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Agricultural Biotechnology Annual

UK GE Plants and Animals Report

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Report Highlights:
Political focus on economy and trade, as well as attention on food security/climate change/population growth has led to an increased awareness of the role that biotechnology can play in United Kingdom (UK) access to biotechnology. The UK is a strong proponent of more efficient and effective regulation of genetically engineered crops within Europe. Increasing global adoption of biotech, and EU restrictions on unapproved biotech events in the food and animal feed chains are affecting the availability and the cost of non-biotech ingredients. In light of this, supermarket chains are reviewing their policies and changes in favor of biotech have taken place. In time, the food industry may have greater confidence to incorporate more products of genetically engineered crops in the supply chain.

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Section I. Executive Summary:

Disclaimer: This report presents analysis and views of the author and does not reflect the official views of the U.S. Department of Agriculture (USDA).

Notes:

1. The United Kingdom (UK) is a member of the European Union (EU) and this report should be read in conjunction with the EU Annual Agricultural Biotechnology Report, coordinated by the Foreign Agricultural Service in Paris, France. The EU Report (FR9105), is available here: GAIN database link to FR9105

2. The term "agricultural biotechnology" refers to an evolving continuum of technologies. It is a broadly applied term that may or may not refer to crops developed through recombinant DNA technologies, i.e., "plant biotechnology," "GMO", "transgenic," "biotech crops," or genetically engineered (GE) crops.

3. USDA uses the terms biotechnology or genetically engineered (GE) in addressing this topic. However, the European Union legislation and Member State implementing regulations refer to Genetically Modified (GM) food and feed and Genetically Modified Organisms (GMO). These terms are used in this report when discussing EU legislation and UK implementation.

Executive Summary:

A focus on the economy and trade (particularly in light of forthcoming negotiations on a Transatlantic Trade and Investment Partnership between the United States and the EU) has made a stronger political case for UK access to the products of genetic engineering. Recent statements by the Environment, Food and Rural Affairs Minister are clearly designed to indicate to technology companies that the UK is 'open for business.' In addition, the UK government is keen to make the European Union regulatory system governing genetically engineered (GE) crops "*more efficient and more effective*".

The UK has some of the largest and most efficient farms in Europe, but recent extreme weather events and a reduction in available fungicides and pesticides (as a result of an EU review) has left horticultural production vulnerable. The UK is keen to attract inward investment in plant science applications and capitalize on any growth opportunities presented by agricultural biotechnology.

As a policy response, the UK is developing a long-term agri-tech strategy focused on knowledge transfer and the application of technology to the agricultural sector. An initial indication of its scope is

expected by mid 2013.

Despite the fact that the UK feed and livestock industries are protein-deficient, trade in these products continues to be erratic. Confidence to trade is wholly dependent on EU approval (for food and feed) for new GE crops grown outside the EU in the main supplier countries of Argentina, Brazil and USA. Low Level Presence (LLP) of unapproved GE events in bulk shipments remains a concern that dominates trade decisions, since the threshold for feed is very low at 0.1 percent (only for traits already in the EU approval pipeline) and continues to be zero tolerance for the food supply chain.

UK political leadership on this issue may give greater confidence to the food industry to incorporate more products of genetic engineering in the food chain. There is an increasing global adoption of biotech in crop production, a zero tolerance of unapproved biotech events in the food chain, and an extremely low tolerance in animal feed (0.1 percent) within EU law. These factors are affecting the availability and cost of non-biotech ingredients to the extent that several major supermarket chains and foodservice suppliers are reviewing their policies. This is creating a more favorable market for biotech animal feed. Incorporation of ingredients derived from biotech crops is happening on a case-by-case basis so that the cost-benefit analysis to consumers is clear.

As regards consumer acceptance for biotechnology, there is a vocal minority opposed. However, most surveys show apathy and lack of knowledge by the general population, who rely heavily on supermarket chains to provide them with safe, quality food. There is a dominance of private label products in the UK market and an inherent trust (cultivated by the retailers) that they will "do the right thing" for their customers.

Generally, there are signs that the ground is shifting in the UK. Trade and even the mainstream media is increasingly making a case for the technology and calling on industry and the public to be more open-minded about potential benefits. There is a growing awareness that European consumers are buying meat from animals fed on biotech feed, and a growing acceptance that biotech crop derivatives in the food supply chain are inevitable, and to be managed, if not embraced.

Section II. Plant Biotechnology Trade and Production:

Production

Despite being a supporter of the science, the UK has never planted a commercial biotech crop, and has no crops under development. The limited portfolio of plant biotech events that are approved for cultivation in the EU are not well-suited to UK growing conditions. However, the UK government is keen to support domestic horticultural production and crop improvement and is supportive of the use of genetic engineering to achieve beneficial outcomes in crop research and development.

