RE: THE PROPOSED DECISION TO ADD 'CHARDON LL' TO THE NATIONAL SEED LIST

Written representations pursuant to and expressive of a desire to be heard for the purpose of Regulation 21 of the Seeds (National List of Varieties) Regulations 1982.

by

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for

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Address until 30 April 2000

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1. Establishment of Sufficient Interest.

As the name of our organisation implies, the purpose of Scientists for Global Responsibility (SGR) is to promote the responsible use of science. We believe that it is premature to allow this maize to be grown commercially, as it presents many risks to human health, animal health and the environment. At the same time, there is no clear advantage either to the animals that will eat it or to the British consumer of the products to be derived from these animals. The only advantage will accrue to the biotechnology companies and partner organisations, from any profits obtained by selling the seed and the chemicals they require.

The organisation was founded in 1992 and has about 650 members.

Our interest in issues pertaining to genetic engineering began with a conference on 'Genetics and Ethics' that we held on 11 November 1998. In June 1999, we issued a position statement on genetically modified foodstuffs. We have also reviewed a number of books on the subject.

In view of the fact that the forage maize under consideration is destined for cattle, whose meat and milk will be consumed by human beings, consideration must be given to this maize also as a component in the human food chain. The following points from our statement of June 1999 are particularly relevant to this representation:

1. Preamble

1.2 … [The] majority of members did not feel the implications of genetic manipulation of plant materials destined for human or animal consumption had been sufficiently investigated, either in terms of their potential impact on consumer health or of their possible environmental impacts. Doubts were voiced whether any trials could ever be sufficiently comprehensive or extensive to ensure satisfactory identification of potential difficulties in terms of unforeseen side-effects from these unprecedented methods of experimental interference in gene-lines, and in all cases it was felt that the technology and its products had not been tested adequately enough to be considered safe for release into the environment.

1.4 A moratorium on the commercial release of GM crops into the British countryside …
[was] considered essential.

In view of these concerns:

2.1 SGR oppose categorically the development and release of any GM crop into the British countryside for commercial purposes until comprehensive, public, transparent and disinterested research has been carried out demonstrating that the crops in question are safe for release into the European environment.

2.7 SGR calls on the Food Standards Agency, on the Agriculture Minister and on the Minister for the Environment to adopt the Precautionary Principle in all their dealings regarding the development and distribution of GM foodstuffs and plants. Their attitude should be that at all times the onus is on biotechnology organisations to prove the safety of their work and of any products which might result from this work, through the conduct of safe, transparent, environmentally segregated and long-term testing programmes conducted under government supervision.

3. Conclusions

3.1 The production of food is the right of each individual, as is the right to determine what s/he consumes. Genetic manipulation of food crops which have hitherto evolved or been developed through traditional means for the sole profit of biotechnology companies and allied organisations, and which carry with them …
- the potential for threatening the livelihood of other sectors of society,
- the potential for threatening the health and safety of consumers,
- the potential for threatening the integrity, health and safety of organisms in the natural
environment,
… should not be permitted.
The distribution of such materials into the food-chain should not be the automatic right of any company with the wherewithal to do so.

3.2 The implications of the safety issues surrounding GM foods, particularly in terms of their environmental impacts, are potentially so far-reaching that the profit motive alone should not be considered an adequate justification for conducting such technology.

As individuals, we are consumers of dairy products, beef and honey. We are entitled to have the possibility to choose whether or not to consume GM food. Since animal feeds are not normally segregated into GM and non-GM varieties, we shall be deprived of this choice when buying dairy products and beef. Honey grown within several kilometres of a farm growing GM maize may contain GM pollen collected by bees.

2. Our Concerns.

A. Contamination of other maize varieties by GM pollen

'Maize pollen is produced in enormous quantities. … Estimates for the numbers of pollen grains produced by an average-sized plant range from 14 million (Miller 1985)[1] to about 50 million (Miller 1985).' [2]

'Published data for the length of time that maize pollen remains viable under natural conditions differs from about 24 hours through to several days. In artificially warm conditions or exceptionally hot weather this time could be reduced to a few hours.'[3]

