

Section 2.3 Genetically modified crops

Preface to Electronic Version March, 2003



**Friends of
the Earth
Scotland**

As part of the three year, lottery-funded Catalyst Project, Friends of the Earth Scotland published a pack of training materials for communities undertaking action for environmental justice. The paper edition was published in 2001.

This file contains Section 2.3: Genetically modified crops. It was compiled from a number of Friends of the Earth Scotland briefing papers written in 1999 and 2000:

Part 2 is from a briefing published in 2000.

Part 3 is from a briefing published in 1999 and revised in 2000.

Part 4 is from a briefing published in 1999.

In this web version, only typographic errors and obsolete contact details have been corrected within the text.

Since the publication of the Catalyst training materials, the Scottish Executive has allowed further crop trials, though opposition has mounted as well. In January 2003 the health and community care committee of the Scottish Executive reported that such trials did not provide adequate safeguards. The consequences of this report for government policy remain to be seen at the time of writing.

The fast changing reorganisations of government departments is difficult to keep up with. DETR (Department of the Environment, Transport and the Regions) is no more. DEFRA (Department for Environment, Food and Rural Affairs) has taken on some of the responsibilities. Transport is now covered by DFT (Department for Transport). Other responsibilities for local government and regions are now being placed in the Office of the Deputy Prime Minister (ODPM). Doubtless by the time you read this, further reorganisations and acronyms will have occurred.

p. 7 Other contacts

The websites have been replaced in the text with current addresses. In addition, see:

Friends of the Earth	www.GMFreeBritain.org
Norfolk Genetic Information Network	www.ngin.tripod.com
GM Free Scotland (with local links)	www.gmfreescotland.net

p. 20 Further Campaigning

Check with the Scottish Executive for the current ministers of Rural Affairs and Transport and Planning.

2.3 GENETICALLY MODIFIED CROPS

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1. Genetically modified crops

Genetic modification has caused a great deal of concern in recent years, with some arguments ranging from the arrogant and elitist to the emotive and scaremongering. The companies who make the genetically modified products argue that the techniques represent a revolution in food technology which will increase food production in the poor countries, reduce the need for pesticides and resource intensive storage methods, and contribute to medical progress. However their introduction has provoked widespread opposition and stimulated legal protest and civil disobedience in rich and poor countries alike, from consumers, environmentalists, local communities, and many farmers and scientists.

The genetic modification of organisms is a technological innovation which allows the selection of animal, plant and micro-organisms with particular attributes. In some respects it is an extension of selected breeding: the use, for example, of the best bull to sire the cows, to make sure that the next generation inherits the qualities of that bull. What genetic modification does however, is to make that process much more precise, such that a particular gene (the section of a chromosome which corresponds with a particular desired attribute) is inserted into the chromosome of an organism, which can then be grown to express that attribute. This can be within the same species, for example where the gene for pesticide tolerance is selected in one variety of maize, and inserted into another variety. It can

also occur between species, where, for example the gene for pesticide tolerance in, say, tobacco, is inserted into maize.

There is considerable debate about the science of genetic modification, and whether the techniques of genetic manipulation can themselves affect the modified organism in unintended ways. There is also an important debate about the politics of the biotechnology industries which are promoting the products, why they are being promoted so strongly, how lacking in accountability they are and the considerable vested financial interests which they and their shareholders have in the sale of genetically modified organisms. This pack will not address these issues, although it is important to ask the questions 'Why are these crops here? Who is really set to benefit from them?' These resources will focus primarily on the problem of crop trials, because this is the area in which the greatest unknown risks are. Essentially, field- and farm- scale trials represent experiments with our environment, which is an unacceptable risk to take.

Friends of the Earth is not opposed to science. Indeed it is important that a rigorous and informed debate be had which draws on the best of science and other disciplines. The debate must involve the public and decision makers must be held accountable through democratic processes. We are concerned that this is not currently happening in Scotland.

This section will help to identify what the particular concerns are with the trials of GM crops in Scotland. They are particularly designed for communities where GM crops are being grown in such trials, but are also valuable for others who have a stake in the environment, whether because we are concerned about our food, our wildlife or democracy.

Part 2 looks at farm-scale trials of GM crops, why they are occurring, what species are being used, and what the environmental problems are. Part 3 looks at the particular situation in Scotland, where decisions have been made about GM trials, and who has made them. This also identifies the problems with the trials, both in terms of science and democracy. Part 4 looks at the particular problems for bees and the honey industry. The final section is an information leaflet for campaigning against farm-scale trials in a particular area.

As you work through the information here, you may find it useful to complete the following exercise. Fill in the issues which concern you most, or are most relevant to your situation, and then identify who you think should know about this, and to whom you want to make the case.

The opposition to GM crop trials is necessarily a seasonal and changing situation. Find out the planting and flowering dates of the GM crops near you. You may want to plan your campaign around this calendar. It is also valuable to keep up to date with developments, through the media, and through briefings produced by Friends of the Earth Scotland, and our colleagues in Friends of the Earth (England, Wales, Northern Ireland). Check the websites on www.foe-scotland.org.uk and www.foe.co.uk.

Concerns about GM crops which are relevant to us

To whom do I want to make this point ?

2. Farm-scale trials of GM crops GM Maize, beet and oilseed rape

A series of outdoor trials of genetically modified crops at the 'farm scale', ie, on the same scale as such crops might normally be grown on a farm, started in the UK in 1999. These trials continue this year at dozens of locations across the country - there could be one near you.

