GM CROPS AND FOODS UPDATE

POST 130
Visit Summary
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In May 1997 the United States Information Service (USIS) invited a number of UK 'opinion formers' to visit the US to discuss the issues surrounding genetically modified (GM) foods. A member of POST's staff was among those invited to meet with American regulators, farmers, trade associations, scientists, biotechnology companies, journalists and consumer / environmental groups.

This note summarises the key themes that emerged over the course of the weeklong visit.

BACKGROUND

America and the European Union (EU) are on a collision course over GM foods. In the US, the application of biotechnology to agriculture is seen as a logical extension of conventional techniques such as plant breeding; GM crops and foods are regulated in exactly the same way as any other comparable products. American farmers have been quick to see advantages in growing the new crops, and the products have been accepted unquestioningly by the media and consumers alike. In contrast, the EU has viewed the process of genetic modification as being a novel technology, deserving of special attention. New laws have been passed to regulate GM crops and the foods derived from them. Consumers and the media have proved suspicious of the new technology, voicing concerns over possible risks to human health and the environment. So great has the divide in attitudes become, that the issue is threatening to spill over into a transatlantic trade war.

Against this background, USIS decided to invite a number of UK 'opinion formers' on a weeklong visitor programme to the US. An intensive schedule (**Box 1**) of meetings was arranged with regulatory agencies, other relevant government bodies, a politician, industry experts, biotechnology companies, academic scientists, consumer and environmental organisations and journalists. The schedule also included several visits to farms and grain storage facilities (elevators). Differences in UK and US attitudes to GM crops/foods were a recurring theme throughout the course of these meetings and visits. A number of key issues emerged from the meetings; these are discussed in more detail below.

BOX 1 THE VISITOR PROGRAMME

The visitors

- Peter Border (POST)
- David Brown (The Daily Telegraph)
- Tom Feilden (BBC)
- Thomas Maxwell (The Scotsman)
- Archie Montgomery (Farmer, representing the NFU)
- David Street (BBC)
- Chris Warkup (Meat and Livestock Commission)
- Alex Waugh (National Association of British and Irish Millers)
- Mike Wilson (Horticulture Research International)
- Christophe Buchholz (German Grain and Feed Import Association) attended the St Louis meetings and visits

Invitations were also extended to a number of other organisations (including UK regulators and consumer groups) and individuals (including some parliamentarians) who declined to attend.

The visited

17/5/99 Washington

- US Food and Drug Administration (FDA)
- US Department of Agriculture (USDA)
- Foreign Agricultural Service (FAS)
- APHIS (Animal and Plant Health Inspection Service)
- British Embassy (Agriculture and Trade)

18/5/99 Washington

- Legal and industry experts representing the National Food Processors Association, Corn Refiners Association, National Corn Growers Association, Biotechnology Industry Organization, and International Food Information Council
- Journalist from the St Louis Post Dispatch
- Senator Christopher Bond (Republican, Missouri)
- US Environmental Protection Agency (EPA)

19/5/99 Washington

- Consumer and other organisations (National Farmers Union, Consumer Federation of America, Union of Concerned Scientists, Centre for Science in the Public Interest, American Farm Bureau Federation)
- United States Grain Council, Corn Refiners Association
- US Trade Representative (USTR)

20/5/99 St Louis

- Monsanto
- Paul Krautmann (organic farmer)
- Academic experts from Washington University
- Agricultural journalists, representatives of Gateway Green Alliance (an environmental group), and industry experts from the National Corn Growers Association

21/5/99 St Louis

- Industry experts from the American Soybean Association, Bunge Corporation, Archer Daniels Midland and Continental Grains
- Greg Guenther (farmer)
- Visits to grain elevators at IP Corn, Evansville IL and Continental Grain, East St Louis, MO
- Protein Technologies International (PTI, a subsidiary of DuPont)

REGULATORY ISSUES

US Regulation

All the regulatory agencies the group met were keen to stress that the regulations were science-based, offered effective protection against potential environmental and health risks, and that the openness and transparency of the process meant that it was trusted by the public at large. They explained that the underlying philosophy was to regulate the product rather than the process. Rather than passing new laws to regulate biotechnology,

the US decided to use existing legislation and agencies. The key players are the:

- FDA, which are responsible for new foods (except meat, poultry and eggs) and food additives sold to consumers under the Federal Food, Drug and Cosmetic Act.
- APHIS, an agency within the USDA, which regulates the field testing of GM crops (see **Box 2**).
- EPA, which is charged with regulating pesticides (this includes GM crops that produce insecticides such as Bt toxins; see Box 2).

