Making Europe unsafe for agbiotech

Book Section

Article in *The Handbook of Genetics & Society*,
edited by Paul Atkinson, Peter Glasner, Margaret Lock. Routledge, July 2009

Making Europe Unsafe for Agbiotech
Les Levidow

Introduction

Since the 1980s biotechnology has been promoted as a symbol of European progress. As a clean technology, agbiotech was meant to enhance efficient agri-production and thus fulfil the beneficent promise of a European Biosociety, like its counterpart of the Information Society. By the early 1990s biotech symbolised the 'knowledge-based society' and eventually the Lisbon agenda. At the 2000 Lisbon meeting of the European Council, Ministers committed the EU to become 'the most competitive and dynamic, knowledge-based economy in the world, capable of sustainable growth with more and better jobs'.

By then, however, agbiotech was becoming stigmatised, opposed and blocked throughout Europe. 'GM food' was widely portrayed as a pollutant contaminating science, agriculture, the environment and democratic sovereignty. The phrase 'GM-free' was playing a role similar to 'nuclear-free' in the 1980s. Few farmers have chosen to cultivate the GM crops which gained EU approval for commercial use. Even for such products, safety claims have remained in dispute.

How did agbiotech undergo such a reversal of its early status and economic ambition? Answers can be found by locating agbiotech within a wider political-economic project – and vice versa. In this article the concept of 'safety' will be elaborated in several ways: as contending accounts of risks to be clarified, and as a metaphor for a socio-political system favourable or not to agbiotech.

Risk issues proliferated and expanded from the late 1980s onwards. Questions were asked about whether or how GMOs could be made predictably safe for the environment. In the margins of this risk debate, a philosopher turned that predictive question into a normative issue. He analysed how organisms were being standardised for predictable, efficient agri-industrial uses through genetic modification, and thus how nature was being made safe for agbiotech (Sagoff 1991). This re-ordering of nature as standard commodities meant a normative shift in what counts as natural, beneficial, rational, etc.

Expanding on his insight, this article analyses how an entire socio-political system. How was Europe being re-ordered in ways more favourable to agbiotech in the 1990s? What difficulties were encountered? How was Europe becoming less safe for agbiotech by the end of the decade?

The article draws upon analytical concepts of socio-natural orders. Any technology is co-produced with specific forms of social and natural order; these are promoted through discourses of promises to address threats of disorder. Technoscientific developments can be understood as socio-technical hybrid constructs, ordering society in particular ways, as if these derived from separate 'natural' characteristics (Jasanoff 2004: 21). Stable success depends upon creating both those implicit links and explicit separations. Whenever a technology becomes contentious, power struggles arise over how to define the issues at stake – over what is 'the technology' and what problems need solutions.

1. Making Europe safe for agbiotech

Agbiotech was originally promoted as a multiple technological saviour: GM techniques would improve crops for both economic efficiency and environmental protection, especially by reducing agrochemical usage. These benefits were attributed to inherent properties of GM crops as smart seeds. Inefficiency was attributed to deficient inputs and a wild, disorderly Nature threatening crops. The inherent hazards of intensive monoculture were represented as external threats of disorder, which could be re-ordered through a molecular-level technofix: crops must be improved by editing their genetic information.

The search for molecular knowledge has featured metaphors of computer codes, which derive from the 1930s' science of molecular biology. This reconceptualized 'life' in physico-chemical terms: DNA became coded 'information' which could be freely transferred across the species barrier. A 'molecular vision of life' diagnosed societal problems as genetic deficiencies (Kay 1992). This informatic concept was favoured by the Rockefeller Foundation and government-funding bodies.

Through molecular biology, genetic engineering facilitated the development of novel commodities. 'As technology controlled by capital, it is a specific mode of the appropriation of living nature – literally capitalizing life' (Yoxen 1981). Genetic engineering was celebrated as 'a natural science', by reference to natural recombination of genetic material (Monsanto 1984).

The global biotechnological agenda was led by the US agri-industrial complex and its government supporters. Long beforehand, these institutions had turned agriculture into a rural factory of standardised commodity production, especially for animal feed and global export. In the 1990s agbiotech innovation complemented and extended that agri-industrial system, with the promise of alleviating its environmental damage through eco-efficient inputs. The development and adoption of GM crops were promoted through new policies – broader patent rights giving financial incentives to public-sector research, 'product-based regulation' normalising GM crops as safe, and trade liberalisation opening foreign markets to US agri-exports.

These policies linked neoliberal models of the natural and social order. In such models, market competition provides a naturally benign regulator, driving innovation as a basis for societal progress. Neoliberal policies promote the societal capacity to compete for economic advantage in the marketplace, while also creating new opportunities to marketise resources, thus elaborating a 'competition state' (Cerny 1999). In the agbiotech case, natural resources were invested with engineering and industrial metaphors, e.g. smart seeds, attributing human powers to commodity agri-inputs. 'Market liberalism and technocracy set the agenda, not democracy… the economism of globalisation discourse is combined with an authoritarian technological determinism' (Barben 1998: 417).