This briefing provides basic information about the crops being grown in the farm-scale trials (FSTs). Three crops are being grown: fodder maize, oilseed rape, and beet. The beet crop will consist of some trials of sugar beet and some of fodder beet.

Problems with GM

The large-scale growing of GM crops raises many concerns, such as:

- * cross-pollination with native species
- * contamination of organic crops
- * contamination of conventional crops
- * contamination of GM animal feed
- * contamination of products such as honey

Not all of the concerns apply to every crop being trialled. For example, maize cannot cross with any wild plants in the UK, and there is little organic growing of either rape or beet.

This briefing only provides an outline of the issues for each GM crop being trialled. More detailed information is available in other brief-

ings from Friends of the Earth and other organisations - contact details are given at the end.

Need for research

Friends of the Earth is not anti-science, nor against research. We do think that the public should have the right to question what research takes place, and we also believe that these particular trials pose an unjustified risk to the environment.

We are calling for a five-year moratorium ('freeze') on large-scale growing of GM crops, until their effects are better understood. And we are calling for more research funding to be provided for all forms of sustainable agriculture (not just organic).

We also question whether the crops being trialled are really needed. Proponents of GM crops have claimed that GM technology will help alleviate world hunger. None of the farm-scale trial crops have any relevance for world hunger or poverty. All of them are herbicide-resistant crops designed to deliver crop management benefits to farmers here in the developed world and financial benefits to the biotechnology companies that sell the herbicides and seeds.

Maize

The GM maize being used in the FST is produced by Aventis (formerly AgrEvo), and is referred to as 'T25'. It is resistant to the herbi-

cide glufosinate ammonium (often known simply as glufosinate or under its tradename of Liberty) which is also made by Aventis.

This GM maize is the only one of the FST crops which has marketing approval under EU law. This means that it can be planted anywhere, not just at test sites. Aventis do not have to tell the public or even the government where they are planting it, although they are doing so at the moment on a voluntary basis.

This maize is also very close to becoming the first GM seed variety approved for commercial growing in Britain. If it obtains this approval, then Aventis will be legally entitled to sell GM maize seeds to farmers – even before the end of the farm-scale trials – if they wish to.

Impacts on the soil

Glufosinate has been shown to be harmful to some beneficial bacteria and fungi that live in the soil. It could disrupt the micro-organism community within the soil, possibly affecting the health of following crops. Maize is often grown year after year in the same field so this is an important issue for farmers.

Threats to other farmers

GM maize poses a threat of contamination, as the result of cross-pollination, for non-GM and organic maize crops. As well as this, the GM maize pollen could contaminate the honey of local bee keepers.

The guidelines under which the FSTs are being conducted lay down separation distances that must be maintained between the

GM maize and any nearby fields of non-GM maize - whether grown for human consumption (sweetcorn) or for animal feed (fodder or forage maize).

For fields of sweetcorn or organic maize, the separation distance is 200m. For conventional fodder maize, the smaller distance of 50m is allowed.

These separation distances are inadequate, because pollen can be carried by bees for several kilometres, as research has shown. Organic growers will not be protected if bees pollinate their maize with GM pollen, meaning that they risk losing their license to sell organic produce, without compensation.

Crossing to wild plants

Unlike the other two crops in the FST, maize does not have any close wild relatives in the UK, so in this case there is unlikely to be crossing to weed species.

Alternatives to GM maize

Using herbicide resistant maize will not help more sustainable and environmentally friendly forms of agriculture. In contrast, there has been some research into mechanical weeding techniques, such as hoeing, in maize. Such techniques have been shown to be cost effective as well as cutting down on weedkillers.

Oilseed rape

The GM oilseed rape is also made by Aventis, and is also resistant to glufosinate ammonium.

Oilseed rape is widely grown in the United Kingdom. It is mainly used to produce food

grade oil, with the pulp then being used in animal feed. The oil is commonly used for margarines and blended vegetable oils. No organic oilseed rape is currently grown in the UK.

The variety being used in the trials is resistant to glufosinate ammonium. At present, glufosinate is not widely used on oilseed rape. So any risks to the environment and human health from using this herbicide will be increased. Although glufosinate residues have been found in harvested oilseeds its presence is not tested for in oilseed products.

The pollen from oilseed rape has been shown to spread over long distances. Studies commissioned by Friends of the Earth at a GM oilseed trial in Oxfordshire in 1999 found GM pollen in bee-hives 4.5 km away from the field.

Bees

Honeybees are the primary pollinators of oilseed rape, although the pollen also spreads on the wind. Oilseed rape fields are one of the biggest sources of honey in the UK.

Given a large nectar and pollen source, such as fields of rape in flower, bees tend to stick to that one source. It is highly likely that local honey production will be contaminated with GM pollen.

Crossing to other plants

Oilseed rape commonly spreads into other crops as a weed. These too will be resistant to glufosinate so they may have to be controlled using alternative herbicides.

Neighbouring fields of oilseed rape can cross

breed easily. The GM oilseed could contaminate non-GM crops leading to the possibility the oil produced could contain GM material.

Oilseed rape has several close relatives which grow wild in the UK, with which it is able to crossbreed. Wild turnip is often found growing in fields of oilseed rape so this crossbreeding could happen very easily.