Despite the assurances of the agencies themselves, the group encountered some criticism of the US regulatory process, principally from the Union of Concerned Scientists. They argued that the decision to use existing laws to regulate biotechnology in the US had led to anomalies within the system. For instance, this meant that from a legal perspective FDA had to treat novel genes in GM foods as food additives, APHIS regulated GM crops as plant pests and EPA regarded them as pesticides.

UCS was also concerned that, in practice, most GM foods were exempt from pre-market approval. Providing a company can show that the novel genes are 'generally recognised as safe' (GRAS), there is no legal requirement to seek FDA approval prior to marketing. In effect, this means that the only legal sanction open to the FDA would be to prosecute a company **after** it had marketed an unsafe product. FDA confirmed that most GM foods had indeed been marketed through this route[1] and that in such cases the onus is on a company to ensure its products are safe. However, it pointed out that it is very much in a company's best interests to do this. FDA regards the fact that it has not yet had to prosecute any company marketing a GM food as proof that its iterative approach of encouraging an early dialogue with companies works effectively.

Overall, UCS and other consumer groups felt that the US regulations were confused, that the agencies were under-funded and that the whole approach placed too much responsibility on the companies developing biotechnology products. They wished to see new laws regulating biotechnology as a process, with a single agency responsible for all aspects of GM foods. However, the consumer groups were very much a lone voice on this issue. The regulatory agencies themselves, the biotechnology industry, the trade associations and farmers all felt that the current system worked well, providing effective regulation without hampering technical innovation.

[1] **FDA considers any genes originating from food sources as GRAS. This also applies to genes from non-food sources providing they are similar to genes found in foods.**

BOX 2 GM CROPS GROWN IN THE US

Companies seeking to market GM crops that have been tested in field trials apply to APHIS to obtain 'non-regulated status'. Since 1992, APHIS has approved more than 40 such applications, covering 11 different crops (see **Table** for details). The main traits in GM crops approved to date include:

- **Herbicide Tolerance (HT)** – a novel gene is inserted into the plant that confers tolerance to a specific herbicide (e.g. Roundup or Liberty). Treatment of the crop with that herbicide kills weeds leaving the crop unaffected.
- **Insect Resistance (IR)** – *Bacillus thuringiensis* genes coding for so-called Bt toxins are inserted into plants. These toxins are harmless to humans, but kill the larvae of many common insect pests. For instance, one of the Bt genes produces a toxin lethal to lepidoptera such as the European corn borer, while another targets coleoptera such as the Colorado beetle.
- **Altered Ripening (AR)** – Genes coding for an enzyme (polygalacturonase) that causes fruits to ripen / soften are inactivated. This results in fruits (e.g. tomatoes) that have higher solid contents, longer shelf-lives, etc.
- **Virus Resistance (VR)** – Genes coding for virus coat proteins are inserted into plants and confer resistance to infection by that particular virus.
- **Other Traits (OT)** – A handful of other GM plants have also been approved with various other novel traits. These include alterations to fertility (e.g. producing sterile lines) and to product quality (e.g. altering fatty acid, protein or sugar compositions).

TABLE SUMMARY OF US NON-REGULATED GM PLANTS

CROP	MAIN TRAIT(S)	TOTAL
Corn	HT (6), IR (4), HT+IR (1), OT (1)	12
Tomato	AR (5), HT (1)	6
Soybean	HT (4), OT (1)	5
Cotton	HT (3), IR (1), HT+IR (1)	5
Rapeseed	HT (1), HT+IR (1), HT+OT (1), OT (1)	4
Potato	IR (2), IR+VR (1)	3
Squash	VR (2)	2
Papaya	VR (1)	1
Beet	HT (1)	1
Rice	HT (1)	1
Chicory	OT (1)	1

Source: APHIS, includes plants approved up to end April, 1999.

EU Regulation

As outlined previously, the EU considers the process of genetic modification sufficiently novel to warrant regulation in its own right. It passed new laws covering three main areas: the contained use of GM organisms (e.g. in laboratories and production facilities); deliberate release of GM organisms into the environment (e.g. by planting GM crops or marketing GM foods); and labeling of foods containing detectable amounts of GM material (either protein or DNA).

