GM Food : Evaluating the Farm Scale Trials Evidence from the Soil Association to the Environmental Audit Committee's inquiry, November 2003

Summary

· The FSEs do not reflect the impacts of GM crops in commercial conditions and over time; they underestimate the negative impacts on biodiversity.

· The one year time period means that the effects of herbicide resistant volunteers and weeds were excluded, under-representing herbicide use on GM crops.

· The lack of yield measurements and the fact that the herbicide regimes on the GM crops were those advised by the companies instead of those used commercially, allowed the trials to be managed in favour of the GM crops.

· The separation distances and procedures for notifying other farmers of the sites were inadequate and threatened organic farmers.

· The SCIMAC code was not applied consistently and not applied in Scotland.

· Clear negative effects were identified for GM oilseed rape and beet in only one year despite the bias in favour of the GM crops. This should be used as new scientific evidence for a UK ban on these crops.

· The positive maize results must not be used as a pretext for commercialising GM maize: the maize trials were particularly flawed, with completely inappropriate herbicide regimes used on both the GM and non-GM crops.

Introduction

The Soil Association is the main certifier and promoter of organic food and farming in the UK. Organic farming now accounts for 4% of UK farmland and UK organic food sales are worth over £1 billion. We have closely followed aspects of the management of the FSEs. We have also been analysing the impacts of GM crops in countries where they have been grown commercially for several years. Our findings were set out in our report Seeds of Doubt, published in September 2002.

1. The adequacy of the design of the farm scale trials and their ability to answer the questions posed at the outset of the trials

There were three serious flaws in the design of the FSEs. The one-year time period and the lack of yield measurements mean the results underestimate the negative impact of GM crops on biodiversity. The trials also threatened organic crops.

(i) Effects arising after the first year: HT volunteers and resistant weeds

The FSEs only looked at the effects of the herbicide regime used in the year that the GM crops were grown. However, from the experiences in North America, it is clear that two of the main pressures on herbicide use arising from GM crops, occur *after* the first year. These are the emergence and spread of herbicide resistant (HT) volunteer plants and herbicide resistant weeds. These require a greater use of herbicides and the use of older, more toxic herbicides, such as 2-4 D and paraquat, as glyphosate /glufosinate are ineffective. The longer GM crops are grown, the greater these problems. The reduced use of these older herbicides was claimed as an environmental benefit of GM crops, but the opposite seems to be true (Seeds of Doubt, Soil Association, September 2002) These important effects were excluded from the FSEs.

Volunteer GM oilseed rape is a particular problem. A recent study by DEFRA found that in a field where a GM crop is grown, GM oilseed rape volunteers will take 5-16 years to fall below 1% in a subsequent crop, depending on the measures that are taken ("G Squire, G Begg and M Askew, "The potential for oilseed rape feral (volunteer) weeds to cause impurities in later oilseed rape crops"). Report of DEFRA project RG0114, August 2003. In Canada, GMHT rape has created a major new weed: in one Province HT rape volunteers are now one of the top ten agricultural weeds. HT volunteers are also now common in fields that have never grown GM crops, indicating that biodiversity would be affected over a wider area than just the land planted with GM varieties, as well as over a longer period of time than the year of planting. Canadian farmers also report that HT volunteers are undermining minimum-tillage practices, which are considered environmentally beneficial. In the US, researchers have documented the emergence of many weed species resistant to glyphosate (velvetleaf, waterhemp and horseweed) and to glufosinate (ryegrass, goosegrass, horsetail and waterhemp) (Seeds of Doubt, Soil Association, September 2000; and "Cynical & Dishonest Science" in GM maize trials, Institute of Science in Society, November 2003).

These problems are particular to GM crops: non-GM volunteers can be controlled with glyphosate/glufosinate, while the greatly increased use of glyphosate /glufosinate with GM HT crops means there is greater selective pressure for the development of resistant weeds.

(ii) Measurement of Yield

In commercial farming, the key factor influencing farmers' decisions on their herbicide regimes is the resulting yield of the crops; they generally seek to maximise yields by maximising weed control. The failure to measure yield makes it impossible to know if the herbicide regimes on the GM crops do in fact reflect commercial practice, or to what extent if not.

The data on maize yields in the report is misleading – it came from National Seed List trials where the GM maize was grown using only atrazine which would have increased yield, compared to the sole use of the less powerful glufosinate in the FSEs.

(iii) Separation distances

From the outset, we were extremely concerned that the separation distances were inadequate for preventing GM contamination of organic crops. The Soil Association lobbied hard for the use of the distances recommended by the National Pollen Research Unit (NPRU), following a review of the scientific evidence, but we were not successful. It was only by efforts by the organic sector that no organic farmers lost the organic certification or sale of a crop as a result of the trials. According to the Government, the distances used were intended to prevent contamination of non-GM crops rising above 1%. However, the available scientific evidence showed that the SCIMAC distances were inadequate for this, while organic certifiers require that GM contamination is below the

limit of detection (0.1%).

