This response was submitted to the consultation held by the Nuffield Council on Bioethics on Emerging biotechnologies between April 2011 and June 2011. The views expressed are solely those of the respondent(s) and not those of the Council.

14 June 2011

AGRICULTURAL BIOTECHNOLOGY COUNCIL

promoting fair debate on behalf of the UK agricultural biotechnology industry

Agricultural Biotechnology Council (abc) submission to Nuffield Council on Bioethics consultation on *'Emerging Biotechnologies'*

The following submission details the Agricultural Biotechnology Council's (abc) views in response to the questions laid out in the consultation paper, entitled: '*Emerging Biotechnologies'*. We very much welcome the timely contribution of this study by the Nuffield Council on Bioethics, as we believe that biotechnology is an area that offers significant potential social and economic benefits.

Our response focuses on the ethical questions raised by GM technology and the implications for policy, governance and public engagement.

abc is the umbrella organisation for the agricultural biotechnology industry in the UK. The companies involved are BASF, Bayer CropScience, Dow AgroSciences, Monsanto, Pioneer (DuPont) and Syngenta. Our goal is to provide factual information and education about the agricultural use of GM technology in the UK, based on respect for public interest, opinions, and concerns.

For further information, please email enquiries@abcinformation.org or call 020 7025 2333.

Emerging technologies – GM

To consider GM technology as an 'emerging' technology is no longer strictly accurate. Over the past 15 years, the use of GM technology has rapidly increased. GM crops are grown by over 15 million farmers on 148million hectares of land worldwide. However, the technology continues to develop, with new products and crop-traits emerging.

This generation of products will include plants which are tolerant to drought or temperature stress; others that will increase the yield of a plant even if only half the amount of fertilizer is applied; and others that have nutritional benefits. Eventually it is envisaged that products may be available to produce pharmaceuticals and renewable industrial compounds.

GM technology is not a 'silver bullet' that can revolutionise world agriculture but it does offer significant agricultural, consumer, health and societal benefits. However, there are continued questions and comments in the media from pressure groups about the ethics and safety of GM technology which are not shared by the scientific community.

In this context, the points below set out the current GM policy in the UK and Europe and endeavour to address the ethical questions raised in the consultation paper.

Executive Summary

- GM technology is currently being used on over 148 million hectares of land (the equivalent land mass of France, Germany, the UK and Ireland put together)[1]. Two trillion meals containing GM ingredients have been consumed over the last 14 years across the world, without a single substantiated example of harm to human health.

- While safety is and will remain the top priority, abc believes that it is time to move on in the public debate and give UK farmers the tools that they need to increase production whilst reducing the carbon footprint and environmental impact of agriculture.

- In January 2011, the Government Office for Science published the Foresight Report on Global Food and Farming Futures. It called for the inclusion of GM as a key part of the approach of policy makers to meeting soaring demand and pressure on resources and for a sensible and science based assessment of the role that the technology can play.

- Political interference in GM regulation is not based on science, but on a political reaction to consumer perceptions of the 'ethics' of GM technology, and a failure of government, retailers, industry and the media to address and communicate the scientific basis of GM.

- The regulatory environment for the use of GM in the EU has driven investment and research and development out of the UK, with obvious negative implications for the UK's knowledge base. This also has an impact on the contribution of the UK to develop agricultural biotechnology which can address issues of world hunger, environmental damage and climate change. In addition, the excessively precautionary approach of the regulatory system fosters an attitude in popular culture that condones vandalism of field trials which have been assessed and approved by governments.

- It should be noted how GM feed and food is slightly different to other emerging technologies in that consumers are faced with confusing and conflicting messages from Government, retailers and anti-GM campaigners.

[1] ISAAA, (2011) *Global Status of Commercialized Biotech/GM Crops: 2010* http://www.isaaa.org/resources/publications/briefs/42/executivesummary/default.asp

1. Defining GM technology

- For thousands of years farmers have selected plants with the characteristics that they want, such as extra seeds in a pod or the ability to survive in the cold. By crossing the best plants, they hoped to produce better varieties. GM allows chosen individual genes to be transferred from one organism into another, including genes between non-related species. Such methods can be used to create GM crop plants.