This means that the GM herbicide resistance gene could become incorporated into wild plants. The impact of this on wild and weedy plant populations is unknown. The prospect of common weeds becoming agricultural pests (often labelled as 'superweeds') is very real and may lead to more toxic chemicals being used to control them.

Fodder and sugar beet

The beet crops being grown are resistant to Monsanto's herbicide glyphosate (Roundup®).

Beet is grown for its root which is used either to make sugar for human consumption, or as fodder for animals. Both types of beet are being grown in the FSTs.

Beet has been bred so that it normally flowers in the second year of growth after creating a store of energy in its root. Since they are normally harvested before flowering, growers claim there is no danger of cross-pollination from crops of GM beet.

However, in any field of beet a proportion of plants 'bolt', i.e. they produce flowers early, in their first year. These bolters are often controlled by hand weeding, or by herbicide applied only to the bolting plants.

This is normal farming practice, but typically not every bolter will be removed so there is a risk of pollen being produced. Beet pollen travels extremely long distances. A study by the Institute of Terrestrial Ecology found that wild beet populations can cross breed at a distance of 14 km.

A French field study of gene flow in GM sugar beet found hybridisation occurring in neighbouring fallow fields where weed beet was growing.

'Weed beet' is a weedy version of the beet plant which is very common in and around fields of beet crops. In addition, the wild plant 'sea beet' grows wild along most of the coast of England and Wales. The GM crop will cross readily with either if allowed to produce pollen.

Because the GM trials are being so closely watched, we expect the participating farmers to be extra careful to remove bolters in these fields. But under normal growing conditions, such extreme care is unlikely, so pollen spread from GM beet crops is still a concern.

Finally, there is the possibility of genetic pollution without the need for pollen. Some soil bacteria have been shown to be able to 'pick up' genes from GM plants a process referred to as 'horizontal gene transfer'. This is a new issue that has hardly been investigated and the implications are unknown.

Animal feed

All of the maize crop and most of the beet is being grown as food for animals. The government has repeatedly said that the produce

from the trials will be kept segregated from non-GM produce, but have not made clear how this can be achieved with the meat or dairy products from animals fed on the crops.

At present, the European Union (EU) does not require an assessment of the safety of GM crops for animal feed. A Regulation covering this issue has been under discussion within the EU since at least 1994, but still nothing has emerged. Commissioner Byrne, responsible for health and consumer protection, has referred to the novel feeds proposal as "the missing link in Community legislation on GMOs."

Despite this lack of safety assurance, the government has said that produce from the FSTs will be allowed to enter the human food chain.

Use of herbicides

The production of herbicide resistant seeds encourages farmers to look upon the use of herbicides as the first choice for weed control. Having bought the herbicide resistant seed, farmers would be far more likely to use the herbicide when previously they might have considered this as only one possible option.

There are still a number of farmers who think that to have any weeds at all in a field is a sign of bad farming, when in fact a certain level may have no adverse affect upon the crop. The ability to use non-selective herbicides in the crop will further promote this attitude and encourage the use of herbicides, rather than promoting the real needs of the crop.

Additionally, some weeds, if exposed often and long enough to a weedkiller, will adapt to this pressure and develop their own resistance. This may lead to stronger doses being required in the future.

Since 1969 the populations of skylark and grey partridge have fallen by 58% and 82% respectively and this has been blamed largely upon modern farming practices such as the widespread use of herbicides and other chemicals on crops. We should be looking for real alternatives to the use of chemicals in farming.

Other contacts:

Department of the Environment, Transport and Regions – www.defra.gov.uk/environment/index.htm

Five Year Freeze – www.fiveyearfreeze.org

Soil Association – www.soilassociation.org

Genetic Engineering Network –
www.dmac.co.uk/gen.html

Scottish Beekeepers Association –
www.scottishbeekeepers.org.uk

3. Farm-scale trials of GM crops Scotland's democratic deficit

In November 1999, a voluntary agreement was reached between the Government and the biotechnology industry concerning the trialing of GM crops [1]. This agreement allows the continued use of farm-scale trials of GM crops until at least 2002. It was made between the Government and an influential biotechnology industry lobby group called SCIMAC (the Supply Chain Initiative on Modified Agricultural Crops).

But many groups, including Friends of the Earth, have grave concerns about the safety of farm-scale trials, and remain unconvinced about their scientific legitimacy. This article looks at the trials of GM herbicide tolerant crops in particular. It examines what these trials aim to find out and questions whether they will provide reliable evidence of the environmental safety of GM crops.

FoE Scotland's Position

FoE Scotland is not opposed to genetic engineering or to controlled research in the lab, which one day might provide a sustainable way to use this technology. However, FoE Scotland is opposed to the manner in which GM crops and foods have so far been introduced. We believe GM crops are being rushed onto the market place before we have a proper understanding of plant genetics and the impacts on health and the environment.

There has been little or no real public debate on the issue. Nowhere more clearly has this

'democratic deficit' be seen than in our own Parliament. Despite being a devolved matter the Scottish Parliament never once debated the issue. With the introduction of GM crops into the UK, there has also been a clear failure to ask simple questions, such as "Do we need this crop? Is there something wrong with the current method? Is there an alternative way to achieve the same result?"

Note: in this article FoE EWNI is used to identify our sister organisation Friends of the Earth England, Wales and N. Ireland.