The US model of intensive agri-industrial production was appropriated as an inevitable European future. Since the 1980s a 'Biosociety' was being promoted within a general European policy of eco-efficient innovation. New policies sought to make Europe safe for agbiotech as normal products, while marginalising any opportunities for dissent or alternative development paths.

Soon this became linked with a neoliberal agenda. Invoking objective imperatives of global competition, the European Commission promoted agbiotech as essential for economic competitiveness and thus for survival of the European agri-food sector, along lines similar to the US model of industrial agriculture. By the mid-1990s the EU and the US were cooperating to remove 'barriers to transatlantic trade' through regulatory harmonisation,

especially for biotech products, as means to liberalise trade across the Atlantic (Murphy and Levidow 2006).

EC policies also facilitated efforts to commoditise human and natural resources. In 1988 a draft EC directive extended patent rights to 'biotechnological inventions', thus broadening the scope of discoveries or techniques which could be privatised and then accrue royalty payments. With such language, discovery of a common resource was presented as an invention warranting proprietary rights. According to a representative of a major pharmaceutical firm, Smith Kline Beecham, 'Genes are the currency of the future' (cited in Emmott 2001: 378). This new discourse naturalised the commoditisation of nature as a patentable human artifice. After a decade-long conflict, the Directive was enacted (EC 1998a). It was meant to resolve political conflicts regarding the patentability of GM crops (among other issues), and thus stabilise rules for the EU internal market. Yet some member states soon objected to the Directive, even bringing judicial challenges, and many more had not transposed it into national law a few years later. 'Biotechnogical inventions' remained controversial as 'Patents on Life' or 'biopiracy'.

In some countries, public-sector research institutes were allocated less state funds than before and were expected to substitute income from the private sector or from patents, e.g. through GM techniques. EU R&D funding priorities complemented that shift towards a marketisation policy for hitherto 'public-sector' research, now blurring the boundary between public and private sectors (Levidow et al 2002). By 1990 EC funds for biotech research became dependent upon industry partners committing resources to a proposed project. Research was given a clear economic function, with 'more careful attention to the long-term needs of industry', according to managers of the DG-Research Biotechnology Division (Magnien and Nettancourt 1993: 51). Together these policies created greater financial incentives for agricultural research to use GM techniques.

For safety issues the EC's 1990 legislation had set an implicitly precautionary framework, requiring that each GMO release have a prior evaluation of potential risks to human health and the environment. By the early 1990s, however, the precautionary content was constrained by a new policy of 'risk-based regulation', which shifted the regulatory burden of evidence towards demonstrating risks. Regulatory conflicts emerged over how to ensure in advance that GM crops fulfil the promise of environmental improvement. Efforts to verify these promises were marginalised by neoliberal policies in the mid-1990s, when agbiotech regulation was put on the defensive for supposedly impeding innovation.

For specific GM products, official risk assessments accepted the normal hazards of intensive monoculture, e.g. pest resistance to pesticides. These normative aspects complemented the EU policy framework of higher productivity for economic competitiveness. Europe was being deterritorialised as a purely economic zone for circulating commodities, as if products and risk assessment had no cultural values (Barry 2001: 70). In this way, GM products were becoming symbolically normalised as safe products.

No special GM labelling was required. Any such requirement was opposed on several grounds: for lacking any scientific basis, unfairly impeding the internal market, and making the EU vulnerable to a US challenge under WTO rules. Without labelling, GM grain would be invisibly mixed with other grain in processed food. As unwitting consumers of GM food, the public were modelled as supporters of a beneficial technology serving the common good.

By the mid-1990s EC policies were making Europe safe for agbiotech to achieve commercial success, by modelling European society along neoliberal lines. All social actors were cast in market roles – as business partners, competitors, clients, consumers, etc.. Societal decisions on agbiotech were reduced to a case-by-case regulatory approval of GM products, on the basis of expert advice. Public accountability meant regulatory procedures for

authorising ‘safe’ GM products, which could then freely circulate throughout the EU internal market.

Those arrangements lay at the nexus of several political agendas which attracted dissent. A technicist harmonization agenda treated regulatory standards as merely technical issues standing above socio-cultural values, as a basis for ‘completing the internal market’ of the EU. The US neoliberal framework was being adapted, but dissent arose from the start, thus signalling conflicts that would intensify later. Rules of the internal market depended upon acceptance (or at least submission) by EU member states, which increasingly objected to the early neoliberal framework and sometimes even defied its rules.

2. Agri-efficiency as a solution or hazard?

Since the mid-1990s the biotechnology industry has appropriated the phrase ‘sustainable agriculture’, cast in its own image of intensive monoculture. Proponents emphasised benefits of reducing agrochemical usage, deploying resources more efficiently, increasing productivity, and so enhancing economic competitiveness. For example, GM crops will continue ‘the progress of high-yield agriculture’ (Monsanto 1997: 16). Likewise, according to Novartis, GM insecticidal maize 'contributes to sustainable agriculture’, even the ‘sustainable intensification of agriculture’ (Imhof 1998; cited in Levidow 2005). From this perspective, society faces a common problem: the risk of failing to reap the benefits.