- GM technology is currently used on a commercial level in other parts of the world, in crops including maize, cotton, canola, soybean, squash, papaya, sugar beet, tomato, sweet pepper and alfalfa. Such plants are modified to contain specific traits such as herbicide resistance to help improve reliable weed control and yield. They can also be modified to be more resistant to insect or virus attack.

- Second generation GM products are nearing commercialisation. This generation of products has the potential to contribute significantly to improving agricultural outcomes for farmers and communities across the developing world. This will include plants which are tolerant to drought or temperature stress; others that will increase the yield of a plant even if only half the amount of fertilizer is applied; and others that have nutritional benefits. Eventually it is envisaged that products may be available to produce pharmaceuticals and renewable industrial compounds.

2. Socio-economic benefits of GM technology – tackling the food security challenge

- Farmers throughout the world face unprecedented challenges brought about by a combination of an ever-increasing world population, the rising cost of raw materials and the threat of climate change. With the world's population set to soar to 9bn by 2050, more food is needed from a similar amount of agricultural land – otherwise food price instability will continue to increase and the pressure on precious areas of natural land will intensify.

- There is no one solution to food security or food inflation; no silver bullet and no quick fix. An integrated approach to protecting the current food supply whilst investing in methodologies to increase agricultural productivity and reduce waste is the key to meeting future challenges. It is imperative that agricultural biotechnology, and in particular GM, is part of this solution.

- GM crops offer the potential for increased yields, greater pest and disease resistance, lower machinery and fuel costs, better nutritional value and greater drought tolerance. Without significant increases in yield and utilising solutions to crop destroying diseases, policy makers will struggle to address hunger and under-nutrition – something that affects almost 1bn people today.

- Over 90 per cent of those using the technology are resource-poor farmers in developing countries growing food, feed and materials on an area considerably less than 10 hectares. These farmers choose to use GM as they are keen to maximise the effectiveness of their crops and achieve better incomes for their families.

- Pest-resistant GM crops in China, South Africa, South America and India are providing stable food and commodity supplies and, in the future, crops suited to drought or temperature changes will play a crucial role in helping farmers adapt to climate change.

- In January, the Government Office for Science published the Foresight Report on Global Food and Farming Futures. It called for the inclusion of GM as a key part of the approach of policy makers to

meeting soaring demand and pressure on resources and for a sensible and science based assessment of the role that the technology can play.

- If the 229 million tons of additional food, feed and fibre produced by biotech crops during the period 1996 to 2009 had not been produced by biotech crops, an additional 75 million hectares of conventional crops would have been required to produce the same tonnage.

- A recent Swedish study estimated that the improved yields resulting from the use of a few common GM crops in Europe would release 645,000 hectares of agricultural land for cultivation or other uses[2]. The report suggests that such land could be used for the production of biofuel crops, set aside for conservation/biodiversity, or used for increased food production. As the threat of climate change increases it is imperative to safeguard dwindling natural resources and maintain a reliable food supply.

- However none of these advantages can be realised in the UK and Europe if there is an inconsistent and obstructive regulatory process.

Case study 1

Developing drought-tolerant GM sorghum fortified with vitamins for Africa

Sorghum is a cereal that has many characteristics comparable to corn. However, unlike corn, sorghum is naturally drought tolerant. It provides calories and minimal nutrition in dry areas of Africa. Efforts to enhance sorghum through GM are being spearheaded by DuPont's agricultural unit, Pioneer Hi-Bred International, which is developing sorghum that contains more Vitamin A, zinc and iron, and has improved protein digestibility characteristics.

The sorghum nutritional improvement project will permit greater levels of essential nutrients to be delivered to those who live in arid places where sorghum is relied upon as the staple food source. Additionally, the 'biofortified'[1] sorghum may become important in new geographies as a result of the effects of climate change.