Background

In the summer of 1997, the Ministry of Agriculture, Fisheries and Food (MAFF) held a consultation on the impact of GM herbicide tolerant crops [2]. Several organisations, including English Nature and the Royal Society for the Protection of Birds (RSPB), expressed their concerns about the impact of GM herbicide tolerant crops on biodiversity in agricultural land [3], [4]. It became clear that despite the hundreds of test sites for such crops in the UK, little effort had gone into assessing their impact on the wildlife. Farmland wildlife has already suffered due to intensive farming and there was concern that GM herbicide tolerant crops could make a bad situation worse.

By the summer of 1998, public concern about the health and environmental impacts of GM food and crops was high [5] and in Europe the

French Government had blocked the first European Union Marketing Consent for GM herbicide tolerant oilseed rape because of concern about its impact on the environment.

However, far from respecting the growing demands for a moratorium on the cultivation and import of GM crops and food, the Government chose to enter a voluntary agreement with SCIMAC (see below) on the trialing of the first commercial GM herbicide tolerant crops [6].

In response to the concerns about environmental impacts, the government commissioned a report by its scientific advisors in which it was acknowledged that - "The current status of biodiversity in arable crops is poorly understood." [7] This was the state of affairs when the details of the Farm-Scale Trials for GM herbicide tolerant crops emerged in spring 1999.

What is SCIMAC?

The Supply Chain Initiative on Modified Agricultural Crops (SCIMAC) is an industry body consisting of representatives from farming, the plant breeders, the seed industry and the biotechnology companies. All major biotechnology companies (Novartis, Monsanto and AgrEvo) send representatives to meetings as does the National Farmers' Union. In addition, representatives of the RSPB and English Nature also attend. SCIMAC is responsible for finding farms to take part in the Farm-Scale Trials.

SCIMAC issued guidelines for farmers, seed merchants and wholesalers to follow if they are to be permitted to grow or handle GM

crops or seeds. The guidelines set out how farmers should manage the GM crops from planting to harvest. They include recommendations on minimum separation distances between GM and non-GM crops; dealing with 'volunteer' GM plants growing after the crop has been harvested; consultation with neighbouring farmers; dealing with seed spillages; and the cleaning of sowing, harvesting and storage equipment.

FoE EWNI have published a detailed critique of SCIMAC's code of practice [8] which highlights the problems farmers will have implementing it, the lack of resources for enforcing it as well as the inconsistencies in the monitoring requirements and penalties for non compliance.

The Farm-scale Trials

The Government-sponsored farm-scale trials are being conducted on three GM herbicide tolerant crops:

- AgrEvo glufosinate tolerant fodder maize;
- AgrEvo glufosinate tolerant spring and winter oilseed rape.

Parallel, industry sponsored trials, are being carried out on:

- Monsanto glyphosate tolerant sugar beet.

The purpose of the trials is to test the following hypothesis: that there is no significant difference between the biodiversity associated with the management of GM winter/spring oilseed rape/maize tolerant to herbicides and comparable non-GM crops at the farm-scale.

The trials started in spring 1999 but so far have only been used to work out which study methods will be used [9]. The farm-scale trials were not designed to study cross pollination with nearby crops, nor has any attempt been made to prevent this (other than a requirement for a 50 metre separation distance between GM and other oilseed rape and fodder maize crops). Pollen monitoring commissioned by FoE EWNI at a GM oilseed rape farm-scale trial near Watlington, Oxfordshire, found airborne pollen at more than nine times this distance and in beehives 4.5 km from the site [10].

The farm-scale trials for fodder maize used a variety that was granted a full European Union marketing consent in August 1998. The UK Government's opinion, sent to the European Commission, was that the crop "does not pose a risk in terms of human health and environmental safety for the United Kingdom"[11]. Thus the Government and the Advisory Committee on Releases to the Environment were content to give their full blessing to the growing of AgrEvo's GM fodder maize despite the fact that they now openly admit that its long-term impact on biodiversity was unknown and unstudied.

The Government has refused to use its power to revoke the Marketing Consent until the crop is proven to be safe. This means that the crop can be planted anywhere in the UK without the Government having any control - even over where the crops are planted. Because of this, Friends of the Earth stands by its charge that the farm-scale trials are merely a front for "creeping commercialisation"[12].

To date, SCIMAC has had limited success in securing farms to take part in the trials. In spring 1999, seven sites were announced - three spring oilseed rape and four fodder maize. One oilseed rape site was ploughed under by the host farmer after only a few weeks.

The search for winter oilseed rape sites fared as badly with only three plots being planted. One farmer in Nottinghamshire withdrew from the trials after consulting with neighbours and FoE EWNI. The status of winter oilseed plots was further confused when the Government and AgrEvo conceded a legal challenge from FoE EWNI which showed that the consent given to grow the crop was in fact unlawful.

The Key Players in the Farm-Scale Trials

- **Aventis** (previously known as AgrEvo)

AgrEvo is the biotechnology company responsible, with SCIMAC, for finding farms for the current round of farm-scale trials. AgrEvo is also providing farmers with the GM seeds and herbicide to be used on the GM crop. The company has to apply for Government consent (under the GMO Deliberate Release Regulations 1996) to release each of the crops under trial, until the crop has full EU marketing consent. It must also place an advert in a local paper informing the public of the location of the trial site. Crops with full marketing consent do not have to be advertised locally.

