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Dear Sir

The scoping note is a strong basis from which the Strategy Unit can work. I have tried to restrict my reply to additional information and amplifications of the various subjects to be considered. In particular the expertise of my group is plant parasitic nematode control. We research GM approaches for the control of plant parasitic nematodes for UK and world agriculture. Our funding comes from BBSRC, industry, DEFRA, SEERAD and EU.

The points I wish to make at this stage are attached below.

Yours sincerely

Howard Atkinson  
*Professor of Nematology*

## Response to invitation to submit views on initial questions

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### 7.1.1. Additions to broad categories of costs and benefits in report

- The UK is self-sufficient in most of the food we can produce. Do we wish to maintain this position or become more import dependent? Those who seek directions for UK agriculture that require more extensive use of land are either supporting increased imports or relying on conserving wildlife increasingly within an expanding farming landscape. GM technologies that are biosafe and reduce the current negative environmental impact of farming can also support bioconservation within the agricultural landscape. Importantly, they can also the land needed to maintain the current UK level of self-sufficiency and so underpin a policy of reverting land of under represented habitats to managed wilderness.
- Government should not move in the directions that increase the cost of food given that 1 in 7 Europeans live in Poverty (EU statistics). The demand from many consumers is cheap and safe food.

### 7.1.2 Main costs and benefits to be within each of the overall categories

- One weakness of the scoping note is the failure to appreciate that each transgene requires examination on a case by case basis. The hazards associated with each opportunity need to be considered and the real risks defined and evaluated.
- Unfortunately too much emphasis has been placed on the two nearest products to the market, Bt and herbicide resistance. There are risks as well as benefits from use of herbicide resistance crops particularly loss of habitat in headlands and fields for insects and the birds that feed upon them. Overemphasis on this particular case has damaged the broader case for GM crops.
- The case by case study extends to the target crop. Those with wild relatives to which they hybridise (carrots) and those that are naturally weedy (Oil seed rape) are distinct groupings. A more interesting group are those that lack wild relatives and are not weedy (maize) and even more interesting are those are not weedy and also lack the need for fertilisation processes (e.g. potato).

### 7.1.3 What information do you have to enable SU to quantify these costs and benefits

I hope you will call for all the information we have on transgenic control of *Globodera* on potato in UK. We have about 10 years of research data funded by BBSRC, DEFRA, SEERAD and industry. We can provide a list of reports and publications. The key points are:

1. *Globodera* (a potato cyst nematode; PCN) causes 9% losses to UK potato yields (DEFRA).
2. Currently control too often depends on nematicides like aldicarb that pose severe risks to the environment and human health when misused. They act by inhibiting acetylcholinesterase and so are also highly toxic to mammals and many other animals.
3. Other approaches to control such as resistant cultivars and rotation are inadequate alone. Organic farming either accepts losses or requires more extensive cropping regimes.
4. The technology we have developed to-date provides partial control of PCN sufficient to replace aldicarb in 4 year rotations. It can provide full control additively with natural resistance genes.
5. The approach is biosafe and environmentally beneficial
  - It relies on cystatins from plant. They inhibit cysteine proteinases and reduce the ability of the nematode to digest protein in their diet.
  - Plant cystatins already occur in our food (e.g. rice and maize seeds, pineapple) and similar proteins occur in other food e.g. egg white has high levels. Cystatins also occur in our saliva and is swallowed continually by all.
  - Cystatins lack mammalian toxicity because cysteine proteinases are not digestive enzymes in higher animals. In addition, work done by an independent toxicology company (report available on request) have shown a) a lack of toxicity and b) a lack of allergenicity. The cystatin is rapidly digested by mammals. Some potatoes off supermarket shelves are more allergenic than our transgenic lines. This is because papatin (a natural protein of potato) is an allergen and its levels varies between cultivars and as a result of growing conditions. Products should be studied for the risks they pose independent of their method of production.
  - We have shown that our plants pose no risk to those non-target invertebrates studied to-date.
  - We are able to restrict expression of these safe proteins to roots only. Therefore the green parts of the transgenic potato plant pose no additional risk to most herbivores.

- We have recently shown that the effects on soil fauna and flora is insignificant in relation to effects of potato genotype or seasonal changes.
- Work still in progress suggests that earthworm population is significantly higher in soils supporting our GM potatoes than those receiving aldicarb to control nematodes.
- We accept that any potato field is not a biodiverse environment but our GM approach will not harm birds and other animals present. In contrast, aldicarb granules are lethal to birds and are used illegally to kill birds. Removal of legitimate reasons for such poisons on farms would eliminate one poison currently commonly used illegally to kill raptors.

#### **7.1.4 How do you weigh each of the categories of costs and benefits in the report**

##### *Costs and benefits in GM product chains*

- I assume market forces will decide this. If a GM seed is too expensive relative to its benefits to producers taking into account any new EU regulations then farmers will not choose to buy.

##### *Costs and benefits to conventional product chains.*

- This needs to be considered on a crop-by-crop basis in relation to isolation distance needed for each crop. The issue of "contamination" also impinges on public perception of GM and the misinformation campaigns that have been mounted.