Pollen grains from maize can travel long distances on the airflow, during the time which it remains viable. The distance covered depends on factors such as weather conditions, presence or absence of convection currents (which may raise the pollen to high altitudes for wide dispersal) and turbulence, and passage of weather fronts. 'The usual length of time available for pollen to travel as it is kept aloft by convection is a maximum of one day. This would be equivalent to a distance of about 50-180 km, although it is well known that much longer transports do occasionally take place (Faegri & Iversen, 1989)[4] when suitable meteorological conditions occur. … Once pollen has arrived in the upper atmosphere it can travel for many hundreds of kilometres on the airflow until finally being deposited … Winds of 10 m/sec would give rise to turbulent conditions in the boundary layer keeping some pollen airborne for longer than in non-turbulent airflows. If the pollen remained airborne it could travel 36 km in an hour and nearly 864 km in 24 hours.'[5]

With such widespread dispersal of GM pollen, it will be difficult (if not impossible) for organic farmers to grow maize in the United Kingdom. The tolerance of 1% of GM pollen allowed in 'non-GM' crops does not meet the stricter standards of organic farming. Yet it is organic produce for which demand by consumers is rising rapidly in this country.

B. Detrimental effects on bees and on biodiversity

'Although corn is wind pollinated it produces such copious amounts of pollen that it is highly attractive to bees, both honey bees and a wide variety of solitary bees.'[6]

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[1] Miller, P.D., 1985, 'Maize Pollen: Collection and Enzymology', Chapter 45, pp.279-282, in: Sheridan, W.F. (ed.), 1985, *Maize for Biological Research.* A Special Publication of the Plant Molecular Biology Association, U.S.A.

[2] Dr Jean Emberlin, 'A Report on the Dispersal of Maize Pollen', compiled for the Soil Association, January 1999

[3].ibid.

[4] Faegri, K. and Iversen, J., 1989, *Textbook of Pollen Analysis*, 4th ed., John Wiley and Sons Ltd.

[5] Dr Jean Emberlin, 'A Report on the Dispersal of Maize Pollen', compiled for the Soil Association, January 1999.

[6] Novakowski, J. and Morse, R., 1982, 'The behaviour of honey bees in sweet corn fields in New York state', American Bee Journal, January, pp. 13-16..

Maize pollen is transported by bees and flies, as well as by wind. Friends of the Earth commissioned a study in the summer of 1999 and found that bees carried pollen to hives at least as far away as the furthest hive in the test area, 4.5 km distant from the field of oilseed rape from which the bees were collecting pollen.[7] It is clear that bees can cross-pollinate maize varieties and that honey can be contaminated with GM pollen.

Friends of the Earth further states[8]: 'The decline of bumblebees and solitary bee populations has been linked to modern intensive farming[9]. 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 [and maize], will reduce still further the diversity and number of wild plants found in UK farmland. Such concerns have been expressed by English Nature, the Government's own wildlife advisor, as well as the Royal Society for the Protection of Birds and the Wildlife Trusts.'

The Submission[10] made by AgrEvo for approval of Aventis T25 maize mentions interactions with the environment only briefly, saying in essence that no differences in comparison with conventional maize fields had been noticed. Reference is made to reports in Appendix 13, which, unfortunately, has been excised on grounds of confidentiality. It is puzzling why reports of favourable outcomes of observations should be kept secret.

'Elizabeth Sickl, Austrian minister in charge of food safety and inspection, was cited as saying … that the country banned imports of Aventis' genetically-modified maize on the grounds there were no available studies on the long-term impact the crop would have on the environment, adding, "Austria is no laboratory and it is of utmost concern that we maintain Austria as a provider of produce of the highest quality for the whole European market."'[11] Britain should maintain no lesser standards.

C. Reluctance of animals to eat GM crops

Animals have been shown to have a preference for organically grown feed over conventionally grown feed. This fact was 'clearly recognisable' in five out of six studies on the feed consumption behaviour of animals; the various tests were made on mice, rats, hens or rabbits.[12]

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[7] Briefing prepared by Emily Diamand of Friends of the Earth, 'Bees, Honey and Genetically Modified Crops', September, 1999.
[8] *Ibid.*
[9] Williamson, I. 1996, 'Aspects of bee diversity and crop pollination in the European Union', in: Matheson, A., Buchmann, S.L., O'Toole, C., Westrich, P. and Williams, I., (eds.), *The Conservation of Bees*, Academic Press, pp. 63-80.
[10] J.F. Sarrazin, for AgrEvo France, 'Submission for Placing on the Market (in Accordance with the Part C of the Directive 90/220/CEE) of Glufosinate Tolerant Corns (*Zea mays*) Transformation Event T25', 1996, in the Public Register at the Department of the Environment, Transport and Regions (DETR).
[11] Reuters, 13 April 2000, 'Austria bans Aventis' gene-modified maize'.
[12] Woese, K., Lange, D., Boess, C and Bogel, K.W., 1997, 'A Comparison of Organically and Conventionally Grown Foods --- Results of a Review of the Relevant Literature', J. Sci. Food Agric., *74*, 281-293.