- **DETR**

The Department of the Environment, Transport and the Regions is responsible for funding the research contractors, issuing release

consents for the trials and dealing with applications for marketing consent. DETR also send assessors to the Farm-Scale Trials Scientific Steering Group meetings.

• **The Consultants**

The consultants for the farm-scale trials are the Institute of Terrestrial Ecology (ITE), the Scottish Crop Research Institute (SCRI) and the Institute of Arable Crop Research (IACR). Each organisation is responsible for one crop - ITE for fodder maize, SCRI for spring oilseed rape and IACR for winter oilseed rape.

• **Scientific Steering Group**

The Government has appointed a Scientific Steering Committee to oversee farm-scale trials. The committee is chaired by Professor Chris Pollock of the Institute of Grassland and Environment Research. Professor Pollock is a strong supporter of GM technology [13]. Other members of the committee come from the Game Conservancy Trust, RSPB, Imperial College, English Nature and the Morley Research Centre. The Steering Committee is responsible for final selection of the farms to be used in the trials, agreeing experimental design and methods as well as the publication of peer reviewed results.

What's wrong with the farm-scale trials?

The farm-scale trials have been criticised by a number of organisations (including The Soil Association, Genewatch UK and FoE) for failing to protect neighbouring farmers and beekeepers from contamination with GM pollen. The John Innes Centre reviewed the risk of cross pollination of organic crops on behalf of

MAFF and confirmed that some contamination was inevitable [14].

The British Beekeepers Association [15] have recommended that their members should move their hives six miles from the trials to avoid any chance of honey being contaminated.

At the moment, companies or farmers planting GM crops do not have to consult with neighbouring beekeepers, or even tell them that there is a GM crop nearby. Even if the beekeeper finds out that there is a GM crop, it is up to them to test their honey for contamination. It is very possible that beekeepers have already unwittingly sold GM honey to the public.

The Scientific Steering Committee [16] are aiming for 25 fields for each crop which they will select from a list submitted by SCIMAC. The consultants will examine key indicators of biodiversity, including the soil seed bank, vegetation and a range of invertebrates, including bees. The trials will be conducted on split fields - half GM crops and half conventional crops - of up to 10 hectares (25 acres). The fact that farm-scale trials are taking place at a time when GM crops are moving towards full commercial approval seriously undermines their credibility as regards scientific independence. Other criticisms have been levelled at the way the trials have been designed and conducted.

Lack of Baseline Data

A report by the Pesticide Safety Directorate [17], produced at the request of the Government, clearly illustrates a lack of basic knowledge concerning the biodiversity of the crops being evaluated in farm-scale trials. The report says: "Therefore it is not possible to

make definitive statements as to the current biodiversity status of oilseed rape, sugar beet and maize fields.” The farm-scale trials have gone ahead without attempting to fill this knowledge gap. It would take several years of research to provide the level of information required, for example typical species present, typical population densities and factors which control population densities.

The Size of Plot

The size of each trial plot depends on the field available. The Scientific Steering Committee wants the trials to take place in fields representative of a typical UK field rather than a plot design to suit the purposes of the research. Often this may mean that more GM crops have been planted than are necessary for the research, thereby increasing the risk of cross pollination.

Securing Sufficient Plots

The Scientific Steering Committee has stated that between 20 and 25 fields will be needed for each crop. To date only a handful of farmers have volunteered. Farmers considering taking part will have to weigh up many factors such as the impact of GM crops on the value of their land as well as impacts on their neighbours and local beekeepers. There is doubt that AgrEvo will be able to recruit sufficient farmers to meet the Steering Committee's requirements.

Controlling Variation Between the Trial Plots

Many different factors play a part in the diversity and abundance of wildlife in arable crops, such as soil type, drainage, weather, previous

crops, types of cultivation used in the past, previous pesticide regimes, and the pesticide regime used during the GM trials. Within a large field, such as those being used in the trials, considerable variation in drainage and soil type can occur. Often these very large fields would have been several fields until recently and different crops would have been grown on different sections. All this means that there is likely to be a high level of variation within the trial fields and between them. With such a large number of variables, analysis of the final results will also be more tricky. These difficulties were highlighted in the Interim Report from the consultants [18].

The Interim Report also included discussion of the variable intensity of the pesticide regime being used on the conventional crops. The Steering Committee will attempt to “classify farm management type”. This suggests that rather than a straight comparison between GM and conventional intensive methods there may be an intention to compare GM with several different conventional management approaches (eg, high input and Integrated Crop Management). If this is the case then it brings into question whether 20 to 25 farms will provide a sufficient sample size for these different comparisons.

Long-term Changes to Biodiversity

It is clear that both the consultants and Scientific Steering Committee recognise that some changes in biodiversity take place over a longer time scale than available to the farm-scale trials. It is likely therefore that only major changes in biodiversity will be picked up during the trials. If no significant differences are found in three years then the crops

will be given a clean bill of health. However, major changes may not become apparent until GM herbicide tolerant crops have been grown on the same farm over a prolonged period.

