



ADVISORY COMMITTEE ON RELEASES TO THE ENVIRONMENT

Response to the report of the House of Commons Environmental Audit Committee: GM Foods – Evaluating the Farm Scale Trials

Date: 3rd June 2004

A. Introduction and background

1. The results of the Farm Scale Evaluations (FSEs) of spring-sown GM herbicide-tolerant (HT) crops were published on 16th October 2003¹. The FSEs studied the effect that the weed management practices associated with three GMHT crops (maize, beet and spring-sown oilseed rape) had on farmland wildlife, when compared with weed control used on non-GM crops that were not resistant to broad spectrum herbicides. ACRE considered the implications of the results of the FSEs and, following two open meetings, published detailed advice on 13th January 2004².
2. Shortly after the publication of the results of the FSEs, the House of Commons Environmental Audit Committee (EAC) announced their intention to carry out an inquiry into the conduct and outcome of the trials. Following submission of written and oral evidence, their report 'GM Foods – Evaluating the Farm Scale Trials' was published on 5 March 2004³.
3. The EAC report raises a number of issues surrounding the trials, some of which relate to the interpretation of the results, and other scientific evidence associated with the use of GM herbicide-tolerant (HT) crops. The EAC also made a number of recommendations to Government concerning cultivation of GM crops in general, and regarding the conduct of future trials. Since these areas clearly fall within ACRE's remit to advise Government on scientific matters underpinning the release or marketing of GMOs, the Committee has produced this response to the points raised by the EAC.
4. Some of the areas considered by the EAC are not concerned with the science underpinning the regulation of GM crops, but focus on matters of policy which do not fall within the remit of ACRE and which will not be considered here.

B. Response to EAC report

General Comments

5. ACRE regrets that the EAC were unable both to appreciate the groundbreaking and pioneering research of the FSEs, the world's largest ever study of farmland

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¹ *Phil. Trans. R. Soc. Lond. B* (2003) **358**, 1777-1913

² ACRE's advice on the implications of the FSE results is available at http://defraweb/environment/acre/advice/pdf/acre_advice44.pdf

³ The report is available at <http://www.parliament.the-stationery-office.co.uk/pa/cm200304/cmselect/cmenvaud/90/90.pdf>

biodiversity, and to acknowledge the key role UK scientists and farmers played in this research.

6. The EAC remit was to evaluate the farm scale evaluations. However, ACRE notes that the report also commented on some studies that were unrelated to this goal (for example, the North America experience). This, in ACRE's view has resulted in the EAC producing a partial evaluation of the potential commercialisation of the specific GM crops assessed in the trials. The GM Science Review⁴ provides a more balanced analysis of the current state of knowledge relevant to GM crops in general.
7. ACRE notes with concern the somewhat arbitrary selection of evidence and witnesses by the EAC. In particular, there was no representation from the FSE consortium of scientists as witnesses to the EAC. Their presence would have been invaluable in clarifying many issues raised by the EAC.

The North American experience following the introduction of GM crops

8. In their report the EAC argue that sufficient attention has not been given to the experience of widespread cultivation of GM crops in North America. Whilst ACRE considers that the North American experience is of relevance to the introduction of some GM crops in the UK, the connection with the aim of the FSE trials is tentative. The two substantive issues which the EAC highlight are considered below:

GM crops in Canada

9. The EAC suggest that issues concerning gene flow between oilseed rape resulting in the occurrence of multiple herbicide tolerant oilseed rape in Canada have not been fully considered within the context of cultivation of GM crops in the UK. In 2002 ACRE considered this issue and published advice⁵ in which the Committee agreed that whilst gene stacking could potentially occur in the UK, the main problem would be in controlling volunteers in agriculture. ACRE is not aware of any new evidence to change this view. Additionally, the Committee clarified that the potential for gene stacking and its consequences already forms a key part of its considerations when assessing the impact of releases of genetically modified crops.

The Benbrook study on pesticide usage

10. The EAC claimed that the impact of the introduction of GM crops in the USA on pesticide use as detailed in the study by Charles Benbrook⁶ has not been fully considered. The report states that farmers are using higher rates of pesticides with GM crops when compared with non-GM crops. The EAC appear to have considered the Benbrook study in isolation and has not taken account of other reports on pesticide usage.
11. Overall herbicide usage in GM crops in the US is heavily influenced by soybeans. When herbicide tolerant soya was introduced into the US the herbicides that glyphosate and glufosinate replaced were typically used at much lower weights of active substance per hectare. The introduction of GM crops enabled US farmers to adopt conservation tillage (little or no movement of the soil) which resulted in

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⁴ <http://www.gmsciencedebate.org.uk/>

⁵ Available at <http://www.defra.gov.uk/environment/acre/advice/advice16.htm>

⁶ BioTech InfoNet, November 2003

reduced erosion but increased the weed challenge. The introduction of GM crops also enabled the farmers to overcome problems with weed resistance to conventional herbicides. It was not directed at reducing the use of active ingredient but at generating agronomic and environmental benefits.