EU policy likewise supported agbiotech as an ecoefficient innovation. According to the Economic and Social Committee, biotechnological solutions are 'guaranteeing yields, helping to cut the use of plant health products in combating pests and diseases, and creating quality products'. Thanks to its precise techniques, moreover, genetic engineering 'allows more accurately targeted risk prediction', argued the committee (EcoSoc 1998). In this promotional account, biotechnological precision and efficiency could be extended to risk assessment, readily clarifying any uncertainties.

By the mid-1990s such assumptions were becoming a greater source and focus of European public distrust towards regulatory authorities. In particular, the 1996 ‘mad cow’ controversy had resulted from animal feed containing animal remains and unknown infected material. This was still biologically active due to a deregulatory change in requirements for heat treatment, and the feed could freely circulate in the EU internal market. As a further basis for political scandal, expert advice had implicitly made policy assumptions, e.g. that real-world practices would follow risk-management guidelines and thus avoid any infectious spread (Jasanoff 1997; Millstone and van Zwanenberg 2001). The Commission likewise covered up the problem, for fear that public concern about the BSE problem would endanger the European beef market, according to a report by the European Parliament (1997).

The scandal was turned into a European crisis of industrial agriculture by its critics. Drawing analogies to the ‘mad cow’ epidemic, opponents pejoratively associated agbiotech with factory farming, its health hazards, and globalisation. In both sectors, regulatory procedures came under attack for pre-empting or concealing political decisions in the guise of ‘science’. Two GM products became test cases for these issues; indeed, the products were turned into high-profile symbols of a dangerous, disorderly technology and irresponsible government policy.

In 1996 Monsanto’s GM soybean received EU-wide commercial authorisation for food and feed import, without any requirement for GM labelling. When US soya shipments arrived in late 1996, these provided a high-profile target for agbiotech opponents. A French

newspaper article was headlined 'Alerte au Soja Fou' – mad soya alert (*Libération* Paris 01.11.96). This metaphor highlighted disorders of government and product behaviour in the BSE episode. At several ports, Greenpeace staged a symbolic blockage with rubber dinghies, temporarily delaying the shipments, thus gaining publicity for its anti-GM message. NGOs accused companies and governments of 'force-feeding us GM food'.

In January 1997 the Commission approved Ciba-Geigy's Bt 176 insecticidal maize for import and cultivation, despite opposition from most member states. According to EU expert committees, there was no evidence of risk from the product. Some national experts dissented. In particular they highlighted risks that its antibiotic-resistance gene could spread to pathogenic microbes, thus undermining the clinical efficacy of the antibiotic. Such experts and NGOs drew analogies to animal husbandry over-using antibiotics, thus spreading resistance. NGOs and some member states also demanded a 'GM' labelling requirement; this demand led to disagreements among Commissioners and procedural delays, before finally granting approval. In a Belgian newspaper, the Commission was denounced for 'recidivism', by reference to its previous role in covering up health hazards of beef (Rich 1997).

The Bt 176 approval decision was criticised by a broad range of civil society organisations. These included consumer NGOs, which did not necessarily oppose agbiotech but demanded more rigorous risk assessments and GM labelling for consumer choice. In April 1997 the Commission was denounced by the European Parliament.

Risk assessment of GM food was criticised for optimistic assumptions, for dependence upon scientific ignorance, and for a commitment to industrial agriculture. Further analogies were drawn to the BSE crisis:

> There was an implicit [government] assumption that the public would be broadly supportive of measures that improved productivity. Subsequent outcry demonstrated that the public did not accept that the risks of such an 'unnatural' practice were justified by the increased 'efficiency' of meat production (Greenpeace 1997).

With the sarcastic slogan, 'How to destroy the beef industry and learn nothing', this report also echoed the attacks on the Commission over approval of Bt 176 maize.

Originating in a loose network of activist groups, in the late 1990s an anti-GM movement emerged, led by environmentalist groups, especially Greenpeace Europe, Friends of the Earth Europe (FoEE) and their national affiliates. Another key opponent was the Coordination Paysanne Européenne and its national affiliates, representing relatively less-intensive or small-scale farmers; they opposed the entire agri-industrial model, while counterposing extensification measures as an alternative. GM crops were widely stigmatised as 'contamination' jeopardising benign alternatives. Although consumer NGOs did not oppose agbiotech, they took up agri-environmental issues as well as GM food safety. Protest linked GM food with potential environmental risks of cultivating GM crops.

Through the agbiotech issue, diverse European movements 'found a unifying topic like no other', helped by 'the fact that genetic engineering touches virtually all areas of life', according to an anti-biotech campaigner. These campaigns crossed the usual boundaries between environmental, consumer and farmer issues. National NGOs intervened at the European level. All shared a common aim: 'stopping the technology from infiltrating the food and agricultural sectors' (Schweiger 2001: 371).