Most of the experts the group met were highly critical of the EU regulatory system. Those from the agricultural and biotechnology industries felt that the system was too precautionary and acted to stifle commercialisation. For instance, they pointed out the US system allows for GM plants that have been field-tested and are ready for commercialisation to be granted non-regulatory status (Box 2). This makes it easy for companies to produce

many different varieties of a GM crop to suit all growing conditions; some 1,100 different varieties of Roundup Ready soybeans are currently available in the US. Under the EU system, each of these would require separate approval prior to marketing.

Another criticism of EU regulations concerned the requirements for labeling. While the EU has announced that all foods containing detectable GM protein or DNA will need to be labeled, it has yet to set out any technical details for this policy. US farmers and grain exporters thus do not know whether they are striving to produce a product that is 100% GM-free, or whether small amounts of GM material will be accepted without the need for labeling. They thus see an urgent need for the EU to define threshold values for maximum permitted levels of GM material (see Segregation).

By far the most commonly voiced criticism of the EU system concerned the time taken to make decisions on applications for marketing consents. Several people the group met suggested that it took at least two years to obtain a marketing consent, and that the EU has still to decide on several of the applications received in 1996. One upshot of this is that only four of the 12 different types of GM corn (Box 2) approved in the US can be imported into the EU (**Box 3**). As discussed in more detail later, this has already caused problems for US farmers and grain handlers. It may also form the basis of a complaint to the World Trade Organisation (see Trade Issues); several people the group met expressed the view that the EU regulatory system was effectively a trade barrier in disguise.

BOX 3 GM CROPS APPROVED IN THE EU

Companies seeking to market GM crops within the EU must first apply to one of the national Competent Authorities (CA). Applications are then passed on to all other Member States for consideration. If the original CA receives no contrary indication from other Member States within 60 days, it may consent to the application in writing; the consent applies throughout the EU. In the case of objections being made, the application is decided by a Committee of representatives from each Member State, chaired by a member of the Commission. If this body cannot resolve the issue, the Commission submits a proposal to the Council, which acts through a qualified majority vote.

To date, the EU has approved 6 different GM crops for use in animal feed and human food (see **Table**). They include four GM corn varieties, Roundup Ready soybeans and a herbicide tolerant rapeseed. These may be imported into the EU, stored and processed into food and feed in the same way that non-GM varieties are used. A seventh GM product (GM tomato paste) was approved in 1995 under different regulations. This product is imported as a paste rather than as a viable organism; it thus did not require marketing consent under the Deliberate Release Directive.

None of the crops in the Table are grown in the EU on a commercial basis. Consent was sought to grow three of the GM corn varieties in the EU; decisions on these are pending judgement on certain issues by the European Court. A further 11 applications to market GM crops (5 types of rapeseed, 2 of corn and one each of chicory, beet, tomato and potato) for food use in the EU have still to be decided (at end of March 1999).

TABLE GM CROPS APPROVED FOR MARKETING IN THE EU

CROP	MAIN TRAITS	TOTAL
Corn	HT (1), IR (2), HT+IR (1)	4
Soybean	HT (1)	1
Rapeseed	HT (1)	1

Source: Trade Analysis Committee of the US Soybean Board

SEGREGATION

Segregation – keeping GM and non-GM crops separate throughout the supply chain from the farm to the consumer - was another recurring theme throughout the visit. The group met with experts from the corn and soybean industries; they explained how these commodities were grown, stored, processed and transported in bulk (**Box 4**). They described some of the difficulties caused by the different regulatory regimes, and outlined possible approaches to segregating crops.

Corn

One problem faced by the US corn (maize) industry is that while US regulations allow farmers to grow 12 different GM lines, only four of these have been approved for import into the EU. Because the various different lines are mixed during bulk transport/storage, (see Box 4) all US corn may currently contain some non-EU approved GM lines. This is currently preventing the US from exporting bulk corn to the EU. It is also raising concerns in the US over the future of corn gluten exports (a more valuable export market than bulk corn) since this product may also contain material originating from non-EU approved lines. While processing corn into gluten would normally be expected to render any GM material undetectable, there are concerns that small amounts might still be present.

In order to minimise these problems, the US corn industry is implementing procedures (by the year 2000) to try and '**channel**' the non-EU approved GM lines out of the export chain. This involves ensuring that growers know which GM lines are approved in the EU and which are not, and encouraging them to ensure that only approved lines are shipped off-farm into the bulk elevators for export or processing (Box 4). Growers choosing to plant non-approved corn lines are advised that there will be a restricted market for their crop. This means that they will have to harvest it separately and use it themselves (~20% of US corn is used on-farm as animal feed) or supply local farmers or processors (this accounts for ~40% of US corn).