Timing of Herbicide Application

In a study of biodiversity differences between two herbicide regimes on the same crop, the timing of the applications is crucial. In the case of GM herbicide resistant crops, experience of growing them in UK conditions is limited to smaller test plots and trials. The only large scale growing of GM spring oilseed rape is in Canada where soils, climate and types of weeds will be different. The BRIGHT project (Botanical and Rotational Implications of Genetically Modified Herbicide Tolerance) is designed to “provide farmers with practical guidance on the appropriate management of herbicide tolerant crops” [19]. This project would appear to be well placed to advise the Steering Committee independently about when to apply herbicides to GM crops in the UK. The results of the BRIGHT project will not be available until the farm-scale trials are completed.

Difference between Herbicides not Studied

The current generation of GM-crops are tolerant to either AgrEvo's glufosinate or Monsanto's glyphosate. The different herbicides have different effects on plants, animals or invertebrates. For example, Monsanto's Roundup® has been shown to be toxic to earthworms but the farm-scale trial for oilseed and fodder maize do not include any Roundup® Ready Crops at present. In fact, the Scientific Steering

Group has decided to exclude earthworms from the study although: “This does not mean that they are unimportant, rather that there are more suitable experimental approaches which would address the issue of whether management of GM-modified (sic) herbicide resistant crops affect earthworm diversity and soil functioning in general.”

Testing of all varieties to allow for the different toxicology of both herbicides to plants and animals would require double the number of farm-scale trials. It is possible that the Scientific Steering Committee has not addressed this issue in public, perhaps due to the adverse reaction it is likely to create.

Trials are not part of normal crop rotation

Maize is commonly grown year after year on the same field. However, the farm-scale trials are not looking at the effect of growing herbicide tolerant maize in successive years.

Genetic engineers are currently working to develop herbicide tolerance in all arable crops. The benefits of GM herbicide tolerant crops are already being pushed by arable specialists, for example stating that “GMHT varieties...could be extremely valuable where weed problems exist” and pushing “their value in strategic plan to minimise weed burdens across the whole rotation”. It is not clear that these trials will determine robust enough data to prove whether GM herbicide tolerant crops are good or bad for biodiversity. In the commercial future envisaged by the biotechnology industry the UK would be ‘carpeted’ in GM crops and it is very doubtful that the farm-scale trials

will be able to tell us what will happen to UK farmland wildlife in these circumstances.

Scotland's Democratic Deficit

Despite clearly being a devolved power the Scottish Parliament has yet to debate the issue of GM crops and their introduction to Scotland's countryside. On more than one occasion FoE has observed what appears to be mere 'rubber stamping' of decisions taken by Westminster.

In December 2000 FoE wrote to 20 farmers in Scotland and England informing them that GM winter oilseed they were growing at 24 sites – including 3 farm-scale trials – were not covered by a legal consent, and should therefore be destroyed.

The letters followed a court order from the High Court confirming that Government permission allowing the crops to be planted was illegal. The order, resulting from a successful legal challenge by FoE, was not contested by the Government. In Scotland, the Executive buried its head in the sand and refused to take action against the illegal crops.

In February 2000 FoE urged those on the Scottish Rural Affairs Committee to demand that the Committee be given the same opportunity as its Welsh Assembly equivalent to discuss the commercialisation of the first genetically modified seed in the UK. FoE was concerned that the Scottish Parliament was being bypassed and decisions being taken without a chance for MSPs to debate the issue.

Last year FoE Scotland submitted a petition, to the Scottish Parliament calling upon it to "use its powers to ensure that it will not permit the release of GM crops into the Scottish environment unless it can be proven to be safe for the environment and human health".

Summary

The farm-scale trials are not designed to prevent pollen escaping into neighbouring crops or the local environment and should be abandoned. The development of GM crops which will contaminate other crops is not economically or environmentally sustainable. The biotechnology industry should therefore return to the lab to develop sustainable uses of their knowledge of plant genetics.

The results of the farm-scale trials will improve our knowledge of arable crop wildlife but not be robust enough to predict the long-term cumulative impact of GM herbicide tolerant crops grown year after year over vast areas of the UK.

Friends of the Earth Scotland believes that the Scottish Parliament must be given the opportunity fully to debate the pros and cons of GM crops. Until that debate takes place and a plan is clearly put on the table, Scotland's Parliament should put a hold on all GM farm-scale trials.

Friends of the Earth is calling for a minimum Five Year Freeze of the commercial growing and testing of all GM crops to allow a full debate on the need and justification for GM crops.

During the Five Year Freeze the following must be developed:

- a system which allows people to exercise their right to choose products free of genetic engineering;
- public involvement in decisions on the need for, and the regulation of, genetic engineering;
- prevention of genetic pollution of the environment;
- strict legal liability for adverse effects on people or the environment from the release and marketing of genetically modified organisms;
- independent assessment of the implications of patenting genetic resources;
- independent assessment of the social and economic impact of genetic engineering on farmers.

