

43. Quoting Hume in this context is curious, since you disqualify the argument two sentences later by justifying *horizontal gene transfer* as natural. No, there are many viruses in the natural world that we could do without and many of them have become virulent through means of *horizontal gene transfer*. I don't think it is effective to use Hume in this context due to our current understanding of complexity and ecological science. To suggest that humans can decide what is useful and what is not is pure hubris. Because *horizontal gene transfer* is a natural process, do we need to exasperate it by using resistant marker genes, Golden rice for instance was created without such genes. When you don't describe any of the hazards associated with resistant marker genes and antibiotic resistance in combination with horizontal gene transfer I fear you might be viewed as being selective with your facts.

48. GM technology is only inexpensive if it is donated to the poor. Teaching poor farmers to compost human waste and all non edible plant material is cheap and would go a long way to improve soil quality, which is the most significant limiting factor in agriculture.

51. Argentina needs to be included with US and Canada.

59. I'm afraid I think this point needs to be rewritten. 1) you need to tell the reader that Bt is a living spray- biological control. To lump Bt as just one of many compounds does not stress the uniqueness of Bt.

2) only certain insects are affected by Bt (order Lepidoptera).

3) spraying has benefits and drawbacks, you need to discuss both.

60. Wrong. Bt is toxic in spray and GM form to Lepidoptera insects of which Monarch butterfly larvae are a part. You could describe though that it is more selective and less toxic than conventional chemical insecticides.

“To preserve this useful.....” How does GM technology preserve Bt? Bt has been used effectively for a large part of a century. Resistance to Bt can be effectively managed in the live spray form, where as in the GM plant variety it is very hypothetical whether it can be managed or not. See Liu et al, Nature, v.400, p519 (1999).

65. “critics” this is loading the argument. Resistance to Bt is inevitable, corporations designed the refuge strategies to slow it down before the crops were marketed. See Science—Palumbi 293 (5536): 1786 for discussion on evolution and resistance.

You note the successful refuge regulation in Australia, but fail to discuss the problems in America and Canada. I have first hand experience in this area because all the maize grown around our farm (we no longer grow maize) is Bt, farmers plant the rim of the field to non-Bt maize, they don't empty the seed drill to create a refuge, they simply pour the Bt seed on top of the seed left over. This

is a very good example of the disparity between science and reality. See Lee Clark, *Mission Improbable*. For a description of regulation strategies that are impossible to implement.

You can't rely on random mating between susceptible and resistant insects (see Liu et al, *Nature* 400, 519 (1999)).

Last sentence: remained resistant for longer than anticipated..... actually it was predicted that Bt crops would be effective for 9 yrs or longer (Horsh, D. @ AAAS meeting May, 1998).

I think this paragraph is going to get you into trouble, it is filled with modified sentences and it is not really reflective of the scientific rhetoric on the topic.

121. It would be wrong to suggest that GM crops have not had some unforeseen consequences. 1) Bt cotton in Mississippi Delta, 1996. 2) RR canola in Saskatchewan.

122. The rationale of comparing the safety of GM crops to conventional agricultural practices is always disturbing since it has already been determined that the current dependence on agricultural chemicals is an unsafe practice. Is this not an argument bioethicists should see through?

Overall you have done a remarkable and exhaustive job. I was disappointed not see a discussion on self determination. Should we care if people may not be able to avoid eating GM food? So often this discussion revolves around food safety issues; however we allow certain groups to make other judgments not based upon safety. For instance, should Israel face trade sanctions for blocking unlabeled sales of pork? Is this not the same as the EU trying to block unlabeled GM food?

Secondly, I would also like to have seen a discussion on legal reparation for people in developing countries against foreign companies. For instance, when the cotton bolls fell off prematurely in the US farmers were able to get compensation, would the same be true of crop failures in other countries?

One last point that concerned me was the use of language. Many times you use sophisticated philosophical arguments combined with modified sentences and lots of adverbs. From a philosophical point of view your utilitarian arguments make a lot of rational sense, but from a more sociological perspective your language frequently appears biased, politicians may buy it, but I think many academics would criticize your work for it.