It is therefore not altogether surprising that animals should also discriminate between genetically modified food and conventionally grown food, as in this case the crop itself has inherent differences. In America, a study[13] on laboratory mice demonstrated that, when offered a choice of GM maize or conventionally grown maize, 16% less of the GM maize was consumed. The mice also spent much less time around the feeding station offering GM maize than around the feeding station offering conventional maize.

A large amount of anecdotal evidence exists that cattle and other animals are reluctant to eat GM food, and that they do not thrive when forced to eat it. Scientists in America report that[14], over the past few years, there have been dozens of instances of farmers telling them that cattle fed on maize or soya sometimes suddenly stop eating. When the farmers investigate what was in the feed, they learn that the crop was genetically modified. Switching back to conventionally grown crops quickly solves the problem. Further cases of animals refusing to eat genetically modified crops have been reported by an American journalist, Steven Sprinkel, who spent four months interviewing farmers. He reports[15]:

- Cattle put out into GM corn stubble would not touch it.
- Pigs would not eat the ration when GM crops were included.
- A farmer said, 'If you want your cattle to go off their feed, just switch them out to a GM silage.'
- A farmer said that his cattle broke through a fence and ate the non-GM hybrids but would not touch the GM Roundup Ready corn, even though they had to walk through the GMs to get to the non-GMs on the other side of the fence.
- A cattleman saw the weight-gain of his cattle fall off when he switched to GM feed.
- An organic farmer with a terrible deer problem on his soy beans found forty of them mowing down his tofu beans while across the road there was not one eating the Roundup Ready GM soy.
- Raccoons romped by the dozen in a field of organic corn, while down the road there as not one ear that had been touched in the Bt fields.
- Even mice will move down the line if given an alternative to GM crops.

Sprinkel asks, 'What is it that they know instinctively that most of us ignore?' That question should be thoroughly investigated before long-suffering cattle and farmers in the UK are presented with yet another unusual diet that may have serious consequences.

[13] [Details of the reference are being sought]
[14] Reported by scientists who work actively with the farming community in the U.S.A., 2000.
[15] [Details of the reference are being sought.]

D. Dangers of glufosinate ammonium to human health, animal health and the environment

The herbicide to which Chardon LL has been engineered to be tolerant, glufosinate ammonium, has been linked with birth defects[16] including brain defects, cleft lip, skeletal changes and damage to the kidneys and urethra. It has caused miscarriage and reduced conception.[17] Such damage is too high a price to pay for any advantages a new variety of maize may have.

E. Dangers of using CaMV as a promoter

Cauliflower mosaic virus (CaMV) promoter is used in this maize. Considerable controversy has been generated amongst geneticists as to the risks posed by use of this promoter since the publication of a paper[18] pointing out serious hazards. Critics[19] claim that the virus already infects many cruciferous vegetables that are produced conventionally and sold in the marketplace; and, since no problems have arisen, there is no cause for worry. They have ignored the fact[20], however, that the naturally occurring virus differs from that used in genetic engineering: not only does the natural form have a protein coat that severely restricts the species it is able to infect, but in the genetic context of its natural host the viral promoter has been stabilised over millions of years --- unlike the situation in which it is placed into an unstable, artificial construct that has never existed before in nature and whose properties are as yet only superficially known. The 'naked' form employed by geneticists is used precisely because, having been divested of its coat, the promoter is easily able to invade a wide spectrum of plant cells.

Natural CaMV cannot enter mammalian cells, but the 'naked' form is a very strong promoter and, once inside a mammalian host, might recombine with fragments of DNA in the bacteria or viruses in the gut of the host. The presence of a 'recombination hotspot', a point at which the DNA fragments or recombines easily, makes this much more likely. The danger is then that the viruses could be reconstructed, or even that new viruses could be created, which would infect the host by horizontal gene transfer.[21] Such
transfer has already occurred from transgenic sugar beet to soil bacteria.[22] Although the probability of transfer may be extremely small, the infectivity and virulence of the new type of virus can be great; and the possibility that new diseases might arise

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[16] Fujii, T. and Ohata, T., 1994, *J.Toxicol. Sci., 19*, 328; Watanabe, T. and Iwase, T., 1996, *Terat. Carcinog. Mutagen*, 1996; Watanabe, T., 1997, *Neurosci. Lett., 222*, 17; Watanabe, T., 1995, *Teratology, 4*, 25B.