The introduction of this GM sorghum is expected to have a major impact on the health and life of targeted communities in Africa – not only by offering improved nutrition, but by providing the sorghum at minimal cost to growers. Biofortified sorghum will be distributed to underserved communities in multiple African countries, royalty free[2].

Pioneer Hi-Bred began working on the project in 2005 in conjunction with the African Biofortified Sorghum (ABS) Consortium, an Africa-led public-private partnership. It recently received a $4 million grant from the Howard G. Buffett Foundation. Mr Buffett funded the project because "improving the nutrition of this staple crop has the potential to change the lives of more than 300 million Africans"[3].

[1] i.e. genetically modified to improve its nutritional value
[2] http://www2.dupont.com/Media_Center/en_US/daily_news/may/article20110505.html
[3] http://af.reuters.com/article/commoditiesNews/idAFN0423996820110504

[2] Commissioned by the Treasury Expert Group on Environmental Studies from the Swedish Agricultural University; http://www.ems.expertgrupp.se/Default.aspx?pageID=3

3. Social, cultural and geographical factors – European farmers denied choice over GM

- Whilst the use of GM products has continued to surge ahead in other parts of the world, Europe has been slow to approve cultivation due to political interference and a moribund approvals process. Despite this fact, Europe continues to heavily rely on imported GM products, such as soy, to feed livestock and satisfy consumer demand.

- This political interference is not based on scientific evidence. In 2010 a European Commission research compendium from more than 500 independent research groups over 25 years concluded that there is 'n*o scientific evidence associating GMOs with higher risks for the environment or for food and feed safety than conventional plants and organisms*.'[3] Instead, the interference is based on a political reaction to consumer perceptions of the 'ethics' of GM technology, and a failure of government, retailers, industry and the media to address and communicate the scientific basis of GM.

- Due to excessive delays in the approvals process, currently approval for a GM crop for import takes on average 37 months in the EU, whereas in the U.S. it takes about 15 months.

- The growth in the use of biotech crops outside Europe is putting our farmers at a competitive disadvantage. The global market for agricultural biotechnology is valued at over £90 billion and growing at 10-15 per cent annually. The regulatory environment has already driven investment and research and development out of the UK and Europe, with obvious negative implications for our future ability to compete with the US and developing world, particularly in East Asia and Latin America.

- Allowing the use of such technologies in Europe could increase the UK's food security, and offer farmers of all types of operation more stable farm incomes and reliable harvests. Access to innovations can drive up farm incomes and allow small-scale as well as large-scale farmers to achieve more financial security.

- The regulatory environment for the use of GM in the EU has driven investment and research and development out of the UK, with obvious negative implications for the UK's knowledge base. If a more evidence based regulatory environment was put in place, both the private and public sector would be encouraged to conduct scientific trials, testing the applicability of agricultural biotechnology developments for the UK market. This would stimulate investment and lead to an increase in highly-skilled jobs within biotech companies and public sector institutes.

- This raises questions over the ethics of denying research on, and access to, GM technology to those who are most in need of its benefits; i.e. small-scale farmers and those subsisting in arid of environmentally sensitive regions.

- Despite this fact, the wider contribution of UK research and innovation to global food security continues to be seen in the development of new traits, including blight resistant potatoes which have been successfully trialled in the UK. The global economic impact of blight is estimated at £3.5bn, but ongoing trials at the John Innes Centre in Norfolk could produce products that increase the reliability of supply for farmers and reduce costs for consumers. abc member companies would seek to commercialise blight resistant potatoes in the UK should the regulatory

[3] 'A decade of EU-funded GMO research', http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/1688

system improve. Through its refusal to allow the cultivation of biotechnology, Europe is continuing to erode the industrial R&D base across the EU.