The private sector's interest in developing varieties of biotech plants suitable for UK and wider EU cultivation has waned. Almost all of the nearly 60 crop trials conducted in the UK since 2000 have been subject to vandalism, and this, together with the uncertainty and delays characteristic of the EU approval process, amounts to an unattractive investment.

In 2012, Rothamsted Research embarked on a field trial of Cadenza wheat, modified to produce a non-toxic odor - (E) beta-farnesene (EBF) (a naturally occurring chemical found in peppermint plants) that the wheat releases to act as an alarm signal to keep aphids away and attract their native predators, parasitic wasps (Braconidae). Project details are available here: Rothamsted Research

This is a publicly funded research trial, Rothamsted Research receives UK government funding via the Biotechnology and Biological Sciences Research Centre (BBSRC). Despite action by protestors, the trial continued amid tight security, was successfully harvested, and was of sufficient quality to yield results. Outreach by Rothamsted scientists, who appealed through video, radio and the web for their work to continue, largely won the hearts and minds of the British population. This trial is expected to proceed again in 2013.

In addition, the UK has recently completed publicly funded field trials of potato lines genetically modified for resistance to late blight and for nematode resistance. In 2007, a large private biotechnology company undertook a field trial with late blight resistant potatoes. It was destroyed in 2007, but completed successfully in 2008. Despite this, that company decided to halt field trials in the UK, citing delays in the EU approval process and a review of returns on its investment within Europe for its portfolio as a whole.

Potato blight (the cause of the potato famine in Ireland) is probably the most devastating crop disease in British agriculture and costs UK growers USD 32 million per year in fungicides to keep it in check. The removal of approval for some pesticides, as part of an EU review, has compounded the problem. Despite a long road ahead for commercialization of any late blight resistant potato within Europe, the UK government and farming industry will be keen to explore the cultivation of plants with this characteristic. If the seed line has been developed with public money, as in the case of the current late blight resistant potato trial in Ireland, public acceptance may be more easily won.

Trade

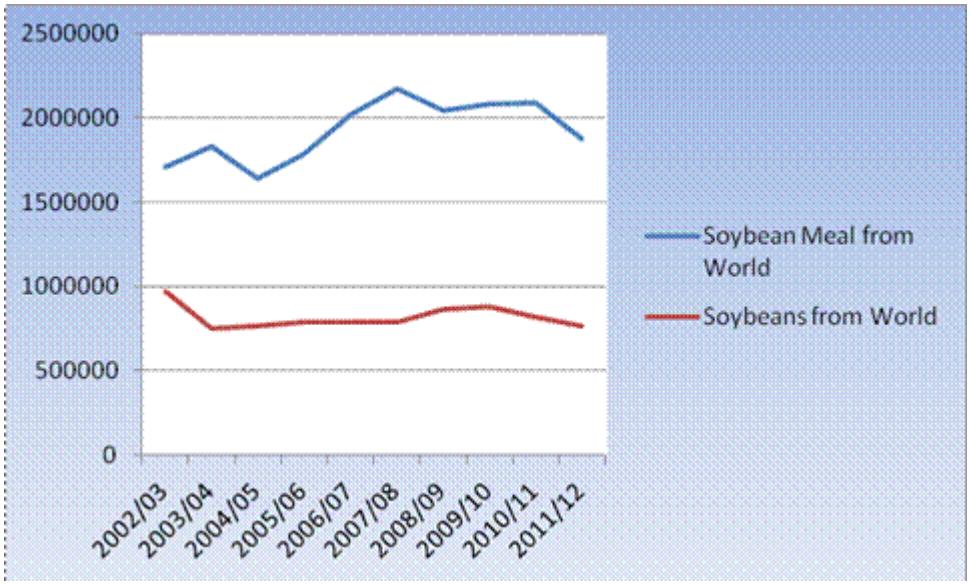
There are strong historic and cultural ties between the UK and the United States, which are obvious in consumer trends in retail and foodservice markets.