Bodies such as the National Corn Growers Association and the Corn Refiners Association were keen to stress

that channeling would **not** produce an export product

BOX 4 THE US BULK TRANSPORT AND STORAGE SYSTEM

Corn

- 26% (21M out of 80M acres) of US corn acreage was planted with GM corn in 1998 (estimates for 1999 suggest this has risen to ~40%).
- Most of this was insect resistant (Bt corn, 16M acres), with the rest comprising Roundup Ready (0.75M acres) or Liberty Link (4.5M acres) herbicide tolerant varieties.
- Total corn production was just under 300M tonnes.
- 60% of this is stored on farm and used locally.
- 40% enters the bulk storage/transport system; half of this is processed within the US into a range of food, feed and industrial products, and half is exported unprocessed.

Soybean

- 38% (27M out of 71M acres) of US soybean acreage was planted with GM soybeans in 1997/1998 (estimates for 1999 suggest that this has risen to ~55%).
- All the GM soybean crop consisted of herbicide tolerant varieties.
- Total soybean production was around 74M tonnes.
- Just under one third of this (24M tonnes) was exported as whole soybeans; around 35% of all US soybean exports are to the EU.

Bulk Storage and Distribution

Bulk commodities such as soybeans and corn enter a grain handling system that depends upon mixing commodities from different geographical areas. Commodities are transported by road to one of 10,000 country elevators and then on to one of 700 terminal elevators where they are loaded onto barges holding ~1,500 tonnes each. These are towed down river to one of the 60 export elevators, which load ocean going freighters with capacities of up to 50,000 tonnes.

The whole system is designed to achieve maximum economies of scale by bulking up crops to a larger and larger extent. This means that it is inevitable that crops from one farm or region will be mixed with those from another. The example of soybeans illustrates the extent to which mixing occurs, and the difficulty of trying to segregate crops within the bulk export system. According to the USDA, soybeans are a 'step-child' crop; they are grown on a small scale by a large number of farmers, with the average area planted being 186 acres per farm. On average, it would take the yields from around 7 farms to fill a single barge and nearly 300 farms to load an ocean going freighter.

guaranteed free of non-approved lines. They see it as inevitable that some non-approved corn will get through the system, from pollen, 'carry-over' from combine harvesters, etc. They are thus looking to the EU to set realistic thresholds to define permitted levels of non-approved lines in bulk corn and gluten; this is discussed in more detail later (see Thresholds).

While the US corn industry sees channeling as the most cost-effective way of dealing with the current situation, it concedes that segregation will become more commonplace. As outlined in **Box 5**, a number of value-enhanced GM corn varieties are nearing the end of the development pipeline. Growers planting such crops will receive a premium; there will thus be a clear financial incentive for segregation. The corn industry is looking at ways in which it can set up '**identity preserved**' (IP) lines, which will be harvested, stored, transported and processed outside of the existing bulk system (Box 4). This may involve bagging or 'containerising' corn on the farm, and transporting it in smaller loads to local, dedicated, processing plants; the industry estimates that this could double existing costs. While it would be possible to set up an IP system for EU-approved corn, the industry considered it unlikely that such a product would carry a high enough premium to warrant such an approach.

Soybeans

As far as soybeans are concerned, bodies such as the American Soybean Association (ASA) sense increasing pressure from European consumers, retailers, etc. to segregate GM (Roundup Ready) from non-GM beans. ASA briefed the group at some length on the difficulties involved in any such exercise. It explained that in 1998, GM-beans accounted for some 38% of the total US soybean acreage and that the bulk distribution system contained many points at which beans from different sources were mixed (Box 4). All US soybeans imported into the EU must thus be assumed to have a significant GM content.

As with corn, it appears likely that biotechnology will lead to the emergence of many more value-added soybean lines that will need to be segregated from the bulk system (see Box 5). Indeed, some growers have already established high-value (IP) soybean lines that are handled outside of this bulk system. Organic soybeans and beans grown for the Japanese tofu market are two IP lines carrying a high enough premium (up to four times the commodity price) to justify the additional cost (estimated at double normal costs) of segregation. As with corn, this involves harvesting the beans separately, bagging them on-farm, and transporting in smaller loads to dedicated shippers or processors. ASA admitted that a similar IP system could be set up to segregate non-GM soybeans, but doubted whether European processors would be prepared to pay the required premium. It also suggested that any such product would not be 'GM-free'; producers were thus unlikely to attempt segregation until the EU sets thresholds for acceptable levels of GM soy in products not requiring labeling.