When mass protest emerged in the late 1990s, then, risk discourses framed agri-industrial efficiency as a threat. Agbiotech critics diagnosed the agricultural problem as intensive monocultural practices, global standardisation and farmer dependence upon multinational companies. Thus agbiotech intersected with a wider debate over agricultural and societal futures.

3. National controversies: agbiotech vs sustainable agriculture

In the late 1990s ‘sustainable agriculture' was being appropriated in divergent ways by advocates and opponents of agbiotech. In Europe 'sustainable agriculture' has been increasingly defined by distinct cultural values, linking the quality of food products, rural space and livelihoods. Although chemical-intensive methods still prevail, the countryside has been increasingly regarded as an environmental issue, variously understood – e.g. as an aesthetic landscape, a wildlife habitat, local heritage, a stewardship role for farmers, and their economic independence.

Such accounts of sustainable agriculture increasingly informed national regulatory approaches to GM products in the late 1990s, thus diverging from the eco-efficiency account presumed by agbiotech innovation. Some national examples below illustrate those policy developments. France and the UK have special significance: originally their governments led efforts to gain EU-wide approval for GM crops, but later their policies became more cautious. Agbiotech was increasingly cast as a problem for sustainable agriculture. Consequently, EU-wide regulatory conflicts intensified (as described in the next section).

Denmark

Denmark’s environmental legislation has affirmed the general aim of ‘sustainable development’ since the 1980s. It also had a policy to reduce agrochemical usage, especially so that ground water could be used safely as drinking water. The Danish approach valued groundwater as a common resource, thus favouring more extensive cultivation methods which would use fewer pesticides.

Citing that policy aim, NGOs criticised the long-term implications of GM herbicide-tolerant crops for herbicide usage and residues, especially in groundwater. In the mid-1990s they successfully pressed the Danish Parliament to raise such questions about herbicide-tolerant crops within Danish regulatory procedures. Under this Parliamentary pressure, the Environment Ministry adopted broad risk-assessment criteria along those lines, thus providing a basis for a broad national consensus on regulatory procedures (Toft 1996).

Within that policy framework of sustainable agriculture, Denmark’s broad criteria went beyond the risk assessment in most other EU member states, which evaluated simply whether a GM crop per se would cause harm. Consequently, Denmark objected to the risk assessments of every herbicide-tolerant crop proposed for EU-wide commercialization, on grounds that they did not evaluate the long-term implications for herbicide usage (Toft 2000). Eventually these objections gained support from more member states, who together stimulated an EU policy shift towards broader assessments. This approach became difficult for the Danish authorities to do a definitive assessment of herbicide-tolerant sugarbeet (Toft 2005).

Austria

In Austria agbiotech was turned into a symbolic threat to organic agriculture. Even before GM crops became a high-profile issue there in the mid-1990s, the Austrian government was promoting organic farming – as ecologically sound, as quality products, and as an economically feasible market-niche alternative for an endangered national agriculture. This 'competitiveness' strategy conflicted with the pro-biotechnology imperative to increase agricultural productivity.

Some government officials regarded agricultural biotechnology as a threat to the environment and an obstacle to sustainability. Austrian regulators unfavourably compared potential environmental effects of GM crops with methods which use no agrochemicals, as grounds to oppose commercial approval. When NGOs campaigned against agbiotech, they effectively reinforced the government's stance (Torgerson and Seifert 2000).

As a GM-free Austria nearly became a national consensus, the government sought stronger means to justify this policy, especially given its conflict with EU legislation. Austria banned several GM crops after they obtained EU approval, while making detailed criticisms of the official risk assessments and safety claims. In Austria's own risk-benefit analysis, risks were always uncertain, while benefit was understood as promoting the political aim of a society oriented towards sustainability (ibid).

To justify restrictions on GM products, civil servants linked the Precautionary Principle with sustainable development – a link already in the 1992 Rio Declaration. In addition, Austria's law on biotechnology had a 'social sustainability' clause, which prohibits 'inappropriate disadvantages' for societal groups through biotechnology. Civil servants anticipated using this clause to justify strict rules for segregating GM crops, thus deterring their cultivation (Torgerson and Bogner 2005).

Italy

Italian agbiotech opponents sought to protect the agro-food chain as an environment for craft methods and local specialty products, known as *prodotti tipici*. In the late 1990s the Italian Parliament had already allocated subsidies to promote such products and foresaw these being displaced by GM crops. According to a Parliamentary report, the government must 'prevent Italian agriculture from becoming dependent on multinational companies due to the introduction of genetically manipulated seeds'. Moreover, argued the report, when local administrations apply EU legislation on sustainable agriculture, they should link these criteria with a requirement to use only non-GM materials. Parliament endorsed such proposals (Terragni and Recchia 1999).

