

Natural England Board



Meeting: 11
Date: 25 June 2008

Paper No: **NEB PU11 07**

Title: **Scope of Draft Policy on Biotechnology in the Natural Environment**

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1. Purpose

1.1. The purpose of this paper is to ask the Board to consider the scope of Natural England's policy on biotechnology in the natural environment.

2. Recommendations

2.1 It is recommended that the Board agrees the scope of this policy.

3. Context

3.1. The development of genetically modified organisms (GMOs) has caused great controversy, partly because of real or perceived threats to the environment. There is a wide range of views among our stakeholders and the wider public on the safety and desirability of releasing GMOs into the environment, ranging from optimism about the benefits to human health, food security and the natural environment, through to outright rejection of genetic modification (GM) in all its forms.

3.2. Applications of biotechnology¹ include breeding of plants, animals and microorganisms for use in agriculture, forestry, aquaculture, bioremediation and medicine. Biotechnology products could have positive, neutral or negative effects on the natural environment, depending on their genetic stability, their biochemical profile, their ecological behaviour and the way in which they are used and managed. Each application therefore needs to be considered on a case-by-case basis².

3.3. Global demand for food is projected to double within the next 25-50 years³, and demand for bio-derived fuel and fibre is also on the rise. Meeting this level of demand while conserving and enhancing our natural environment will

¹ Biotechnology includes genetic modification (GM) and other modern methods of plant breeding, such as Marker Assisted Breeding and Mutagenesis.

² In Europe, GMOs are regulated under Directive 2001/18/EC, which stipulates a rigorous environmental risk assessment (ERA) for each GMO. Non-GM biotechnology organisms are not regulated in this way, even though they may pose some similar environmental risks. Natural England is a statutory consultee to Defra and an assessor to the Advisory Committee on Releases to the Environment (ACRE) for proposed field trials and commercial releases of GMOs. We also act as GB Lead Agency on biotechnology and GMOs, on behalf of JNCC.

³ Synthesis Report of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), 2008. This study was led by Defra's Scientist Robert Watson.

be a massive challenge, and new technologies including biotechnology and GM may provide important opportunities – indeed they may be essential. However, in the UK increases in yields of cereals, grass, milk and meat over the last quarter century have been accompanied by sharp declines in numbers of many non-crop species, and there is little evidence to date that the current generation of biotechnology products will help to reverse this trend.

- 3.4. Through its expertise in science and evidence, Natural England has a key role to play in ensuring the environmental safety and wise use of GMOs and other forms of biotechnology. While continuing to provide evidence-based advice on the safety of GMO releases, we must also work proactively with stakeholders including regulators, policy makers, industry, scientists, farmers and environmental groups to advocate the need for research and development, including biotechnology, to take full account of of the natural environment.
4. Natural England's policy on biotechnology in the environment
 - 4.1. Natural England believes that biotechnology, including genetic modification, could contribute towards agriculture, forestry and fisheries becoming more environmentally sustainable and adapting to climate change, provided that breeding programmes actively target these goals.
 - 4.2. Natural England believes that GMOs also have the potential to harm the environment and should be assessed carefully according to the Precautionary Principle. Because GM can be used to develop organisms with radically different properties, we are particularly concerned about potential impacts on biodiversity that could be caused by changes in crop, tree or animal husbandry. Where necessary, and where there is sufficient evidence to demonstrate their environmental safety, we advocate the use of field-based ecological studies using GMOs to assess risks of changes in management practices before commercial release is licensed.
 - 4.3. Natural England believes that environmental risk assessment should be carried out on all novel biotechnologies that could result in significant changes in the way our land or water is managed. We will advocate the need to avoid the use of new plants, animals or microbes which could compromise the natural environment. We will also advocate the need for changes in the ways that novel organisms and technologies are regulated, to secure greater protection for the natural environment and to promote more sustainable ways of managing our natural resources.
 - 4.4. Natural England believes that genetically-based technologies should not be regarded as alternatives to good management practice, including rotation, integrated pest management (IPM) and organic systems. Over-reliance on specific genes to solve problems with weeds, pests or diseases could result in increased selection pressure for resistance to develop, and if use of biotechnology led to further simplification of farming systems, this could hinder Natural England's work to halt and reverse biodiversity loss. .
 - 4.5. Natural England believes that an effective liability regime is needed to rectify and compensate for adverse environmental impacts shown to be caused by GMOs and other biotechnology.

- 4.6. Natural England believes that there is a need to be alert to wider or indirect environmental and socioeconomic impacts which may arise from use of biotechnology and GMOs which would not be considered within the current GMO regulatory framework.
- 4.7. Natural England has an important role to play in engaging positively with Government, industry, the research community, land managers, environmental bodies, communities and the public to explore how these technologies could support more sustainable land management and adaptation to climate change and to advocate the need for more research to fill important gaps in the evidence base.