Not all shared ASA's view about the demand (and willingness to pay) for GM-free soy. Indeed, the group met with one company (Protein Technologies International; PTI) that has already set up an IP line to produce just such a product. PTI are offering growers a non-GM version of a herbicide tolerant soybean[2] that will be harvested separately and shipped to a dedicated plant for processing into soy protein isolate. Growers

[2] **DuPont's STS (sulphonylurea tolerant soybean) soybean, a non-GM herbicide tolerant soybean derived using mutagenesis.**

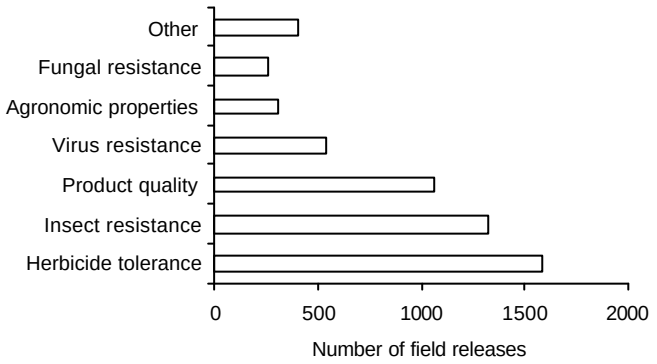
will receive a small premium (~$6/tonne) for growing the non-GM soybean, and PTI hope to market the product in the EU as "*substantially free of GM*". Again, the commercial success of this venture depends critically on the threshold levels set by the EU for labeling (see below). PTI currently has around 180,000 tonnes of the soy protein isolate available, and has ~800,000 (~1% of the US soybean acreage) acres of non-GM beans planted.

BOX 5 GM CROPS IN THE DEVELOPMENT PIPELINE

APHIS received notification of more than 1,000 field trials involving GM plants in 1998 alone; some of these will be commercialised and form the basis of novel GM foods in the coming years. In all, more than 40 different species of GM plants have been field tested in the US. These include all the major staple crops (corn, potato, soybean, rapeseed, sugarbeet, rice and wheat), as well as a wide range of fruits, vegetables and some species of trees.

To date, the focus has been on two characteristics: herbicide tolerance and insect resistance. Between them, these two account for more than half (~2,900 out of 5,500) of all field releases (see **Figure** below). More recently however, there has been an increase in field trials aimed at improving product quality, virus resistance, agronomic properties, fungal resistance and various other properties (Figure).

FIGURE MOST COMMON FIELD RELEASE TRAITS (1987-99)



Agricultural biotechnology companies such as Monsanto and PTI predict that the emphasis will continue to be on improving agronomic traits and developing crops with better processing characteristics in the next few years. Examples under development include corn with enhanced nutritional profiles, and soybeans with altered fatty acid profiles (e.g. high oleic acid, high stearic acid) to enhance processing. They anticipate that the first GM foods to offer direct benefits to consumers will be introduced from around 2002-05; these are likely to be foods with enhanced nutritional/health properties (e.g. high isoflavone soybeans). Ultimately, the aim is to produce novel pharmaceuticals, vitamins, plastics, and other high value products in GM crops, although these are not expected until 2005 at the earliest.

EU THRESHOLDS

As noted previously, EU law requires foods to be labeled if GM material (protein or DNA) is detectable. But the EU has yet to set the thresholds that will define exactly what this means. This is of concern to the US corn (which wants to know what constitutes an acceptable level of non-EU approved content in its products) and soybean (which wants to know how much GM soy will be tolerated in 'GM-free' products) industries.

Neither industry saw a threshold of 0% as a realistic option. They pointed out that some 'cross-contamination' was inevitable, even in IP systems where great efforts were made to segregate crops. For instance, they noted that detectable levels of GM material had been found in IP organic (non-GM) soybeans, presumably from wind blown pollen from GM crops planted nearby. The corn industry felt that it could live with a threshold of around 5% for non-EU approved varieties, whereas the soybean industry felt happier with a threshold of ~10% for non-GM beans. Both suggested that thresholds of this magnitude were the norm for bulk commodities; for instance, certified organic flour in the US may contain up to 5% non-organically grown material.