Such anti-agbiotech demands gained widespread support, especially from the Coltivatori Diretti, a million-strong union of mainly small-scale farmers. Environmental NGOs, farmers and food retailers built a national network seeking to exclude GM products from Italian agriculture. This network successfully maintained Italy's political and commercial opposition through government changes. When Romano Prodi's *L'Ulivo* (Olive Tree) coalition was replaced by Berlusconi's *Casa delle Libertà* coalition in 1996, its policy generally shifted along neoliberal lines; and the new government included strong advocates of agbiotech. Yet Italian officials continued to deter or block GM field trials and to oppose product approval.

That policy was often translated into risk arguments in EU-level regulatory procedures. When a company requested authorisation to import GM rapeseed in 2003, for example, Italy argued that any escaped seed could contaminate related plants and thus undermine centres of diversity for *Brassica* crops. This risk argument effectively served to exclude GM crops and grain – framed as a threat to Italian food products, their wholesome image and small-scale producers.

France

In 1996 the NGO Ecoropa initiated a petition emphasising unknown risks of GM crops, as a basis to advocate a moratorium. It was signed by several hundred scientists, many seeking more stringent regulation rather than a ban. Soon critics were putting the government onto the defensive for failing to protect France from risks of GM crops.

In 1997 greater controversy emerged over Agrevo's GM herbicide-tolerant oilseed rape, which had a great capacity to spread its genes. Expert advisors anticipated that weeds would eventually acquire resistance to broad-spectrum herbicides, thus jeopardising and complicating future methods for weed control in agriculture. In early 1998 the Institut National de la Recherche Agronomique (INRA) abandoned its joint innovation research with seed companies on GM herbicide-tolerant oilseed rape, partly in order to protect the neutral reputation of its research on environmental risks. In March 1998 Agrevo decided to destroy its own field trials of this crop in France, in order to avoid further unfavourable publicity. Invoking the Precautionary Principle, moreover, in November 1998 the government announced that this product would not be approved for commercial use – even though France had previously led the EU-wide procedure for such approval (Roy and Joly 2000).

Another GM crop became a major controversy in France. Novartis' insecticidal Bt 176 had generated controversy about several risks including its antibiotic-resistance marker gene. In 1996 the European Commission approved the product, despite opposition from all member states except France, which was acting as the rapporteur for the proposal. The French government was accused of favouring commercial interests over scientific criteria. According to Ecoropa, 'Obviously, the French government surrendered to interests of multinational agrochemical companies and its decision is entirely commercially motivated' (quoted in FoEE 1997).

During 1997 the French government initially refused to confirm the approval and then later approved Bt 176 maize. Ecoropa and Greenpeace filed a challenge at the *Conseil d'Etat*, the administrative high court, on several grounds – that the risks had not been properly assessed, that the correct administrative procedures had not been followed, and that the precautionary principle had not been properly applied. Their arguments gained some support in the court's interim ruling in September 1998, though not in the final one (Roy and Joly 2000).

In the late 1990s the French agbiotech debate expanded from 'risk' to sustainability issues, featuring divisions among farmers. The Fédération Nationale des Syndicats d'Exploitants Agricoles (FNSEA) represented industrial-type farmers, who sought access to GM crops as a means to enhance their economic competitiveness. In the name of 'sustainable production', they also anticipated environmental benefits such as reductions in the use of pesticides and water. As a means to control the European cornborer pest, they sought access to insecticidal Bt maize, e.g. Bt 176 or Monsanto's MON 810 which gained EU-wide approval in 1998.

By contrast, the Left-wing farmers' trade union *Confédération Paysanne* (henceforth *Conf*) denounced such products as a threat to their skills and livelihoods. According to their spokespersons, such as Jose Bové, GM crops pose risks to their economic independence, to high-quality French products, to consumer choice and even to democracy. Those values were expressed in the *Conf* slogan, 'For another agriculture: Produce, Employ, Conserve'. This slogan resonated with *produits de terroir*, a marketing label which denotes its origin from specific localities and peasant producers. They promoted a *paysan savoir-faire*, as a basis for a different societal future, independent of commoditized agri-inputs from multinational companies. In those ways, they also 'set in motion a discourse and an activist strategy that would later counter the risk hegemony of the French GMO debate' (Heller 2002: 16).

Thus the French public controversy was extended to agri-innovation choices, far beyond environmental risk issues. Although French farmers were expected to adopt Bt maize on a

larger scale, few did so, given uncertainties about the market prospects (see section on Market Forces).

United Kingdom

In the run-up to protests against the G8 Summit in Birmingham in May 1998, an activists' meeting set up 'GenetiX Snowball: a campaign of civil responsibility'. Snowballers collectively, openly 'decontaminated' GM maize fields, thus encouraging others to follow their example. To claim legitimacy, they quoted the UK Deputy Minister of Agriculture: 'The government is not in the driving seat'. He meant that commercialization was driven by companies and by EU decisions to approve their GM products, thus allowing little choice for member states. According to the activists, 'Our democratic system has failed us; government has waived its responsibility... Meanwhile transnational corporations hold the reins and pull the strings of power' (GenetiX Snowball leaflet 1998). Thus the technology and its authorisation were framed as an undemocratic, sinister control.