In recent years, the UK has increasingly imported more horticultural products and consumer-ready food and drink products as opposed to bulk and intermediate agricultural products from the USA. The *de facto* closure of large swathes of the UK market after implementation of the EU's biotechnology regulations in 2004 (Regulation 1829/2003) affected bulk/lightly processed commodities, such as animal feed components: soybean meal, and corn products such as Distillers Dried Grains (DDGS) and corn gluten feed (CGF), in particular. Despite the fact that the UK feed and livestock industries are protein-deficient, trade in these products continues to be erratic. Confidence to trade is wholly dependent on EU approval (for food and feed) for new biotech crops grown outside the EU in the main supplier countries of Argentina, Brazil and the United States. Low Level Presence (LLP) of unapproved biotech events in bulk shipments remains a concern that dominates trade decisions, since the threshold for feed is very low at 0.1 percent (and only for traits already in the EU approval pipeline) and continues to be zero tolerance for the food supply chain.

For over a decade, U.S. exports of processed foods and beverages have also been constrained by market conditions and EU legislation pertaining to GM foods. As a result of the pervasive negative image of biotechnology, UK supermarkets and food manufacturers formulate their regular grocery products to exclude biotech ingredients. Usually the biotech element of processed foods is a small component of the overall product, for example, soy lecithin (used as an emulsifier). This means that the additional cost of sourcing non-biotech ingredients adds only a small contribution to the finished price of the goods. However, for many U.S. companies, the additional burden to source non-biotech ingredients to supply the EU is often too large a hurdle to overcome. This is also increasingly the case for other countries wishing to supply the EU. Since 28 countries now produce biotech crops it is becoming ever-harder to source non-biotech ingredients.

As can be seen from the chart below, soybean meal is of significant importance to UK livestock industries. Imports of whole soybeans are fairly steady, since there is only one UK processing plant.

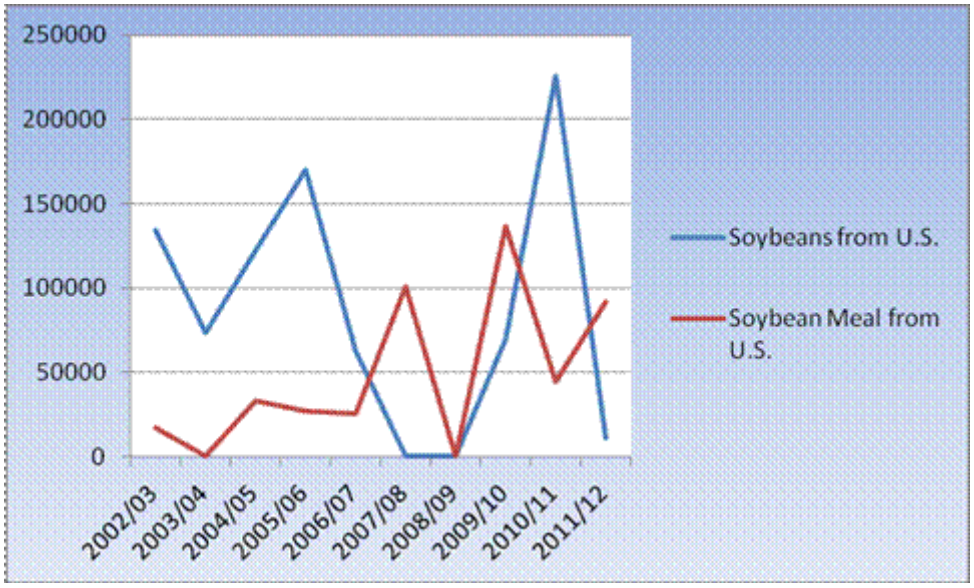
UK Soybean and Soybean Meal Imports, Last Ten Marketing Years in Metric Tons



Data source: GTIS/UK HMRC

The next chart shows the erratic price and confidence-driven buying pattern from the United States. Adoption of biotech traits, and their asynchronous EU approval, has clearly affected U.S. exports to the UK.