References

1. Department of Environment Transport and the Regions, 1999.
2. Ministry of Agriculture, Fisheries and Food, 1997.
3. Royal Society for the Protection of Birds, 1997.
4. English Nature, 1997.
5. Genewatch/MORI, 1998, Opinion poll results Jul 1998.
6. House of Lords Select Committee on the European Communities, 1998.
7. Pesticide Safety Directorate, 1998.
8. Friends of the Earth, 1999.
9. Firbank L., et al, 1999.
10. Friends of the Earth 1999.
11. DETR, Biotechnology Unit, 1996. Notification for consent to market from a member state, 20th June 1999.
12. Friends of the Earth, Press Release 21 May 1999.
13. Farmer Review, January 1999.
14. Moyes, C.L. and Dale, P. J. 1999.
15. British Beekeepers Association, 18th October 1999.
16. The Farm-Scale Evaluation Scientific Steering Committee consists of six members from RSPB, Imperial College, Game Conservancy Trust, Morley Research Centre and English Nature chaired by Professor Chris Pollock of the Institute of Grassland and Environment Research.
17. Pesticide Safety Directorate, 1998.
18. Firbank, L. 1999
19. MAFF, 1998 Press Release 14th October 1998.
20. See Cox, C., 1995, Glyphosate Part 2: Human Exposure and Ecological Effects.
21. National Institute for Agricultural Botany, 1999. GM Crops a reality, Landmark The Journal of the NIAB January 1999.
22. May, Sir R., 1999, Sunday Express, 14th Nov 1999.

4. Bees, honey and GM crops

Bees are extremely important to the pollination of UK crops, particularly oilseed rape and beans. In the UK there are estimated to be between 100,000 and 300,000 hives, working out at one hive per square kilometre. A hive may contain up to 50,000 bees and individual bees may visit up to 100 flowers on each trip out from the hive. The value of honey bees' services as pollinators in the European Union has been estimated at around £3 billion per year.

GM crops are very near to being grown commercially. GM maize and oilseed rape varieties are in the last stages of the regulatory procedure which will allow them to be grown anywhere in the UK. A farming industry organisation, the Supply Chain Initiative on Modified Agricultural Crops (SCIMAC) has developed guidelines for farmers growing GM crops. But there are no provisions within these for protecting beekeepers from contamination with GM pollen, or even to inform them if GM crops are to be grown in their area.

In 1999 the government started a series of 'farm-scale trials' of GM herbicide tolerant crops. Each of these GM crop trials covers 10 hectares (25 acres) and it is planned to have at least 25 sites each for GM crop involved - winter and spring oilseed rape, maize and sugar beet. These trials are meant to examine the environmental effects of GM crops, but they have not been designed to prevent pollen escaping from the test sites or to protect nearby beekeepers from contamination of their honey.

GM Crops

Oilseed rape is an extremely important crop for bees and beekeepers. It is the crop to which commercial hives are most often moved, and pollination contracts for oilseed rape provide an important source of income to many beekeepers. It is very attractive to bees, and has 'sticky' pollen, which the bees can get covered in. Most GM oilseed rape in the UK has been engineered to resist herbicides.

GM maize is also close to commercial production and being growing at farm-scale trials. Bees collect pollen for food and in the US it has been found that pollen from maize fields can make up to 20% of the total collected by bees from nearby bee hives.

Is GM Honey safe?

Genetic engineering is imprecise and unpredictable. Genes are inserted from organisms which have never been eaten as food, and so new proteins are introduced into the human and animal food chains. There is concern that these could cause allergic reactions or other health effects.

A study by Government researchers found that there are between 20,000 and 80,000 pollen grains in a portion (10g) of shop bought honey. There are already cases of people who are allergic to honey, and this has been linked to pollen in the honey. The novel proteins or toxins produced by GM crops may also be in the pollen they produce. This means that honey containing GM pollen could pose a

potential health risk. The researchers who studied this problem concluded that if GM pollen contained novel toxins or proteins it “could pose problems, not only to man who consumes honey as a food, but also to bee populations which rely on pollen as the sole source of protein”.

Research has found that bees can pass proteins unchanged from nectar into honey. If GM crops produce novel proteins or toxins in the nectar as well, this may further threaten the safety of honey produced from GM crops.

GM plants may also contain genes which provide resistance to commonly used antibiotics such as ampicillin. There is concern that these could be passed onto the bacteria that live in humans and animals. DNA from pollen has been found to be able to survive in honey for seven weeks, it may be that this could be a route for such gene transfer.

In spite of the risks, there has been almost no safety testing of GM pollen, either for humans or for bees. Even the food safety tests of GM crops have been limited to short-term tests on animals. The Government's advisors on the safety of GM foods rely on results of tests conducted by the GM companies themselves.

Recently Dr Andrew Chesson, a leading food scientist from the Rowett Research Institute, expressed concern that current safety tests may be insufficient to detect new, unexpected chemicals in GM foods. Although the Government is conducting its own independent research into GM food safety, the results are not yet published.

Bees and gene pollution

Honey bees commonly forage up to 2 km from the hive, but oilseed rape fields are such an attractive source of nectar, that bees may travel at least 5km to get to them. In a recent study, a bee hive was placed 800m from a field of GM oilseed rape. When the oilseed rape was in flower, it made up 70% of the pollen that the bees carried back to the hive. One bee returning to the hive had 60,000 oilseed rape pollen grains stuck to its body. As the bees brush past each other in the hive any GM pollen is spread throughout the colony and taken out again by other bees.

In summer 1999, Friends of the Earth commissioned research to study this issue. The researchers put pollen samplers on the entrances to beehives around a 10 hectare farm-scale test site of GM oilseed rape. The pollen samplers measured how much pollen the bees were carrying into the hive. The beehives were 150m, >2km and >4km away from the test site. GM pollen was found in all the samples from the different beehives, including the one furthest away. The results show that even if a beehive is >4km from a field of oilseed rape, the honey can still become contaminated with GM pollen. This has serious implications for all beekeepers.