Others however felt they may be able to comply with a more stringent threshold. PTI have been running their non-GM IP soybean line for some time on a small scale, and claimed that they were averaging ~0.5% GM content in soybeans used for processing (this might rise as the scale of operation increases). They emphasised that tests on the end product to determine GM content were only part of the story; achieving acceptable levels required strict control measures over the entire system of production. The European Commission is expected to propose new thresholds by October 1999.

TRADE ISSUES

Many people the group met expressed the view that the EU regulatory system acted as a barrier to trade. Some saw this as a deliberate ploy; others merely as a by-product of an 'unscientific' regulatory system. Either way, it was widely felt that the US was losing trade because of the EU position on GM foods, and that at some stage, the US was likely to look to the WTO to resolve matters. Two potential areas of contention emerged from the various meetings: labeling and the time taken to make regulatory decisions.

Labeling

As noted previously, the EU's policy on labeling GM foods is at odds with the US regulatory philosophy, which is that consumers have no right to know whether a product has been derived using GM. From a legal perspective, FDA require labeling only where there are 'material differences' between products; this does not apply to GM foods currently on the market since these are regarded as being 'substantially equivalent' to their non-GM counterparts. Equally, FDA pointed out that US law does not prohibit labeling of products as 'GM-free' providing the claim is not misleading. In practice however, FDA would view such labeling as misleading, because they feel it implies that non-GM products are in

some way better than GM products.
Industry experts and US regulatory agencies expressed frustration that the EU had yet to decide the finer details of its labeling requirements. When such details are finalised and the scheme comes into operation, the US may view the requirement to label as a breach of international trade rules. Under the terms of the SPS Agreement[3], WTO members are encouraged to use international standards in regulating food safety; they are allowed to set higher standards only where there is scientific justification for doing so. Since there is no international consensus that GM foods should be labeled, the US might argue that the requirement to label constitutes an additional safety standard that acts as a barrier to trade. The WTO would then have to decide whether this was the case, and if so, whether the labeling requirement was scientifically justified; the outcome of any such action is difficult to predict.

Time Taken to Consider Applications

The time taken for the EU to consider applications is another source of frustration within the US. The group met with experts in biotechnology and international trade who expressed the view that the US might consider action in the WTO over this matter. In their view, the US could argue that the EU regulatory system was effectively acting as a trade barrier and thus in breach of the SPS agreement.

This is a complex issue and the outcome of any such action would depend largely on two aspects of the SPS Agreement. First is the question of whether the Agreement applies to the process of regulating biotechnology, since this is not explicitly mentioned in the text. The experts the group met were fairly confident that the SPS Agreement would cover the regulation of GM foods since it requires countries to base regulations on science and risk assessment, and these also form the basis for biotechnology regulation. Second, the Agreement requires risk assessment to be conducted within a 'reasonable' (rather than a specified) period of time. Any WTO Disputes Panel would thus have to address the question as to what constitutes a 'reasonable' period of time.

USTR were less than forthcoming on the options open to it in resolving these trade issues. Other experts the group met were of the opinion that the US may not seek a resolution through the WTO in the immediate future, in the hope that European attitudes to GM foods might change. The attitude of US consumers may also prove to be a factor; the US might be reluctant to pursue a trade war if it felt that the publicity generated might generate fears about GM foods at home.

PUBLIC PERCEPTION

All members of the group were keen to get a US perspective on why attitudes to GM foods varied so markedly between the US and UK, and on how American consumers perceived such products in general. Consumer groups and journalists advanced several reasons for the differences in attitudes:

- **Trust in the regulatory system**. There was a consensus that US citizens placed greater trust in the regulatory process than their UK counterparts. The occurrence of food scares such as BSE in the UK was a commonly cited reason for this. Another was the lack of transparency in the UK system compared to the freedom of information culture in the US.
- **Trust in science and technology in general**. One journalist told the group that the US public was unquestioning in its support of progress in S+T, suggesting that this must be due to the presence of a 'trust gene' within the population. Several consumer groups expressed the view that this acceptance of GM products was based on near total ignorance among the public over the science involved. In contrast, the UK public was seen as far more knowledgeable about biotechnology.
- **Differences in the way GM stories are reported in the media**. The US media appears to be far less preoccupied with GM stories than that in the UK (only 1% of food stories in US papers and magazines are GM-related). There was also a perception that American journalists are more supportive of their own specialised sectors.
- **Benefits are 'closer to home' for US consumers**. Several consumer groups felt that the US public might be more accepting of GM crops and food because they perceived benefits for American farmers and biotechnology companies.