##### *Organic farming movement*

- The definition of "organic" is arbitrary. Any scientific definition would of course include GM crops but exclude some of their current practices. Such producers have a right to produce distinctive products and to market them. However they do not have the right to misinform and to develop the simple but highly marketable view that only their food is safe (see below). Unfortunately some of the organic campaigners have vested interest in perpetuating misinformation as they are also producers of the products.

##### *Food quality and safety*

- The highest need is safe food and there can be no compromise on that. The public have the right to know that all foods they purchase irrespective of the method of production is safe. GM has an important contribution to make for instance in reducing pesticide residues in food sold in Europe particularly fruit and vegetables. They have provided 54% and 44% respectively of all such alerts for food produced in EU since 1999. The EU rapid alert system identified 78 potential or actual risks to consumers from pesticides since January 2001 alone. However it is new ingredients present in food and not their method of production that should be the focus of interest. All systems of production should be examined. Microbial contamination is the most frequent cause of risk and all methods of production are subject to it. A dangerous chemical contaminant (Nitrofen) has been reported in foodstuffs for organic poultry in Germany. The Food safety Directorate must treat safety of all food with equal vigour irrespective of the means of production. Conventionally bred potatoes have proven to be hazardous. Growing conditions alter levels of some tuber ingredients e.g. solanine and patatin and other natural allergens and toxins of potato. The concept of substantial equivalence needs to be refined particularly as the contents of a supposedly standard product like a potato varies with cultivar and growing conditions.
- One solution would be a national body auditing the risks and benefits of proposed changes to agriculture and whether or not the claims made for or against products made by any production system are correct and fairly stated.

##### *Environmental issues*

- The FSEs can offer useful information but they are concentrating on just two examples of GM technology and so do not provide information on the benefits and risk to the environment of very different technology. Such information when available should be gathered.
- A key issue that needs to be addressed is the cost and benefits of extensive versus intensive agriculture for the nation. The aim of the latter should be to maintain current production levels and free land for other use. This model may enhance biodiversity to a greater extent than supporting an extensive approach. Example benefits of intensive agriculture would be restoring nationally rare habitats such as wetland meadows and marshlands. RSPBs Leighton Moss is an example of land recovered from cereal cropping. The loss of 0.5 million hectares of grassland to the plough between 1968 and 1992 is an example of damaging extensive processes in progress. Part of this is new potato growing land and one driver for this is an inability to control PCN on traditional potato cropping land with the desired high frequency of cropping. GM could control PCN on traditional land without environmental harm but with the benefit of not causing this creeping extensiveness. Approaches such as organic farming either promote extensive farming or accept a higher level of import.

- I disagree with the view that there has been no impact on the UK science base in biotechnology of having universities institutes and industry hindered from developing beneficial approaches beyond proof of principle in the lab. Destruction of field trials, occupation of buildings etc has also occurred. NGOs and INGOs have been allowed to use misinformation and scientifically unsound information to scare the general public and build unjustified outrage.

#### **7.1.5 What do you see as the major uncertainties that will need to be dealt within this study?**

*The ability to ensure any GM product allowed on to the UK market is placed fairly in the marketplace*

- There has been a political failure to ensure that misinformation of activists used to create outrage is removed from the debate and not perpetuated by the media.
- A failure to prevent activists from targeting supermarkets to force them from stocking GM products. Currently consumer choice is seen by government as the right to avoid GM products. There is no pro-GM choice for good reasons such as reduced pesticide residues, food of a lower cost (1 in 7 EU citizens live in poverty) or environmental benefits. There is a need for supermarkets to treat this issue more soundly than by a blanket ban.

*The ability to develop GM crops that have a poverty focus*

- The issue of GM crop uptake in the developing world is more complex than stated. The scoping note is limited to the risk that informed choice in the developing world will be undermined by commercialisation of GM in UK. A precautionary principle that allows any perceived risk however unlikely to hold up the process of evaluating the potential of some GM applications for the developing world is harmful. There is much public funded research for public good being carried out. Many traits are being offered on a royalty-free basis freed from the interests of industry. Again the past approaches taken by Monsanto may be harming the general case. Those who misinform developing world governments or people (examples could be provided) are actually being anti-poor by forcing their dogmas upon them. Some GM applications can provide agricultural improvements that are fully biosafe, put the means of production into the hands of the poor and conserve the environment. Seven national academies including the Royal Society have made the case for GM crops in the developing world. My group and others have been actively working in this area.
- The problems of environmental damage in the developing world plantations producing for European markets should also be considered. For instance, FAO considers one of the most compelling reasons for adopting genetic transformation of banana is to reduce pesticide use. It identifies our technology in roots for nematode control as one of the key approaches. Pesticides are over used in banana plantations. The levels of pesticide applied to banana in Central America is claimed to be up to 20 fold that applied to crops in the industrialised world. The withdrawn fumigant dibromochloropropane (DBCP) is claimed to have sterilised thousands of plantation workers in Latin America. Successful class actions have been brought against its manufacturer within USA. Nematicides are still damaging the environment. Dogmatists seek to put GM to one side when it can make a contribution to prevent much of this.
- The issue of informed choice is practically complex when illiterate people and informal markets are considered.
- Specific examples could be produced to support these points. Our work in this area is funded by DFID and European Union.