UK Imports of Soybeans and Soybean Meal from U.S. 2002/03 to 2011/12



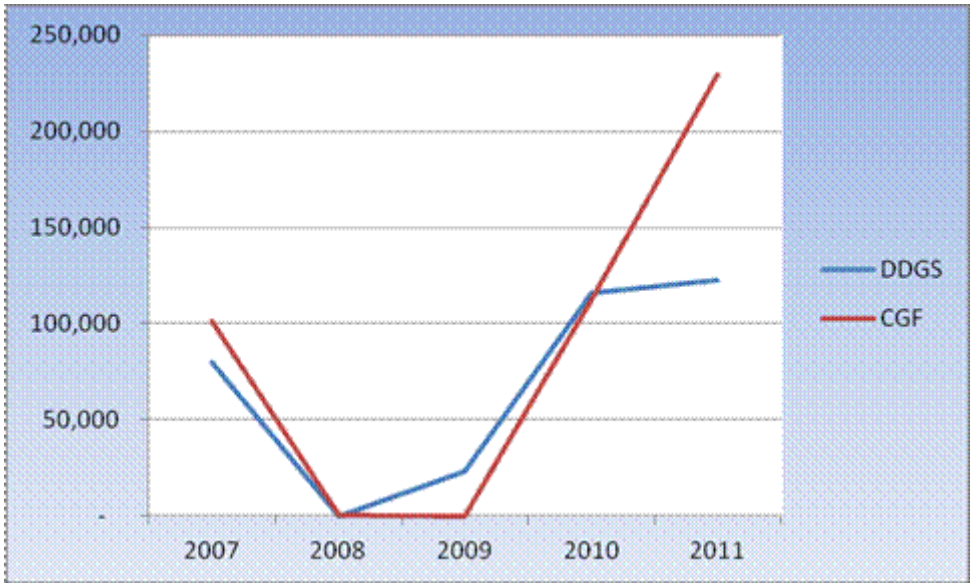
Data source: GTIS/UK HMRC

Without change in the EU approval process, this trade pattern will continue for U.S. product and may be repeated in imports from Brazil, Argentina and other non-EU countries, as they adopt new biotech traits that may not yet be approved or which never seek approval in the EU.

Confidence, provided by EU approval, also dictates trade in Distillers Dried Grains (DDGs) and Corn Gluten Feed (CGF) from the U.S. Price is also an overriding factor, and the U.S. has had bumper corn harvests until the drought affected yields last year.

As illustrated by the below chart (data from U.S. Grains Council), the last few years have seen a return to UK imports of DDGs and CGF from the United States. However, there is UK industry concern that corn varieties planted in the U.S. in 2013 may not make it through the EU approval system in time for marketing year 2013/14.

UK Imports of Distillers Dried Grains and Corn Gluten Feed from U.S. 2007 to 2011



Source: U.S. Grains Council

Since the late 1990s/early 2000s, U.S. exports of processed foods and beverages have also been constrained by market conditions and EU legislation on genetic engineering. As a result of a pervasive negative image, UK supermarkets and food manufacturers formulate their regular grocery products to exclude biotech ingredients. Usually the biotech element of processed foods is a small component of the overall product. This means that the additional cost of sourcing non-biotech ingredients adds only a small contribution to the finished price of the goods. However, for many U.S. companies, the additional burden to source non-biotech ingredients to supply the EU is often too large a hurdle to overcome. Soy and corn-based products are particularly affected, but those containing glucose or other sugar components of biotech sugar beet or oilseed rape (Canola) must also label, and by doing so may not be listed or carried in UK inventories.

There are examples of products overcoming the hurdles, labeling appropriately and achieving sales success. These products are usually those where consumers have a desire for the product or there is a price incentive that counters the presence of biotech ingredients, for example, candy bars and oils.

Section III. Plant Biotechnology Policy:

As a Member State, the UK must implement all European Union Directives and Regulations since novel foods and processes is an aspect of food law that is harmonized throughout the EU.

Responsible UK authorities

1. The Health and Safety Executive (HSE) regulate genetically modified organisms (GMOs) in contained use (e.g., in a laboratory) HSE
2. The Department for Environment, Food & Rural Affairs (Defra) is responsible for the control of the deliberate release of GMOs, and for national, EU and international policy on the environmental safety of GMOs. Defra

Defra is the competent authority that implements and enforces Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms. EU Directive 2001/18/EC

Defra provides the secretariat for the Advisory Committee on Releases to the Environment (ACRE). ACRE is the independent body which reviews applications for field trials of organisms. Defra/ACRE

3. The Food Standards Agency (FSA) controls the assessment of GM food for human consumption (food and feed), and consumer labeling of GM foods. FSA

The FSA is advised on both GM and novel foods by an independent body of experts called the Advisory Committee on Novel Foods and Processes (ACNFP) and on GM animal feed by the Advisory Committee on Animal Feedingstuffs (ACAF). The ACNFP is responsible for assessing the safety of novel and GM food, and ACAF is responsible for assessing the safety of GM feed.

Recent statements by Secretary of State for Environment, Food, and Rural Affairs

It is clear from recent statements made by Owen Paterson, Secretary of State for Environment, Food, and Rural Affairs, that the UK government is determined to make progress on this issue. Continued economic difficulties for the UK and the likelihood of negotiations starting on a Transatlantic Trade and Investment Partnership between the U.S. and the EU have made a stronger political case for access to biotechnology. The UK has some of the largest and most efficient farms in Europe, but recent extreme weather events and a reduction in available fungicides and pesticides (as a result of an EU review) has left horticultural production vulnerable. The UK is keen to attract inward investment in plant science applications and capitalize on any growth opportunities presented by biotechnology.