Not only are bee hives which are near to GM oilseed rape fields likely to become contaminated with GM pollen, but the bees may spread GM pollen to non-GM crops several miles away. It is likely that in the future farmers will be growing oilseed rape for the 'GM free' market. In such cases, contamination of the crop could cause financial loss to the

farmer. At the moment it is unclear who would be held liable for this, and whether the bee keeper might be held responsible as well as the farmer who grows the GM crop.

Impact on Beekeepers

At the moment, companies or farmers planting GM crops do not have to consult with neighbouring beekeepers, or even tell them that there is a GM crop nearby. Even if the beekeeper finds out that there is a GM crop, it is up to them to test their honey for contamination. Because of this, it is very possible that beekeepers have already unwittingly sold GM honey to the public.

The former Food Safety Minister Jeff Rooker stated that honey containing GM pollen would have to be labelled before being sold. But this only applies to honey containing pollen from GM crops which have gained permission to be sold as food. GM test sites, including at present the farm-scale trials of GM oilseed rape, grow GM crops which have not yet got such permission. In these cases, the law states that any GM material from them cannot be sold in food, including GM pollen. This means that if honey becomes contaminated with pollen from a test site or the farm-scale trials it could be illegal to sell it.

As it stands, GM crops pose a serious threat to beekeepers and honey production in the UK. Honey contaminated with GM pollen will either have to be disposed of safely or sold as a GM product. Either of these options is likely to cause financial harm to beekeepers. Despite this, there is no system to ensure that beekeepers are consulted about GM crops growing nearby nor are there any provisions for com-

penation in the event of financial losses which might result.

Impact on Wild Bees

Wild bees are vital for the survival of many of our native plants, as well as being important for crops. Some plant species are dependent on wild bees for their pollination and survival. Several species of bumble bees and solitary bees are also important pollinators for food crops.

Bumblebees are very important in the UK as they fly around at lower temperatures and in worse weather than honey bees. In addition, bumble bees are best able to pollinate some wild flowers, such as foxgloves. Natural populations of bumble bees are in decline in the UK and across the EU. Solitary bees are bees that live on their own, rather than in hives or nests. There are several hundred species across Europe, but very little is known about them apart from the fact that, like bumblebees, they are in decline.

The decline of bumble bees and solitary bee populations has been linked to modern intensive farming. The widespread use of herbicides and the increased intensity of farming has removed the habitats that wild bees make nests in, and reduced the numbers of wild plants which they use for food. There is concern that the introduction of GM herbicide tolerant crops, such as oilseed rape, will reduce still further the diversity and number of wild plants found in UK farmland. Such concerns have been expressed by the Government's own wildlife advisors, as well as the RSPB and the Wildlife Trusts. The widespread use of GM herbicide tolerant crops is likely to further threaten wild bee populations.

Summary

It is clear that growing GM crops in the UK will pose a serious threat to beekeepers and honey production. Issues around food safety, liability, the cost to beekeepers and the threat to wild bee populations have yet to be resolved. Vital questions need to be answered and there needs to be a full public debate on the acceptable uses of genetic engineering.

Friends of the Earth is opposed to the untested introduction of GM crops and foods in the UK. We believe the current farm-scale trials of GM crops to be flawed and an unnecessary risk to the environment. FoE is calling for a full public debate on the future of farming and how our food is produced. A moratorium, or freeze, is urgently required.

5. Farm-scale trials

How you can help stop the crop

This guide will help you if you have a farm-scale trial of GM crops in your area or wish to object to plans to trial GM crops in Scotland. Exactly what you choose to do is up to you, and will depend on the time and people you have available. You might be able to do only some of the actions included here, or there might be other actions you wish to take.

OBJECTION LETTERS

The GM oilseed rape must be advertised in your local paper under the Public Notices. There is a short 'objection' period. We encourage you to object to the trials.

Please send a letter of objection yourself, and also encourage neighbouring farms and beekeepers to object to the trials. Send your letters to the DETR Biotechnology Unit - the address is on the example letter included in this pack. You can use the example letter as it is, or adapt it in your own words. It would be useful to copy your letter to the Scottish Executive – details are provided.

PERSUADING THE FARMER

The farm-scale trials rely on farmers volunteering to host the trials on their land. We suggest you concentrate on persuading these farmers that their neighbours and other local people are against the growing of GM crops. In the past this has succeeded in getting farmers to pull out of some trials, because of the strength of local feeling.

If enough local people show their opposition, this sends a strong message to farmers running trials that their neighbours don't like it. Please send a letter to the farmer politely urging her or him not to proceed with the trial.

PUBLIC MEETINGS

Organise a public meeting to show local feeling about the trials, and to discuss whether we want GM food at all. You could invite the farmer hosting the trial to answer your objections or concerns publicly.

KEY MESSAGES

The GM trials pose an unnecessary risk to our environment.

There isn't a market for GM crops, so why waste tax-payers money on them?

Farmers must have the right to grow organic or GM-free if they want. These trials may affect their ability to do so.

Further campaigning

You can also write to ROSS FINNIE MSP (Rural Affairs Minister) or SARAH BOYACK MSP (Transport and Planning Minister) and to your own MSPs.

All MSPs can be contacted at:
Scottish Parliament, Edinburgh EH99 1SP

To find out which MSPs represent you call the Parliament Information Line on 0845 278 1999.