12. In the Benbrook report it was reported that the usage of herbicides in soybeans, in terms of weight of active substance per hectare, was the same in 2002 (with 75% of crops GM herbicide tolerant) as in 1996 (with 7.4% of crops GM herbicide tolerant). The report estimated usage for 2003 because there was no USDA data available. It should be noted that the measure of herbicide usage by weight alone is not a good indicator of environmental impact
13. There is a body of evidence indicating that the commercialisation of some GM crops in North America and elsewhere has led to reductions in pesticide use^{7,8}, as well as evidence of a switch in some farm systems to more environmentally acceptable practices using more environmentally friendly products for controlling weeds^{9,10}.

Yield measurements

14. The EAC suggest that it was unfortunate that yield measurements were not included in the FSE and recommend that future trials should include such measurements. The issue of measurements of crop performance was considered in detail by the scientific steering committee (SSC) and its views are clearly stated in the minutes of meetings. The SSC accepted the need to produce evidence that the weed management approaches used by farmers in both halves of the field gave appropriate levels of weed control. It, however, argued strongly that crude yield measurements would not provide this assurance, because of the different cultivars used. Detailed measurements of crop phenology (the timing and duration of different developmental stages) provided much better evidence that weed control in both halves met good agronomic practice and detailed descriptions of these measurements were given in the paper by Champion et al¹¹. ACRE considered this matter in detail during its evaluation of the FSE results and during the associated open meetings and agreed with this approach. In light of this evidence ACRE are content that performance of the GM plants in the FSE was not compromised by ineffective weed control and thus that the data sets for the two experimental treatments are directly comparable in terms of the null hypothesis. The acceptance of these data after rigorous international peer review by the journal confirms and endorses this view.

Cumulative effects

15. The EAC express concerns over the long term cumulative effects of the management of GM crops, and recommended that longer term trials for GM crops, in particular maize, should be carried out. ACRE considers that the

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⁷ Fernandez-Cornejo et al (2003), Economic and Environmental Impacts of Herbicide Tolerant and Insect Resistant Crops in the United States. In: *The Economic and Environmental Impacts of Agbiotech: A global perspective*. Kluwer Academic/Plenum Publishers, New York, NY.

⁸ Gianessi et al (2002). Plant Biotechnology current and potential impact for improved pest management in US agriculture: an analysis of 40 case studies, NCFAP, USA

⁹ Hin et al (2001). Agronomic and Environmental Impacts of the Commercial Cultivation of Glyphosate Tolerant Soybeans in the USA. Centrum voor Landbouw en Milieu. Utrecht, Netherlands.

¹⁰ Nelson and Bullock, (2003). Environmental Effects of Glyphosate Resistant Soybeans in the United States. In: *The Economic and Environmental Impacts of Agbiotech: A global perspective*. Kluwer Academic/Plenum Publishers, New York, NY.

¹¹ *Phil. Trans. R. Soc. Lond. B* (2003) **358**, 1801-1818

assessment of the long term effects of GM crops is best achieved through case specific risk assessments and new information gained as a result of post market monitoring. This is made possible as the legislation allows for marketing consents which are time limited and can be revoked (in light of new information) at any time. In light of a favourable risk assessment the Committee does not consider there is a need for longer term trials prior to release. In this context it is important to recognise that releases of GM crops are not irreversible. Should new substantiated evidence of adverse agronomic effects be forthcoming either from monitoring or other sources, seed can be withdrawn from sale.

Atrazine and the FSE results for maize

16. The EAC expressed concern regarding the implications of the phase-out of atrazine for the interpretation of the FSE results for maize and suggest that the trials for maize need to be repeated. The FSE consortium recently published a follow-up scientific paper¹² analysing the range of practices used on the conventional halves of maize fields in the FSE. The report concluded that conventional herbicide regimes used in the FSE that did not involve the triazine herbicides (e.g. atrazine) led to a similar impact on weed populations as the management regime associated with GMHT maize. ACRE have considered this issue in detail and recently published additional advice¹³ in which the Committee suggest that replacement herbicide regimes to atrazine for use with non-GM maize could have equivalent impacts to glufosinate on weed populations. ACRE accepts that further information will be needed on this point.

Future trials and evaluations

17. Recommendations with respect to future FSE style trials are made by the EAC. In particular, they suggest that all trials should be multi-site, at least 4 years long and that guidelines detailing the evidence required to demonstrate biodiversity impacts should be produced. ACRE has commented previously that there is no need to repeat similar trials on the scale of the FSE. The FSE were extremely valuable in providing important and robust evidence on the effects of herbicide regimes on GM and non-GM crops. They have provided important information on the key indicators of biodiversity that need to be measured. These will be used to inform future studies. In addition the FSE demonstrated a consistency in results both across years and in different locations. This robustness and consistency provides clear justification that future trials will not be required to be carried out on such a large scale.

Wider issues

18. The EAC report that the FSE raise wider issues concerning the impact of agricultural practice on biodiversity and that they highlight a need to establish appropriate benchmarks for the evaluation of biodiversity impacts and the effects of agriculture. During its consideration of the FSE results, ACRE also raised the subject of wider issues and has subsequently set up a subgroup to consider this topic in more detail.

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¹² *Nature* 428, 313-316; published online on 4 March 2004

¹³ Available at http://www.defra.gov.uk/environment/acre/advice/pdf/acre_advice49.pdf