For maize, the NPRU had recommended a distance of 3km. The SCIMAC distances were 50m for conventional crops and 200m for organic crops, although research had shown cross-pollination occurs at 1.6% at 200m and over 0.2% at 800m (Pollen dispersal in the crops maize, oilseed rape, potatoes, sugar and wheat, by Treu and Jean Emberlin, January 2000). For oilseed rape, the NPRU recommended 6km, but the SCIMAC distances were only 50m for conventional crops (from 2001, 100m for varietal associations and partially restored hybrids) and 200m for organic crops. For beet, the NPRU had recommended 1km but the SCIMAC distances were only 6m for conventional and 600m for organic crops.

2. The conduct and operation of the trials

There were several flaws in the operation of the trials. Most seriously, the management of the GM crops meant that the trials were biased in favour of higher biodiversity levels being found than in commercial conditions.

(i) Management of the GM crops

The FSEs should have been managed to reflect commercial farming practice. However, only the non-GM side was managed by the farmers themselves. The GM side was managed according to the company recommendations, rather than the commercial practice in countries growing these GM crops, which has turned out to be less positive for biodiversity. The companies also actively influenced the farmers' decisions during the trials in ways that increased biodiversity, but would not be viable commercially because of the cost or yield penalty. The management of maize in particular is a cause of concern.

Farmers were encouraged to delay the use of herbicide applications and use just one spray. The theory with GM HT crops is that a single application of herbicide can be made late in the growing season when weeds are larger, so promoting biodiversity and reducing herbicide costs. However, delays in weed control/the use of a single spray causes a fall in yield, as confirmed by GM sugar beet research by Broom's Barn. Most of the maize in the FSEs was treated with just one spray averaging 3.5 litres/ha of glufosinate allowing weeds to flourish, although up to 8 litres/ha had been allowed in the efficacy trials (PSD Notice 1123). One FSE trial farmer told us that as the weeds grew he wanted to spray his beet but Monsanto told him to hold off to as more weeds and insects would then result. This is not how farmers are managing GMHT crops in North America, where herbicides are usually applied 2-4 times including a spray before planting to avoid any yield penalty.

The herbicide types on both the GM and non-GM maize were completely unrealistic. The herbicide used on the GM maize was not the one used commercially or promoted by Aventis for this maize. Only glufosinate was used, but farmers, researchers and farm advisers have all found that glufosinate on its own is inadequate for GMHT maize weed control, particularly a single application (Seeds of Doubt, Soil Association, September 2002. "Weed control in Liberty Link Corn 1996-1999, B,Brent and M.Rowland, Texas Agricultural Extension Service report, which reports that a single Liberty application is inadequate and control is greatly improved by the addition of atrazine. Berzeny *et al*, which says "the results of field experiments showed that a weed management strategy with glufosinate must include multiple applications, residual herbicides or mechanical control"). In the US, 75-90% of farmers growing Liberty Link (glufosinate resistant GM) maize are now using a mix of glufosinate and atrazine called "Liberty ATZ". Aventis/Bayer has been selling this since March 2001 and is recommending its use on

GM maize in other countries ("Cynical & Dishonest Science" in GM maize trials, Institute of Science in Society, November 2003). A stronger herbicide should therefore have been used in the FSEs (which would have reduced biodiversity). Though Aventis clearly knew of this issue since 2001 and it was publicised on BBC Newsnight on 25 June 2002, no action was taken.

An inappropriate herbicide was also used on the non-GM maize. About 75% of the non-GM maize was grown using atrazine. This is persistent and more powerful than the glufosinate used on the GM maize. However, the EC recently banned this herbicide which will come into force in two years (this decision was actually expected for many years - because of its toxicity, atrazine is already banned in Germany, the Netherlands, Denmark, Italy, Austria, Sweden and Finland). Non-GM maize will almost certainly be grown in future with a less powerful herbicide, which could negate the positive effect of GM maize found by the FSEs.

A FSE beet trial farmer told us that they were required by Aventis to remove bolters by hand every two weeks to prevent them setting seed. Even in the most rigorous commercial practice, a beet crop is only likely to be hand-rogued once or twice.
GM Free Cymru have it on record that the GM halves of the FSEs were in effect controlled by SCIMAC who were varying the seed densities and herbicide spraying intervals in ways which would be unlikely if farmers were left to themselves.

The advice given by DEFRA for the post-trial management of volunteers was also unrealistic. Farmers trialling the GM oilseed rape were told not to grow another rape crop for the next couple of years. However, DEFRA's research has shown that it would take 5 to 16 years for the level of volunteers to fall below 1%. We also wonder why no such advice was given for the beet trials.