The initial opposition movement was joined by large NGOs, especially Greenpeace and Friends of the Earth. Through various pollution metaphors, opponents stigmatized all institutions which might promote, authorise or sell GM products. 'GM contamination' had diverse meanings, for example: unnatural genetic combinations posing unknown ecological risks, money interests perverting science, multinational companies controlling seeds, etc.; globalization corrupting national democratic procedures; intensive methods further industrializing agriculture and perpetuating technological dependence; and pollen flow contaminating non-GM crops, thus denying consumer choice (Levidow 2000).

A loose network of activists, the Genetic Engineering Alliance, proposed a 'Five Year Freeze' on the commercial use, import or patenting of GM products. Its February 1999 manifesto criticized shortcomings of the regulatory system and demanded public involvement in such decisions. Soon the coalition had attracted more than forty members, including consumer, environmental, development and quasi-governmental organizations.

Regulatory conflict focused on GM herbicide-tolerant crops, which were designed to replace specific herbicides with broad-spectrum herbicides which kill all vegetation. According to proponents, these crops would help farmers to minimise herbicide sprays and so protect wildlife habitats in or near agricultural fields. According to critics, broad-spectrum herbicides could increase such harm. In 1997 the government's own nature conservation advisors advocated a delay in commercial use of herbicide-tolerant crops, pending additional research.

The government had no clear responsibility for these issues until 1998, when the Environment Ministry announced a three-year moratorium in order to facilitate the 'managed development' of GM herbicide-tolerant crops. An ambitious plan for farm-scale evaluations would compare the effects on farmland biodiversity of spraying GM and conventional crops, as a means to ensure environmental protection. Thus a broader account of environmental harm delayed any regulatory decision for several years. In parallel, from a UK initiative, the EU Environment Council (and eventually the Commission) incorporated that broader account into EU law.

4. EU-wide regulatory conflicts

In the mid-1990s national regulators had generally accepted safety claims by companies, while acknowledging that GM crops could cause some undesirable effects. If weeds acquired tolerance to herbicides, or if insects acquired resistance to GM toxins, thus undermining the

pest-control agent, then such effects were regarded as acceptable or irrelevant to EU legislation for regulating GMOs. Herbicide-tolerant crops were designed for farmers to substitute broad-spectrum herbicides, which kill all other plants, yet there was no institutional responsibility for the wider environmental effects.

In such ways, risk assessment accepted the normal hazards of intensive monoculture for an innovation which promised to reduce agrichemical usage; regulatory criteria were framed by an ecoefficiency account of sustainable agriculture. This agri-industrial ordering of natural resources complemented a particular socio-political order: economic-competitive pressures to maximise agricultural productivity, with minimal regulatory standards facilitating safety claims. This policy framework was reinforced by the European Commission, especially in driving the EU regulatory procedure towards approval of specific GM products, e.g. Bt insecticidal maize and herbicide-tolerant oilseed rape in 1996-97.

By the late 1990s, facing greater public opposition to agbiotech, some national authorities shifted their regulatory policy. They evaluated GM crops on a relatively broader basis to protect various crop-protection methods (naturally occurring Bt insecticides and relatively benign herbicides) and public goods (e.g. safe drinking water, organic agriculture, local specialty products, etc.) These resources were seen as under threat from industrial agriculture in general and GM crops in particular. Implicitly or explicitly, national regulatory frameworks linked biotechnological risk with unsustainable agriculture (as described in the previous section).

The Deliberate Release Directive was meant to link environmental protection with 'completion of the internal market' through harmonised standards (EEC 1990). Conflicts arose over the standards that would shape a market for agbiotech products. By the late 1990s, member states were disagreeing more sharply about how to define the 'adverse effects' which warrant evaluation and prevention. Diverse agri-environmental issues came from national norms – e.g. organic agriculture in Austria, drinking water policy in Denmark, farmland biodiversity in the UK, weed-control issues in France, etc. – in conflict with the intensive agri-industrial model which underlay biotech innovation and official risk assessments.

Regulatory conflicts intensified over the basis for commercial approval of new GM products. Proposals for broader risk assessments gained support from more member states in the late 1990s (Levidow *et al* 1996, 2007; Levidow and Carr 2000). Greater conflicts delayed the EU decision procedure. In June 1999 several Environment Ministers signed statements opposing the approval of any more GM products until regulatory criteria were strengthened, including a requirement for traceability and labelling of all GM material, as well as precaution as the basis of risk assessment. Such changes were necessary 'to restore public and market confidence', according to their statements (reproduced in FoEE, 1999: 3).

Widely known as the *de facto* moratorium, this regulatory blockage delayed any further approvals for several years, pending several legislative changes along more precautionary lines in 2001. Meanwhile controversy continued over the scientific basis for safety claims of GM products already approved by the EU. The controversy gained impetus from two lab experiments whose surprise results cast doubt on previous evidence of safety.