Annex 1

Principles

Natural England's role as statutory consultee on GMO releases requires us to consider the environmental risk assessment of specific GMOs . We must also consider biotechnology and GMOs within the wider context of developing more sustainable systems for agriculture, horticulture, forestry, aquaculture, pollution control and waste management. Our work on biotechnology will therefore be based on the following principles:

GMO releases

- i. Rigorous environmental risk assessment must be undertaken for all proposed releases of GMOs including direct, indirect, immediate or delayed risks.
- ii. Where a GMO includes two or more transgenic traits ("gene stacking") the environmental risk assessment should consider the potential for interactions between or additive effects of the different transgenes.
- iii. GMO releases should not be permitted unless risks to the natural environment have been shown to be acceptably low based on available evidence.
- iv. If, based on the evidence, there is any reasonable doubt about the safety of a proposed release, the Precautionary Principle should be applied.
- v. Where mitigation measures are attached as conditions to a GMO release, they must be economically practicable and enforceable.
- vi. Effective monitoring and surveillance should be carried out on all GMO releases to check for adverse impacts on the environment.

Regulation, policy and strategy

- i. Regulation of GMOs and other forms of biotechnology should be adequate to prevent adverse impacts on the natural environment and should be regularly reviewed in the light of new scientific and technological developments.
- ii. Use of biotechnology and GMOs in agriculture should complement and should not impede other approaches to improving sustainable land management.
- iii. Where GMOs and other biotechnology are shown to have caused adverse environmental impacts, there should be an adequate liability regime in place to rectify and compensate for these.
- iv. The use of GMOs and other biotechnology products should not promote further agricultural, forestry or fishery intensification, especially in areas of nature conservation value, and should not inhibit the widespread continuation or adoption of more environmentally sustainable products or practices.
- v. Development of new policies, regulations and research programmes involving biotechnology and GMOs should be open and transparent and include effective public consultation.

Annex 2

Science and evidence – benefits and risks

Biotechnology has the potential to offer a range of opportunities for protecting and enhancing the natural environment, including:

- development of crops which facilitate more sustainable farming practicesⁱ;
- production of bio-based materials with environmental benefitsⁱⁱ;
- enhanced biological control agentsⁱⁱⁱ; and
- plants or microorganisms which could be used in bioremediation of contaminated land or water^{iv}.

Release of biotechnology products into the environment, either for small scale experimental testing or for widespread commercial use, also has the potential to cause environmental damage. For GMOs, Directive 2001/18/EC stipulates a rigorous Environmental Risk Assessment. The specific environmental risks of a GMO must be determined, but may include:

- “escape” of the GMO from human control, or hybridisation with related species, leading to establishment of GM populations in the natural environment^{v,vi};
- establishment of GM weeds in agricultural or other managed environments^{vii};
- incorporation of novel sequences of genetic material into the genomes of microorganisms (bacteria or viruses) via horizontal gene transfer^{viii};
- increased toxicity of GMOs to non-target species^{ix}; and
- impacts of the way the GMO is used and/or managed^{x,xi}.

The most comprehensive review of scientific evidence on the environmental risks of GM crops (but not other GM organisms) relevant to the UK is probably contained within the UK Government’s GM Science Review, which was published in 2003 and updated in 2004 (www.gmsciencedebate.org.uk). This is now four years old, but the basic conclusions generally remain unchanged:

- GM is not a single homogeneous technology and its applications need to be considered on a case-by-case basis;
- for the current generation of GM crops, the most important issue is their potential effect on farmland and wildlife;
- detailed field experiments on current generation GM crops show that in a range of environments they are very unlikely to invade the countryside and become problematic plants, nor are they likely to be toxic to wildlife;
- however, it is clear that gaps in our knowledge and uncertainties will become more complex as the range of plants and traits introduced increases.

It is important to note that although there is a sizeable body of evidence on the environmental impacts of GMOs, much of it is of questionable quality. Evidence presented in Environmental Risk Assessments (ERAs) for GMO releases is often unpublished. Comparisons with independent, published and peer-reviewed research are needed to validate it. It is therefore critical for us to keep abreast with the latest developments in the field.

There have been many claims that biotechnology including GMOs will assist in the development of higher yielding crops, animals and trees and in improved environmental performance^{xii, xiii, xiv}. The evidence so far is mixed^{xv}. Some GM products do seem to support higher levels of production (e.g. in the United States, GM-produced rbST hormone given to cows increases milk production per cow by 10%^{xvi}) while for other GM products currently in commercial use the main benefits seem to be in simplifying the crop management for farmers^{xvii}. There is evidence that use of GM Bt insect resistant maize and cotton results in lower levels of pesticide use and increased abundance and diversity of arthropods in comparison to the equivalent non-GM crops where pesticides are used, but not in comparison to conventional crops grown without pesticides^{xviii}.

In countries like England where industrialised agriculture is already the norm, the potential for substantially increased yields without further environmental degradation will be difficult to achieve because there is an inverse correlation between agricultural productivity and levels of non-crop biodiversity within fields^{xix}. Delivering higher levels of food production while also delivering biodiversity and resource protection will require careful land management practices in combination with targeted breeding of desired traits^{xx}.

It is recommended that Natural England should undertake a review of the evidence base for the potential and practicalities of delivering increased yields through biotechnology without adverse impacts on the natural environment.

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