In general, the consumer groups felt that attitudes among the US public might be about to change; they see a real prospect of the debate on GM foods spreading from the UK to the US. They suggest that there has been a noticeable rise in activism over such issues in the US in recent months and that a development of some kind might act to spark a much wider debate in the US. Some felt that the Monarch butterfly study[4] might prove to be the trigger, citing it as the first evidence of unexpected effects from GM crops. Others doubted whether the issue would 'take off' in the US in quite the same way that it has in the UK. Rather they saw a number of potential issues that might form the focus of a more considered debate within the US, and these included:

[3] **The Sanitary and Phytosanitary Measures (SPS) Agreement reached in 1994 as part of the GATT Uruguay Round settlement.**

[4] **Which suggested that pollen from Bt crops may be toxic to the Monarch butterfly (commonly found in some US states).**

- **Labeling** – evidence from consumer surveys shows very strong (US) public support for labeling GM foods. Some saw this as a 'knee-jerk' reaction, arguing that consumers wanted more information (e.g. leaflets), but not necessarily on labels. Others saw it as it as real evidence of consumers demanding the right to know whether a food is GM or not.
- **Time-scale** – consumer groups claim that the US public is becoming increasingly uneasy about the speed at which new GM products reach the market. They claim that this is helping to fuel fears that the regulatory system in the US is more concerned with promoting biotechnology than protecting consumers.
- **Consolidation** – US consumers are concerned about the way that biotechnology is reshaping ownership of the food production chain. They are worried that, if current trends continue, a handful of agricultural biotechnology companies may end up with effective control of the entire food chain.

BENEFITS AND RISKS

Another recurring theme of the visit was the extent to which the benefits and risks of GM crops had been (or could be) established by science.

Benefits

Most of the people the group met were firmly convinced of the benefits offered by the GM crops currently grown in the US (Box 2). Among the main benefits claimed by farmers were:

- **Reduced pesticide use** – all the farmers the group met confirmed that GM crops significantly reduced the need for pesticides. Monsanto estimate that Roundup Ready soybeans need 40% less herbicide than conventional beans and that its Bt corn reduces insecticide use by up to 90% (from 10-12 to 1-2 applications).
- **Increased yields** – yields vary from one location to another and depend on the extent of pest problems encountered. Overall, farmers were convinced that GM crops produced higher yields. Monsanto cited (1997) figures of ~2 bushels per acre for herbicide tolerant soybeans and over 10 bushels per acre for Bt corn. The group heard some anecdotal evidence that GM yields had slipped slightly in 1998, but no figures were produced to support this.
- **Economic benefits** – the combination of reduced pest control costs and increased yields add up to economic benefits for farmers. Again, these vary from place to place and from year to year. Figures from the NCFAP[5] put the net gain to farmers at around $40 per acre for Bt cotton in 1998 (15$ per acre saving on insect control plus $25 profit from improved yields). The same body estimates that in 1998, Roundup Ready soybeans saved farmers $12/acre in weed control ($18/acre for the GM beans compared to $30/acre for conventional ones).
- **Other benefits** – farmers also told the group that they liked the convenience (e.g. fewer applications of herbicide) and flexibility (e.g. allowing them to grow soybeans or corn in areas where this would not previously be possible) of GM crops.

Industry / academic experts and regulators also claimed that GM crops carried certain **environmental benefits**. Monsanto suggested that Roundup Ready soybeans encouraged the use of 'no-till' farming methods and thus helped to reduce soil erosion. ASA told the group that nearly one third of the US soybean crop is now produced using no-till methods. Farmers and academic experts also claimed that no-till farming increased the diversity of the insect population, and that this had knock-on effects on wildlife further up the food chain. However, no figures from ecological research were available to validate such claims; EPA and other experts said that such studies were underway, but that results would take some time to appear. It was not clear to what extent these possible benefits were due to herbicide tolerant crops *per se*, since no-till methods can be (and are) used with conventional crops.

Other experts suggested that GM crops were beneficial to the environment since they reduced overall levels of pesticide use: in the words of one academic, "*genes are better than chemicals*". They claimed that GM crops would lead to lower pesticide residues in soil, water, etc. While this may prove to be the case, the group was surprised that so little research had been conducted to back up claims of environmental and ecological benefits.