Excerpts from recent media coverage:

Owen Paterson: "*Genetically modified food should be grown and sold widely in Britain and consumer opposition to the technology is a complete nonsense*"
Source: Telegraph 9 Dec 2012

"*Downing Street said it was working behind the scenes to encourage European Commission officials to make it easier for farmers to grow GM crops*."
Source: Telegraph 10 Dec 2012

Owen Paterson: "*We should not be afraid of making the case to the public about the potential benefits of GM beyond the food chain - for example, reducing the use of pesticides and inputs such as diesel. I believe that GM offers great opportunities but I also recognize that we owe a duty to the public to reassure them that it is a safe and beneficial innovation*."
Source: Guardian 3 Jan 2013

Owen Paterson: "*Every year we delay, Argentina, Brazil and Canada are getting further ahead of us," he said. "We are mad not to seriously look at this technology*."
Source: Farmers Weekly 8 Feb 2013

UK Government

Political attention on food security, climate change, population growth concerns and adoption of a policy to pursue sustainable intensification of agricultural production has paved the way for greater acceptance of biotechnology. The quotation "*It's another tool in the tool-box of technologies we need to feed more and impact less*" has gained traction to such a degree that it forms part of the UK government's Department for Environment, Food & Rural Affairs (Defra) policy statement on biotech crops:

"*The Government recognizes that GM technology could deliver benefits providing it is used safely and responsibly, in particular as one of a range of tools to address the longer term challenges of global food security, climate change, and the need for more sustainable agricultural production. Developing countries should have fair access to such technology and make their own informed decisions regarding its use.*

To encourage innovation, fair market access for safe products and economic growth, the Government believes that regulation of this technology must be proportionate."

The UK government makes decisions on a science and evidence base. It considers each new biotech dossier submitted to the European Food Safety Authority (EFSA) on a case by case basis. The UK's independent Advisory Committee on Releases to the Environment (ACRE) and Advisory Committee on Novel Foods and Processes (ACNFP) review each relevant application made to EFSA and their

opinions guide UK policy.

UK tends to adopt a pro-trade, pro-science, principled and pragmatic approach in EU negotiations on biotechnology. Increasingly frustrated by the slow EU approval process for new biotech events, particularly for cultivation, the UK government (as with most thorny EU issues) seeks to partner with other like-minded European Member States to effect change. However, the centre of gravity at EU level seems to be weighted towards those Member States politically opposed to the technology. Without a serious political shift in Member States with large voting weights, such as France, Germany, and to a lesser extent Italy, there is no prospect of achieving the Qualified Majority needed to shorten approval times (around 46 months currently for food and feed dossiers).

Agri-tech Strategy

The exceptionally wet weather in the UK in summer 2012 highlighted the need for progressive plant science to tackle fungal disease in domestic horticulture, particularly potatoes. Defra's policy statement also states: "*The Government supports farmers having access to developments in new technology and being able to choose whether or not to adopt them*." Increasingly, the UK's considerable plant science research base is seen as an area of Life Sciences that is critical to the UK's economic growth and employment. A prioritized agenda for laboratory and field work, applicable to the needs of farmers and growers, adequately supported by agricultural extension services, is also now seen as vital to increase UK self-reliance in food and agricultural commodities. If biotechnology is the means by which a particular outcome and agronomic or quality benefit can safely and most economically be achieved, then the UK government's current stance indicates likely support for commercial cultivation.

As part of the UK Industrial Strategy announced by the Secretary of State for Business, Innovation and Skills in September 2012, the UK is developing a long-term agri-tech strategy focused on knowledge transfer and the application of technology to the agricultural sector. A public comment period ran from October to November 2012, and an initial indication of its scope is expected by mid 2013.

Role and membership of the Biosafety Committee

The UK has ratified the Cartagena Protocol on Biosafety. Defra is the contact point, see: Defra/Cartegena Protocol

The enforcement of this regulation has been implemented in England by way of the Genetically Modified Organisms (Transboundary Movements) (England) Regulations 2004 . Similar regulations have been implemented in Scotland, Northern Ireland and Wales).

Biological Diversity is an increasing area of work for the UK government, as agricultural innovation seeks to increase production while at the same time reducing environmental and biodiversity impacts.

Biodiversity 2020 – A strategy for England's wildlife and ecosystem was launched in 2011. Increasingly, countries with experience of growing biotechnology crops will be asked how they measure the impact of monoculture/short rotation on wildlife, and for hard statistical results.