- Positive and robust regulatory regimes in other parts of the world have allowed public private partnerships to flourish, with local scientists taking the lead on producing tailored crops for specific climatic conditions; boosting yields in places like Uganda (see case studies below):

Case study 2

Developing disease-resistant GM bananas for Uganda

The International Institute for Tropical Agriculture and the African Agricultural Technology Foundation have been developing a GM solution to the problem of Banana Xanthomonas Wilt (BXW), in conjunction with a Taiwanese biotechnology institute.

In central Uganda, one of the main banana-growing regions, BXW hit up to 80% of farms, sometimes wiping out entire fields. To get rid of BXW, it is necessary to dig up and burn the affected plants, disinfect all machinery and tools and allow the ground to lie fallow for six months before replanting. For small-scale farmers, leaving their gardens lying empty for this long is not an option, and they switch to other crops.

Bananas are the staple food of Uganda and are the country's second largest cash-crop after coffee. The disease is endangering the livelihoods of the nations' farmers, 75% of who grow bananas, and threatening an important food source in one of the poorest nations in the world. Damage caused by BXW is now estimated to cost farmers in the East Africa region half a million US dollars per year.

This is the first time it has been tried with a banana, although initial trials are promising, with six out of eight strains showing 100% resistance to BXW. Development of wilt-resistant GM bananas has now progressed to the confined field-crop testing stage and is showing promise[1].

[1] http://www.sinica.edu.tw/manage/gatenews/showsingle.php?_op=?rid:4043%26isEnglish:1
[2] http://www.guardian.co.uk/world/2011/mar/09/gm-banana-crop-disease-uganda?INTCMP=SRCH

4. Ethical concerns raised over GM

- Two trillion meals containing GM ingredients have been consumed over the last 14 years across the world, without a single substantiated example of harm to human health.

- In fact, Biotech crops are rigorously tested for safety prior to commercialisation, and their cultivation methods undergo as much, if not more scrutiny than conventional crops. The proteins produced by certain insect-resistant biotech crops are also used in organic farming and gardening, and the cultivation of GM crops actually reduces the use of pesticides.

- Therefore, while safety is and will remain the top priority, abc believes that it is time to move on in the public debate and give UK farmers the tools that they need to increase production whilst reducing the carbon footprint and environmental impact of agriculture.

- There are obvious questions over whether it is ethical for European politicians to arbitrarily deny farmers the choice to grow GM crops and enjoy the associated social, economic and environmental benefits.

- There are also questions over whether it is ethically right, at a time of rising food prices and increasing concerns over food security, for Europe to push the responsibility for its share of global food production increasingly onto farmers in the developing world.

5. Public opinion of GM

- One of the most common arguments deployed by those arguing against the use of GM is that consumers are opposed to the technology. However, recent studies show that consumer perception in the EU is actually growing more favourable towards GM foods.

- A recent survey in the UK by the Institute of Grocery Distribution showed 52% of British consumers consider GM a means of tackling growing global food shortages, while only 13% disagreed with this idea.[4]

- However, GM still faces slightly different challenges to other 'emerging technologies'. With emerging technology in medicine or chemical engineering, consumers will tend to rely on professionals and experts to communicate the benefits/risks of the technology to help them make an informed choice; doctors and engineers. It is more difficult to link GM technology directly to consumer benefits, such as lower food prices or reduced deforestation, while consumers are faced with confusing and conflicting messages from Government, retailers and anti-GM campaigners.

- However, with a world population set to soar to 9bn by 2050, the UN Food and Agriculture Organisation predicts that global food production must rise by 70% to meet the food needs of a growing population by 2050. This tremendous increase in demand will have to be matched with an increase in supply. Without significant increases in yield and utilising solutions to crop destroying diseases as offered by GM technology, it is questionable whether supermarkets will be able to continue fill their shelves with the same level of produce at affordable prices.

For further information, please email enquiries@abcinformation.org or call 020 7025 2333.

Agricultural Biotechnology Council
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[4] IGD, (2008) *Consumer Attitudes to GM Foods*, Consumer Unit Base: All adults
http://www.igd.com/index.asp?id=1&fid=1&sid=17&tid=0&folid=0&cid=1487