[17] [Reference being sought.]

[18] Ho, M.W., Ryan, A and Cummins, J., 1999, 'Cauliflower Mosaic Viral Promoter – A Recipe for Disaster?', *Microbial Ecology in Health and Disease, 11*, 194-197.

[19] *E.g*., Hull, R., Covey, S.N. and Dale, P., 'Genetically modified plants and the 35S promoter: assessing the risks and enhancing the debate', *Microbial Ecology in Health and Disease*, to be published

[20] Ho, M.W., Ryan, A and Cummins, J., 'Hazards of Transgenic Plants Containing the Cauliflower Mosaic Viral Promoter', *Microbial Ecology in Health and Disease*, to be published

[21] *Ibid.*

[22] Gebhard, F. and Smalla, K., 1998, 'Transformation of *Acinetobacter* sp Strain BD413 by Transgenic Sugar Beet DNA', *Appl. Environ. Microbiology, 64*, 1550-1559.

cannot be discounted.[23] 'Within the past 20 years, drug and antibiotic resistant infectious diseases have come back with a vengeance. *Geneticists have confirmed that the diseases are due to new viral and bacterial strains that have been created by horizontal gene transfer and recombination.*'[24]

Because no proper monitoring exists, it is impossible to trace the origin of any new disease or strain that may appear. But unless the possibility that the CaMV promoter is a culprit has been eliminated by proper scientific studies, it would be folly to assume that it is not.

The dangers can be summarised as follows[25]: '… based on currently available evidence, there was a real and significant danger of genetic pollution of other crop plants and weeds from the maize crop on trial in Application 96/R13/6 [Aventis T25 maize]. The construct could also pass from plant material into the guts and cells of animals eating it, together with the inactivated form of glufosinate (N-acetyl-phosphoinothricin),which can then be converted to glufosinate, known to be a neurotoxin and a teratogen. There are clearly potential hazards associated with this approach to weed control that need to be much more fully examined.'

F. Possible danger from the use of the ampR marker gene.

Only a deleted fragment of the ampicillin resistant marker gene is used, which, on its own, is non-functional. Nevertheless, the possibility remains that it might combine with other fragments that would cause it to be re-activated.

A MAFF official, Mr N. Tomlinson wrote to the U.S. Food and Drug Administration
to warn that antibiotic-resistance marker genes could interact with human bacteria and viruses and create antibiotic-resistant diseases.[26]

G. Lack of testing of effects on health of cattle and of humans eating meat/dairy products.

A paper by the Advisory Committee of Releases to the Environment (ACRE) Secretariat[27] concludes that 'We are satisfied that the GM crops used in the evaluations are themselves no more hazardous to human health and the environment than are conventionally bred crops with similar traits.' However, it is difficult to see on what evidence this conclusion is based. Tests on rats and chickens are mentioned, and it is stated that the animals were fed the T25 maize. However, the Submission by AgrEvo[28] mentions only that the PAT protein was fed to two of four groups of ten rats

[23] Ho, M.W., Ryan, A, Cummins, J. and Traavik, T., January 2000, 'Unregulated Hazards: "Naked" and "Free" Nucleic Acids', ISIS Report (Institute of Science I Society).
[24] *Ibid.*
[25] Prof. B.C. Goodwin, Expert Report on Horizontal Gene Transfer, Soil Assoc., 12 May, 1999.
[26] Letter from N. Tomlinson of Additives and Novel Foods, Branch C of Ministry of Agriculture, Food and Fisheries (MAFF) to U.S. Food and Drug Administration (FDA), 4 December 1998.
[27] Advisory Committee on Releases to the Environment (ACRE), document ARD 05-00, 2000, 'Regulatory Evaluation of Herbicide Tolerant Maize (T25) Under Directive 90/220/EEC)'.
[28] J.F. Sarrazin, for AgrEvo France, 'Submission for Placing on the Market (in Accordance with the Part C of the Directive 90/220/CEE) of Glufosinate Tolerant Corns (*Zea mays*) Transformation Event

each[29], over a period of 14 days: the maize itself was not fed in those experiments. Since genetic constructs outside the context of the organism (maize) may behave very differently than if they were contained within the genetic structure of the maize itself, the very nature of the tests was invalid. Furthermore, 'statistical significance' has little meaning when such small numbers are involved. Finally, feeding over only 14 days could show only gross effects, and any long-term effects would not be observed. It may also be noted that cattle, for which maize is intended, have very different digestive systems from those of rats. Thus the test made has little relevance in the present context.