(ii) Non-application and non-compliance of the SCIMAC code of practice
The SCIMAC code of practice was not applied in Scotland, according to evidence given under oath in a Scottish court case on one of the trials and accepted by the judge on 6 March 2003. Derek Bearhop, Head of the Scottish Executive GM co-ordination team, giving evidence on 4 December 2002, said that the SCIMAC guidelines were not applied by Scottish Minister to their consent for the FSE trials in Scotland.

There seem to have been several cases of non-compliance to the code. The SCIMAC survey of farmers in the FSEs in December 2002 revealed that the guidelines were not properly adhered to or monitored. Only a third of farms were visited in the survey, and the 'phone checks revealed 13 potential non-compliances. These checks would not have been able to pick up all non-compliances. Several non-compliances have been reported by observers, such as machinery not being cleaned before leaving the field and spreading GM seed as it was transported away.

(iii) Siting and prior notification of the trials
The management of the siting of the trials gave rise to much tension and conflict with local people and the organic sector. There was far too much secrecy about the site selection and far too little prior notification. According to the SCIMAC guidelines, "the onus lies with the GM grower to notify neighbouring farms in writing of his planting intentions - as soon as possible and at the latest by 1 March for spring sown crops". This was not respected. SA licensee, John Dove, only found out about a GM beet trial next to his farm on 21 March 2000 from neighbours as a result of a notice in the local papers 3 days before. He had to change his cropping plans. The Lambes in Hereforshire found that a GM rape trial was 3.8km from a conventional rape crop on their organic farm; there had been no newspaper adverts.

The Soil Association held many meetings with the Government and submitted proposals in October 1999 and April 2000. We requested a map based register of the sites; prior notification of organic producers before approval of the sites; detailed assessment of the contamination risks of all organic farms within 6 miles of each site using a set of criteria (such as type of crop, scientific data on pollen transfer, time of flowering and prevailing wind direction); reimbursement of our costs; and for the procedures to be legally binding.

In September 2001, DEFRA asked for a list of our licensees and their forward cropping plans, but we were unable to provide this because we do not hold detailed information on cropping plans. Our other requests were ignored and from 1999 to spring 2002, the Soil Association carried out at considerable cost a risk assessment of each site with respect to the location of organic farms; thereafter we advertised the sites to our licensees for them assess the risks. In 2000, we found 61 farms within six miles of the sites and in March 2002, we found 111 organic farms within six miles. A GM maize trial less than 2 miles from the organic research centre, the Henry Doubleday Research Association, was withdrawn. However, for other trials, it was left to organic farmers to make sure that they were not growing 'at risk' crops.

3. The ways in which the results of the farm scale trials will be integrated with policy and decision-making

The AEBC advised the Government in 2001 that the FSEs alone will not suffice as a basis of the decision on commercialisation and that other information, including other scientific, economic, ethical and strategic issues, would need to be considered (Crops on Trial, 10 September 2001, AEBC).

There is now an overwhelming case for the Government to not allow any GM crops to be commercialised, even with restrictions. Each Government policy initiative has come out against commercialisation: the Cabinet Office's economic study concluded that there is no economic case for commercialisation in the near future; the Science Review revealed that there are still many uncertainties and gaps in knowledge; and the public debate showed there is a very strong opposition to GM crops. It is also now known that a majority of farmers (56%) are opposed to commercialisation, as shown by an October poll by Farmers Weekly, with only a third in favour (Farmers Weekly, 24-30 October 2003.)

The scientific and real farming evidence against GM crops is compelling. It would have been impossible to design the trials to fully measure the cumulative effects of GM crops and the effects on non-GM crops, so it very important that the experience of farmers in countries where GM crops have been grown for several years is used as evidence. The overall evidence from these is overwhelmingly negative (Seeds of Doubt, Soil Association, 2002).

The FSE results can be used to prohibit at least two of the GM crops. DEFRA said that "There will be no commercial growing of GM crops until the FSEs are completed and only then if the crops and associated farming practices are assessed as causing no unacceptable effects on the environment" (Press Release, July 2001). As FSEs were flawed in ways which mean that the results do not reflect actual impacts in commercial conditions, the farming practices *cannot* be assessed as causing no unacceptable effects for any GM crop. As the trials were biased in favour of the GM crops, the results for the two which produced negative effects can be treated as new scientific evidence to ban these. The European Commission confirmed in October that the results of the FSEs

could be used as the basis of a UK ban on the crops (David Bryne, EC Commissioner, addressing to the European Parliament Environment, Public Health and Consumer Policy Committee on 2 October 2003).

Other recent Government research reinforces the findings of the FSEs of negative effects from GM oilseed rape and beet: the study showing that HT oilseed rape volunteers would take 5-16 years to fall below 1% and another study that GM beet would drive skylarks to extinction in two decades. Also, of the small-scale studies available prior to the FSEs, at least 7 showed that the three crops trialled increase the efficacy of weed control and only 1 suggested otherwise.