In UK experiments led by Arpad Pusztai, rats were fed GM potatoes containing a transgene for a lectin that was understood to be harmless to mammals. Yet the rats apparently suffered damage to their immune systems and organ development. The transgene itself was not a plausible cause of damage, so Pusztai raised the possibility that the genetic modification process had led to an unknown change in the potato; this hypothesis raised doubts about the safety of GM foods already on the market. Soon Pusztai was removed from his post. This affair was turned into a symbol of precautionary science being suppressed for commercial or

political reasons, especially through attempts to silence dissent. Official expertise for GM food safety was criticised for optimistic assumptions and inadequate scientific methods to detect risks. Controversy ensued over the methodological basis to detect any potential harm in advance.

In Swiss experiments led by Angelica Hilbeck, Bt toxins apparently harmed lacewing larvae, a predator of the cornborer pest (Hilbeck *et al*1998a, 1998b). The experiments were criticised regarding the methodological basis for detecting such harm in the lab and predicting harm in the field. As a wide-ranging rejoinder, the project leader surveyed all previous research on non-target harm from Bt toxins and criticised the methods as faulty, incapable of detecting any risks (EcoStrat 2000).

Also at issue here was the relative acceptability of any harm. Bt maize would anyway cause less harm to non-target insects than 'that from the use of conventional insecticides', according to EU expert advice (e.g., SCP 1998). Their risk assessment implied that any lesser harm from Bt maize would be acceptable, on the assumption that it would always replace conventional maize sprayed with chemical insecticides. This assumption became contentious, especially because most maize is not anyway sprayed with chemical insecticide. Regulatory procedures came under pressure to evaluate any non-target harm, regardless of its severity or likelihood.

Those two controversial cases highlighted precautionary issues in the experimental design of risk research. According to official accounts of the Precautionary Principle, this arises only at the risk-management stage, in special cases of uncertainty about risks, as if the latter were technical matters for experts (CEC 2000). Yet disputes arose over the methodological validity of research cited to justify safety claims for GM products. More stringent norms for environmental harm, e.g. to non-target insects or farmland biodiversity, increased pressures to investigate the prospects and causal pathways of such effects. These were debated as precautionary issues for risk research and assessment, not simply for a later stage of risk management (Levidow 2001).

These uncertainties were cited to justify national bans on some products which had already gained EU-wide market approval. For example, Bt maize products were banned by Austria, Italy, Greece and later by Germany. The Commission lacked political authority for judicial action against the bans.

5. Market forces out GM products

Early EU agbiotech policy symbolically normalised GM products within the agri-food chain. In the mid-1990s GM soya and maize were approved for the EU internal market with no requirement for a special label. GM ingredients were invisibly mixed in agri-food chains and processed food. Without GM labelling, the public would be unwittingly consuming GM food and thus supporting the technological development.

When the first US shipments of GM grain reached Europe in 1996-97, activists held protests linking GM products with pollution and anti-democratic coercion. Local affiliates of national and European NGOs demanded GM labelling and non-GM alternatives. In revolting against GM food, many people were 'voting' as consumers, in lieu of a democratic procedure for a societal decision about a contentious technology. In the ongoing debate over GM labelling, consumer choice was framed in contending ways.

From a pro-agbiotech standpoint, consumers were modelled as rationally pursuing their individual interests in safe food. According to EuropaBio, rules should instead be based upon

intrinsic product characteristics which are scientifically verifiable and relevant to consumer interests. The market would distribute societal benefits through farmers' decisions to buy GM seeds. From this standpoint, process-based labels, encompassing all products of GM techniques, would provide no useful information would unfairly stigmatise a safe technology.

EU policy had a similar stance but was put onto the defensive and was eventually destabilised. Demands for process-based GM labelling united a wide range of civil society groups which had diverse or ambiguous stances towards agbiotech per se. Consumer NGOs demanded comprehensive labelling of GM products to ensure the consumer right to know and choose food according to its origin. From an anti-biotech standpoint, environmental NGOs demanded GM labelling as a democratic right and defence against both risks and globalisation; such rules could also be used to deter the commercial use of GM grain. Through these cultural discourses and consumer boycott actions, food companies were being pressed to use their economic power vis à vis grain traders.

Food companies eventually redefined their interests along the lines of consumer rights. European retail chains had been building up their own-brand lines, designed to symbolize product quality, as a tool of competitive advantage; this strategy made retailers more vulnerable and responsive to consumer concerns. Without an agreed basis to distinguish between GM and non-GM products, however, processed food had an ambiguous identity. European retailers found themselves competing to sell processed food as 'non-GM', defined according to diverse, unstable criteria. Facing market instability, the European food industry sought common rules for distinguishing GM from non-GM products. Such rules were needed to clarify product identity, as a means to re-order markets for processed food.