'The BMA believes that any conclusion upon the safety of introducing genetically modified materials into the UK is premature as there is insufficient evidence to inform the decision making process at present.'[30]

H. Doubts over benefits

The desired advantage of growing the new maize variety is that it should reduce the amount of chemicals used. There is reason to be cautious about whether this advantage will materialise in practice. A comparison[31] of the performances of conventional hybrids of oilseed rape with transgenic oilseed rape tolerant of the same herbicide as the GM maize under scrutiny shows that the mean yields from the GM crop were lower, showed a higher degree of variability and usually cost more to produce when herbicides were used than when they were not used; any small gain in yield offered by weed control with the herbicide was more than offset by the cost of the herbicide. The financial disadvantage of the use of the herbicide would have been even greater had the extra premium paid for the GM seed been taken into account.

A study[32] published by the U.S. Department of Agriculture found no increase in yields of commercial crops of GM varieties of cotton, maize and soya over yields of conventional varieties in 12 of the 18 regions investigated in 1997 and 1998. In 7 of 12 regions, the same amount of pesticide was used on the GM crops as on the conventional crops. These GM crops, too, had presumably passed all trials and tests required.

A review[33] of more than 8,200 controlled university-based trials of varieties of soya beans led to the conclusions that (1) on average, the best conventional varieties yielded on average 6.7% more than the best Roundup Ready varieties, while in some areas of the Midwestern U.S.A. the figure rose to 10%; (2) several times more

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T25', 1996, in the Public Register at the Department of the Environment, Transport and Regions (DETR), p. 49.

[29] Pfister, Th., Schmid, H., Luetkemeier, H., Biedermann, K., Wilson, J. and Weber, K., RCC Project 616307, 'PAT-Protein: Repeated Dose Oral Toxicity (14-day Feeding) Study in Rats', Preliminary Draft Report, 8 February 1996, p. 12.

[30] The British Medical Association, Board of Education, '*The Impact of Genetic Modification on Agriculture, Food and Health: An Interim Report*, May 1999, p. 6. No new statement has been issued

[31] Aspects of Applied Biology, *55*, 1999, 'Production and Protection of Combinable Break Crops'.

[32] *New Scientist*,

[33] Dr C. Benbrook, AgBioTech InfoNet Technical Paper no.1, 13 July 1999, 'Evidence of the Magnitude and Consequences of the Roundup Ready Soybean Yield Drag from University-Based Varietal Trials in 1998'. (Available at www.biotech-info.net/RR_yield_drag_98.pdf)

herbicide per acre was used for Roundup Ready soya as compared with other soya varieties; and (3) the amount of Roundup used rose sharply in 1999, partly because weeds tolerant of Roundup had emerged.

In Canada, where various GM varieties of oilseed rape dependent on different herbicides were grown in proximity, volunteers appeared that were resistant to all three of the herbicides: Roundup, Liberty (glufosinate ammonium) and Pursuit.[34] The GM varieties had been approved for farming only 5 years earlier.

It has been disclosed that some data from the 1999 trials of Chardon LL had been falsified.[35] A crucial parameter, the amount of dry matter, had been reported as a higher figure than the actual data merited. The Ministry documents state: 'An employee of Grainseed [acting as an agent for the British Plant Breeders Society] altered the data from the … trials at Crewe so that they appeared to be within protocol for dry matter at harvest. It appears that he then went on to manipulate the data on individual varieties which had the effect of increasing the dry matter yields of some and decreasing those of others.' The Cabinet Office then responded that 'all the affected data from this year was discounted … and had no bearing on the proposed list[ing] of Chardon LL '. Thus, not only has a large portion of the data, originally considered requisite before approval for the Seed List could be granted, been removed from the assessment, but the very fact that falsification had been necessary in order to meet the protocol means that the variety has performed too poorly to be approved. This poor performance is, in itself**, sufficient grounds to withdraw the decision to approve Chardon LL** for the National Seed List.

These written representations are made without prejudice to how Scientists for Global Responsibility may wish to present our case at any hearing or at any other administrative or legal proceedings concerning this Listing decision. We reserve the right to make further points at any such hearing or in any such proceedings.

[34] Mary MacArthur, Camose bureau, 10 February 2000, as reported on the website www.btinternet.com/~nlpwessex

[35] Andrew Barnett, *The Observer*, 16 April 2000. Internal minutes from the Ministry of Agriculture were obtained by the newspaper.