Political factors

The United Kingdom is comprised of England, Wales, Scotland and Northern Ireland. The devolved governments of Northern Ireland, Scotland and Wales have jurisdiction over agriculture, fisheries, and food policy in their regions. Scotland and Wales are countries with a high proportion of "Less Favored Areas" for agriculture under EU Common Agricultural Policy definitions and they trade heavily on their 'pristine environment' image. The political leadership of Scotland and Wales continues to seek the most restrictive policies possible on agricultural biotechnology, including the set up of "GM-free zones". Similarly, Northern Ireland joined forces with the Republic of Ireland to call for Ireland to become a "GM-free zone" in September 2008. These more rural communities generally feel that growing biotech crops risks damaging the reputation of produce from Scotland, Wales and Ireland that outweighs any benefits that agricultural biotechnology might bring.

In formulating overall UK biotechnology policy, central government (based in London) solicits views from a wide range of stakeholders, including the devolved Parliaments.

Approvals for food/feed and cultivation

The procedures for gaining EU approval for the import of biotech food or animal feed, and also seeds for cultivation are detailed in our EU report here: GAIN Database link to FR9105

Since the EU livestock industry, particularly pigs and poultry, require an external source of protein-rich animal feed, import authorizations for food and feed (which go hand in hand) intended to supply that market are usually approved when trade becomes critical. However, approvals for both food/feed and cultivation are slower than intended under EU law. Cultivation dossiers have taken notoriously long times to pass, with the last approval taking over 13 years for a non-edible potato. According to EuropaBio, the European trade association for the biotech industry, cumulative delay in EU approval of biotech products now amounts to 44 years, see: EuropaBio summary of delays

Biotechnology Crops Approved for Commercial Use

The full list of approved products for feed and food use under Regulation EC 1829/2003, and cultivation (environmental release) under Directive 2001/18 is available at: Europa GM Register.

The approval process for stacked events (more than one trait) is the same as for single events.

Field testing of biotechnology crops

As covered earlier in this report, the UK has currently only one field trial of wheat that has been modified to produce a non-toxic odor that repels aphids. Having had only one year of results, it is too early to predict a possible time to commercialization for this trait.

There are no pending applications for additional field trials. Applications are listed Defra website GM applications-consents

Field trials must provide a grid reference for sites for which there is an active consent for a biotech trial release. Details are posted on the Defra website trials page.

Coexistence between biotech and non-biotech crops (including organic agriculture)

The UK government's policy statement says: *"If and when GM crops are grown in England commercially, we will implement pragmatic and proportionate measures to segregate these from conventional and organic crops, so that choice can be exercised and economic interests appropriately protected."*

The basis for any UK coexistence policy is likely to be the extensive work carried out by SCIMAC (Supply Chain Initiative on Modified Agricultural Crops). Information on their proposals for coexistence and liability can be found here: SCIMAC

The EU's labeling requirements are intended to address consumer concerns, and are not related to safety. Labeling regulations for products containing or consisting of Genetically Modified Organisms (GMOs) are presented in Regulation (EC) No 1830/2003, article 4B. In general, these labeling regulations apply to bulk agricultural commodities, such as whole grains and oilseeds. The scope of biotech products covered is defined in Directive 2001/18, see: Eur-Lex Europa.

Labeling regulations for food and feed products that are produced from GMOs are presented in Regulation (EC) No 1829/2003, articles 12-13 for food, and articles 24-25 for feed. These are for products that have undergone varying degrees of processing. In general, all food and feed products containing/consisting of GMOs and/or produced from GMOs, including products that no longer contain detectable traces of GMOs, must be labeled. The allowable adventitious presence level for EU-approved varieties of GMOs for use in food and feed is set at 0.9 percent. Above this level, all products must be labeled.

As the EU's authorization procedures for new biotech varieties tend to be slower than those of other countries, a time-lag known as 'asynchronous authorization' occurs. To deal with the possible presence of unauthorized varieties in imports of commodity crops, the EU has adopted a measure, Regulation 619/2011, which sets a tolerance level of 0.1 percent for certain varieties for which a valid application for an EU authorization has been made and which fulfill the requirements set out in Article 2 of the

Regulation.

Above this threshold, the product is not allowed on the EU market. Operators must demonstrate that the presence of GM material was adventitious or technically unavoidable.

The EU's Joint Research Centre has published guidance on the application of Regulation (EU) No 619/2011.

EU regulations do not require labeling of products that are not food ingredients, such as processing aids. In addition, meat, milk or eggs obtained from animals fed with GM feed or treated with GM medicinal products do not require GM labeling.