The positive maize results must not be used as a pretext for commercialising GM maize. The maize trials were particularly flawed, in ways which favoured the GM maize. Moreover, a decision for all GM crops must be made strategically with respect to the environment and economic welfare of UK farming. The Government is committed to reversing the decline in farmland birds by 2020. Conventional maize, oilseed rape and beet are all terrible for biodiversity and our farmland wildlife is now in a very precarious state. Further negative effects and gambles cannot be considered. Even limited increases are irrelevant as substantial improvements are needed and all GM crops help maintain an environmentally damaging system of farming which is dependent on chemicals which destroy wildlife, contaminate water resources and contribute to climate change.

A positive alternative is available: investment in more organic farming, which has great public support and has been proven through many comparative studies of commercial farms over several years to have substantial biodiversity benefits as well as other environmental benefits (reductions in pollution, waste and energy use). GM crops, however, would threaten organic farming through inevitable contamination.

The main conclusion of the Curry report, which examined the serious economic and other problems of UK farming, was that UK agriculture must reconnect with the market. This was accepted by the Government's ensuing strategy documents. The Cabinet Office review concluded that GM crops "would… in the current climate … not be consistent with the vision set out in these reports, and could leave farmers facing a low market price or, in the extreme, no market at all."

4. The implications of the trial results for the Government and other decision-makers

The levels of wild plants, seeds, butterflies and bees were all far lower on the GM oilseed rape and beet than the conventional crops, while the GM maize had the opposite effect in the trials. However, the missing information must be taken into account: the level of HT volunteers, resistant weeds, and the yields are key to assessing the actual impacts in commercial conditions and over time. These and the flaws in the management of the trials mean the FSEs significantly under-represented the negative impacts of the GM crops. The highly flawed herbicide regimes for the maize trials must invalidate the results of the GM maize, which in reality could be worse for biodiversity than non-GM maize.

The omission of data on HT volunteers is particularly important for GM oilseed rape, and means the effects would be far worse than the FSEs indicate. Dr Paul Rylott of ABC/Bayer has claimed that the yields of the GM rape were 15-20% greater than the non-GM varieties (Farmers Weekly, 24-30 October 2003). If true, GM rape would be very attractive to farmers, so approval would have a very destructive effect on wildlife.

That clear negative effects were picked up from GM oilseed rape and beet in only one year and despite the bias in favour of the GM crops, is alarming. The researchers concluded that GM oilseed rape and beet "might exacerbate the long-term declines of those weeds that are important food resources for birds". We agree with the RSPB that "The commercialisation of GM beet and oilseed rape could be disastrous for birds" (Press Release, 16 October 2003, RSPB). Farmland birds rely on the soil seedbank for over-winter survival. The seedbank is now only a quarter of what it was at the start of last century. The GM varieties depleted seed bank levels by about 30%, which would increase the rate of decline of the seed bank from the current fall of 3% per year to 7% per year, according to researcher Dr Matt Heard (Farmers Weekly, 24-30 October 2003). The results also indicate that these GM crops would further reduce wild plant levels. The trials only looked at 12 common weeds, and not threatened species for which further declines would be particularly significant.

5. The costs and benefits of GM food, bearing in mind the potential market, in the light of the farm scale trials and the recent Strategy Unit report

We just wish to make one point here. It is often stated that GM crops must be beneficial as otherwise why would so many farmers have taken up these crops in North America. However, we would ask why so many farmers and other industry groups in North America are now so desperately opposed to the introduction of GM wheat, if GM crops were so beneficial?

From our analysis of GM crops in North America over the last few years, it is clear that there is a serious conflict between the direct effects on individual farmers and the common effects on the whole agricultural industry and consumers. The direct effects on individual farmers vary from a limited negative to a limited positive effect in terms of yield and convenience. Heavy marketing has over-promoted the positives. However, the overall impacts on the agriculture industry have been overwhelming negative. Both the US and Canada have lost major export markets to Europe and Asia ($300 million dollars annually of each of maize and oilseed rape exports to Europe); nearly all seed stocks are contaminated and contamination is now hard or impossible to prevent in the field, so farmers and consumers have no option of growing and consuming GM-free crops; and organic farmers have had to give up growing oilseed rape in parts of Canada. However, individual farmers cannot avoid these common negative effects by not growing GM crops. The only choice they have is whether to gain the possible limited direct positive effects of GM crops. So they continue to grow the existing GM crops whilst opposing the introduction of new GM crops.

The UK Government must get to grips with this. After all, it is precisely to manage common problems that Government is needed, as opposed to problems that can managed by individuals alone through the market place or other means.

GM, 13.11.2003, GMOs022

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