Another claim made for GM crops was that they would benefit society as a whole. Academic experts told us that current intensive agricultural practices were unsustainable and that ways would need to be found to maintain or increase yields while reducing inputs. Some (e.g. farmers, industry experts) saw GM crops as a way of achieving this, portraying GM as 'feed the world' technology. Others (consumer and environment groups) were less sure. While acknowledging the potential of the technology to 'feed the world', they argued that the products emerging so far seemed more designed to 'feed the overfed'.

While views differed as to the extent to which GM foods benefit farmers, the environment, society, etc., everyone the group met agreed on one thing: none of the commodity (soy, corn, etc.) products marketed to date

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directly benefit consumers. This was seen as a major factor behind consumers' reluctance to accept such products in the EU. Biotechnology companies such as Monsanto were acutely aware of this, and were pinning their hopes on the next generation of GM products (see Box 5) that will offer consumers more direct benefits (e.g. enhanced nutritional properties).

Risks

In general, the US public and consumer groups seem to have relatively few concerns over the potential risks of GM foods. There is little evidence that American consumers see GM foods as a potential risk to human health or to the environment. The consumer groups' perspective on health risks was that they were hypothetical; as one representative pointed out, "*GM foods haven't killed anyone yet*". They thus view food risks such as microbiological food poisoning – which kills thousands of people each year in the US - as a much greater priority. As noted previously, their main concerns over GM foods are less focused on risk *per se*, and more to do with perceived weaknesses in the regulatory system, the pace of change, control over the food supply chain, etc.

Environmental groups such as the Gateway Green Alliance (GGA) had a somewhat different perspective on GM crops. Their views on the potential risks were more closely aligned with those expressed by European pressure groups, with the main concerns being:

- **Gene flow** – GGA were concerned that novel genes would transfer from GM crops to weedy relatives, leading to the emergence of 'superweeds'. Academic experts confirmed that gene flow could occur if GM crops were grown near wild relatives. For instance, they suggested that gene flow from GM corn might be a problem if the crop was grown in parts of Mexico, because of the abundance of weedy relatives (grasses). But they also pointed out that the regulatory system prohibited GM crops being planted in areas where weedy relatives grew. EPA suggested that 'superweeds' - e.g where plants collect a 'complete set' of herbicide tolerances - were unlikely to emerge, because 'gene stacking' made plants uncompetitive.
- **Bt crops** – GGA also raised the issue that widespread use of Bt crops would provide the ideal environment for Bt resistant insect strains to predominate. A particular concern was that this would compromise the effectiveness of non-GM applications of Bt-based pesticides, which are used extensively in organic farming. Industry and academic experts confirmed that Bt resistant insects would eventually come to predominate, but that the use of non-GM refuges would slow the rate at which this occurred. Estimates of how long this might take varied; most were in the range 10-15 years, although some suggested up to 20 years (providing farmers observed the rules concerning refuges).
- **Herbicide residues in foods** – herbicide tolerant systems such as Roundup Ready soybeans involve applying herbicide directly onto crops; GGA claimed that this could raise the levels of herbicide residues found in GM foods. However, no evidence was presented to show that this had actually occurred. EPA had previously told the group that companies wishing to use herbicides in this way had to reapply under 'change of use' regulations to ensure the herbicide posed no risk to human health.

OVERVIEW

The visit served to emphasise the difference in American and UK attitudes towards GM crops and the foods derived from them. Nowhere was this more apparent than in the regulatory system. Under US food legislation regulators have the power to prosecute companies **after** unsafe foods have been marketed; EU regulations require companies to seek approval **before** they market GM foods. Many of the UK visitors were surprised by the amount of responsibility the US system places on the companies developing the products. From the US perspective, there was resentment of what was seen as an unnecessarily precautionary and long-winded EU system. The overall impression was that the US approach helped to promote the biotechnology industry; US regulators were keen to point out that this was not part of their remit, and was not at the expense of consumer safety.

No clear picture emerged from the visit as to the likely outcome of the trade issues raised by GM crops. While the US might take action through WTO to 'level the playing field', they are concerned that any such move might spark a more intense debate on GM foods among US consumers. Nor was it entirely clear why the American public seemed to accept GM products so readily. US regulators were convinced that they had won consumers over by engaging them in an early and open dialogue, but consumer groups painted a picture of acceptance based largely on ignorance. Finally, it was clear that the different attitudes to GM products created opportunities as well as problems; US companies are actively seeking to supply the new market for 'GM-free' products (albeit at a premium).