Example of to How to Label for Food Produced from GMOs

Article 13 of Regulation 1829/2003 specifies the wording to be used on the label as follows:

(a) Where the food consists of more than one ingredient, the following wording must follow immediately after the ingredient concerned, in brackets: "genetically modified" or "produced from genetically modified [name of ingredient]. A compound ingredient with a constituent X which is produced from a GMO Y must be labeled "contains X produced from genetically modified Y. Example: a biscuit containing soy flour derived from GM-soy must be labeled "contains soy flour from genetically modified soy".

(b) Where the ingredient is designated by the name of a category, the following wording must be used in the list of ingredients: "contains genetically modified [name of organism]" or "contains [name of ingredient] produced from genetically modified [name of organism]". Example: for vegetable oils containing rape oil produced from genetically modified rape, the reference "contains rape oil from genetically modified rape" must appear in the list of ingredients.

(c) Where there is no list of ingredients, the words "genetically modified" or "produced from genetically modified [name of organism]" must appear clearly in the labeling. Example 1: "a spirit containing caramel produced from genetically modified corn". Example 2: "genetically modified sweet corn"

(d) If the product consists of or contains a GMO, e.g., sweet corn in a Mexican salad, the label must state "genetically modified sweet corn"

The designations in (a) and (b) may appear in a footnote to the ingredients list, provided they are printed in a font at least the same size as that of the list of ingredients or, where there is no list of ingredients, clearly on the labeling.

Labeling for Genetically Modified Microorganisms (GMMs) and "Processing Aids"

Food and feed (including food and feed ingredients, such as additives, flavorings and vitamins) produced by fermentation using a GMM which is kept under contained conditions and is not present in the final product are not included in the scope of Regulation (EC) No. 1829/2003. These food and feed products are considered as having been produced with the GMM, rather than from the GMM.

Therefore, these products do not have to be labeled like products produced from agricultural biotechnology. Likewise in the case of GMMs such as yeast used in alcoholic beverages, the EU does not require labeling if the GMM is not present in the final food. This is also true of cheese that has been produced "with" the use of chymosin, an enzyme that is genetically modified. Such processing aids do not fall within the scope of the labeling regulations.

In the UK, traceability and labeling regulations are the responsibility of the Food Standards Agency. UK information on GM food and feed labeling can be found at: FSA Labelling.

Seed Labeling Legislation

In the absence of any EU seed labeling regulation for the adventitious presence of biotech seed, the European Commission has advised that any seed lot containing GM seed authorized for the cultivation has to be labeled as containing GMOs. Seed lots containing GM seeds that are not authorized for cultivation cannot be marketed in the EU.

In the UK, this is enforced by the GM Inspectorate of the Food and Environment Research Agency (Fera). In the coming year the GM Inspectorate will focus on minimizing the risk of adventitious GM presence in conventional seeds of *Brassica napus*, *Brassica rapa*, *Glycine max* and *Zea mays*. For more information see: GM Inspectorate.

Section IV. Plant Biotechnology Marketing Issues:

There are signs that the ground is shifting in the UK. The trade and even mainstream journalism are increasingly making a case for the technology and calling on industry and the public to be more open-minded about potential benefits. There is a growing awareness that European consumers are buying

meat from animals fed on biotech feed, and a growing acceptance that biotech crop derivatives in the food supply chain are inevitable, and to be managed, if not embraced.

Numerous opinion polls and consumer surveys have been carried out in relation to British consumer acceptance, or otherwise, of biotech food. There is a vocal minority against, but most surveys report apathy and a lack of knowledge by the general population, who rely heavily on supermarket chains to provide them with safe, quality food. There is a dominance of private label products in the UK market and an inherent trust (cultivated by the retailers) that they will "do the right thing" for their customers. Since all of the retail chains publicly declared their private label to be "GM free" in the early 2000s very few biotech derived ingredients/products have made it onto British shelves.

As the number and adoption of biotech products worldwide continues to increase exponentially, availability and the cost of sourcing and segregating biotech products has become a real issue for the UK supply chain. No single retailer wants to be the first to undo their previous general stance on biotechnology. However, movement has been necessary on the animal feed side as the availability of non-biotech has rapidly decreased and the cost increased. Asda (Walmart) and Wm Morrisons Supermarkets were the first to move to acceptance of biotech feed for their private label meat and poultry products around two years ago. In April 2013, Tesco, Cooperative Group, Marks & Spencer, and Sainsbury Supermarkets also communicated to their customers that from May 2013 the poultry and livestock supply chains could no longer source sufficient quantities of non-biotech animal feed at a reasonable cost. Organic options are available for those who wish to avoid biotech-fed livestock, and the up-scale Waitrose chain (capitalizing on the opportunity to differentiate from its competitors) now requires non-biotech feed for both its poultry and pig meat products.

There have been recent calls by lobby groups to label biotech-fed meat and poultry products (currently exempt from EU labeling law). Some commentators believe that voluntary labeling will help acceptance of biotech feed and food, since the labeling will be become familiar. Others cite concerns that biotech-fed meat and poultry products will be seen as the option for the poorest in society, while the richest will have alternatives. However, it is more likely, if given the information and a choice, UK consumers will vote with their wallets and pocket books.

UK Consumer Research into Attitudes and Acceptance of Biotech foods

A selection of available research:

Food Standards Agency Consumer Research on GM and Novel Foods

British Science Association Reports

Institute of Grocery Distribution Factsheet

European Crop Protection Association

The food price spikes of 2008 and ensuing debate and focus on how to deliver global food security, while addressing climate change and feeding a burgeoning population resulted in more positive media coverage for biotechnology. This, together with the economic downturn and a need for the UK government to support areas that will create economic growth and skilled labor, has created a more favorable policy environment for biotechnology. This may create more confidence in the food retail and manufacturing base to incorporate biotech derivatives in mainstream grocery products. As alluded to earlier, the majority of consumers look to supermarket chains to determine the quality/price ratio and to rigorously check the safety of the food they purchase.

Section V. Plant Biotechnology Capacity Building and Outreach:

After almost a decade of minimal outreach on biotechnology, the Office of Agricultural Affairs in London renewed their attention on this area as the food security/climate change/ population growth debate grew on the back of the food price spikes of 2008-2009. In September 2010, a one-day conference was hosted using part U.S. Department of State and part internal Foreign Agricultural Service (FAS) funding. This has been followed up with several speaking engagements for State's Bureau of Economic and Business Affairs' (EB) staff, again utilizing part agricultural biotechnology outreach funds and part internal FAS funding.

The International Visitors Leadership Program (IVLP) has also provided a valuable opportunity to send British contacts to the U.S. on tailored biotechnology or broader agriculture programs.

Section VI. Animal Biotechnology:

Genetic modifications and enhancements in animals "*are much further away from commercial application in food production*" (British Society of Animal Science) compared to plants. Research is the main focus of biotech animals in the UK.

Laws have been implemented since the 1980's to better control and regulate genetic manipulation in

animals and protect the citizens of the UK. The Animal Scientific Procedures Act was passed in 1986, which required strict scientific and ethical justifications for procedures and experiments on animals. In 1994 the UK government created a committee to advise the government on issues dealing with the ethical issues of biotech animals. Although selective breeding for preferable genetic traits has been occurring since the 18th century (Health and Safety Executive), "*both the creation of genetically modified organisms, and breeding from them, are controlled procedures already in the UK, requiring a license from the Secretary of State. Before a license is granted, the likely 'adverse effects' on the animal have to be weighed against the likely benefits of the modification*" (British Society of Animal Science).

These strict requirements make it inefficient and expensive for genetically modified animals to be used for commercial and agricultural purposes. However, research is ongoing to advance the use of genetically modified animals for agriculture and pharmaceuticals. For example, cows have been genetically engineered to produce milk that is drinkable for people who suffer from lactose intolerance, as well as milk that is high in the fatty acids found in fish. In 2011, the universities of Cambridge and Edinburgh announced that they had created a biotech chicken that will not pass on the avian influenza virus to other birds. This protects the flock and could potentially increase production output. Research into agricultural and food-based applications of biotechnology is funded by the Biotechnology and Biological Sciences Research Council (BBSRC).

Defra, the Department for Environment, Food and Rural Affairs, plays an overarching role in the regulation of genetically enhanced animals. The Health and Safety Executive helps to control the contained use of genetically modified organisms in the United Kingdom to make sure that no products or animals are released or exposed to humans without safety inspections and approvals.

The National Centre for the Replacement, Refinement and Reduction of Animals in Research is an independent scientific organization. Tasked by the UK government, they support the science base by facilitating and funding innovation and technological developments that replace or reduce the need for animals in research and testing, and lead to improvements in welfare where animals continue to be used. This also includes work to reduce, refine and replace GM animals.

Currently, no GM animals or derived products are on the EU market. However, the European Food Safety Authority (EFSA) has started to look at this area with a view to informing EU policy decisions.

Sources of information on Animal Biotechnology:

Defra GM Page

HSE Biosafety Law

HSE Biosafety GMO Information

British Society of Animal Science

National Centre for Reduction of Animals in Research

EU Food Safety Authority