Labelling rules redefined what is a 'GM' product according to detectability criteria which became successively broader, supported especially by some member states and the European Parliament. A 1997 Regulation had set a 1 per cent threshold but without agreed criteria for detectability. In lieu of clear statutory rules, in 1998 European retail associations devised their own GM labelling rules, though with some differences in criteria across EU member states. To standardise the rules, in 1998 the EU set labelling requirements for products with any detectable GM content above the 1 per cent threshold (EC 1998b).

By 1999 European retail chains had excluded GM grain altogether from their own-brand products, rather than apply a GM label, thus avoiding any market disadvantage. Commercial pressures against GM crops were extended across Europe and the agro-food chain. Given the strong consumer signals in some countries, food companies changed their ingredients or supply-chain sources across Europe. Farmers came under similar pressures from food companies and faced uncertainty about a market for GM grain. Market forces were deterring farmers from a choice of GM crops, thus nearly forcing out agbiotech from the EU (Levidow and Bijman 2002). At least a decade later, this commercial boycott continued.

Consequently, by the late 1990s GM grain was used only for animal feed. The only large market for GM seeds came from Spain, where GM and conventional maize were mixed together, without any price disadvantage for GM grain. Given the blockage of US maize exports, Spain had a shortage of animal feed. For all those reasons, approx. 10 per cent of maize fields were cultivated with Bt varieties; this remained the limit of commercial cultivation in Europe.

6. Conclusion

Agbiotech has been largely blocked in Europe, despite strong government efforts to promote its commercialisation. This blockage has been often explained by public irrationality and

ignorance, as well as regulatory burdens or delays, as if a beneficial technology had been turned into an innocent victim. Opponents have been accused of targeting agbiotech as a proxy for extraneous issues such as globalisation and sustainable development, thus politicising the technology.

Yet politics were always involved in agbiotech, which was co-produced with specific forms of the social and natural order. GM crops were promoted as a means of enhancing productive efficiency, sustainably intensifying agriculture, and thus accommodating the inexorable global competition for bulk agri-commodities. That social order was naturalised by a techno-fix whose genetic properties would protect society from the threat of competitive disadvantage from market forces.

By the early 1990s that project was more clearly linked with neoliberal agendas. Competitive imperatives justified policies such as marketization of public-sector research, broader patent rights for 'biotechnological inventions' and European regulatory harmonisation for trans-Atlantic trade liberalisation. The EU and the US were cooperating to identify and overcome any regulatory differences that could pose trade barriers, especially for biotech products. 'Risk-based regulation' mandated regulatory approval on the basis of product safety, with no further control measures. As a basis for European integration, a technicist harmonization agenda treated regulatory criteria as simply technical matters for experts. Proposals for labelling were rejected as lacking any scientific basis, unfairly stigmatising a technology, impeding the EU internal market and leaving the EU vulnerable to the threat of a US challenge under WTO rules.

Together these policies were designed to make Europe safe for agbiotech as a series of safe, eco-efficient, beneficent products. Conversely, the technology became a political instrument for constructing a 'competition state'. Success would depend upon naturalising that socio-natural order through new discourses and neoliberal policies.

These policies created a vulnerable target for mass opposition. By the late 1990s they turned the technology into an ominous symbol of 'globalisation' – as a multiple threat to sustainable agriculture, human health, the environment, consumer rights and democracy. Fred Buttel (2000: 1) wondered '… whether GMOs might be the Achilles Heel of the globalization regime, or conversely whether the globalization regime is the Achilles Heel of GMOs'. Indeed, these issues were turned into a mutual vulnerability. Agbiotech had been promoting a socio-natural order which was now attacked as a disorderly threat.

Drawing ominous analogies to the BSE crisis, critics linked agbiotech with intensive agri-industrial methods, productive efficiency, its inherent hazards and its political unaccountability through globalisation. Moreover, they stigmatised GM products as pollutants. In France and the UK in particular, activists physically attacked GM field trials and grain stores, while portraying themselves as public-interest defenders of democracy and the environment. Agbiotech was opposed as a threat to skilled *paysans* developing quality agriculture. Their accounts of sustainable agriculture favoured different future scenarios for what should be sustained – what kind of economy, environment and society.

Opposition became widespread in civil society. Similar issues circulated across conventional boundaries and remits of NGOs – environmentalist, consumer, farmer, etc. – as well as across national boundaries. Beyond simply 'activists', a wider societal participation took various forms such as public meetings, protest actions, consumer boycotts, attacks on GM crops, etc. By linking critical perspectives across diverse issues and constituencies, a broader citizenry sought to hold governments accountable for their policies – as choices which could be different.

A decisive arena was the food retail sector. Consumer boycotts and demands turned GM ingredients into an instability for the processed food market. To stabilise the market, European retail chains devised their own GM labelling rules, which were eventually formalised and standardised in EU law. Under pressure from these rules and public protest, retailers eventually organised a commercial boycott of GM grain, thus deterring cultivation of GM crops. From its original promotion as an essential tool for economic competitiveness, agbiotech was turned into a competitive disadvantage.

Safety approvals of GM products were being promoted by citing EU-level expert advice in the name of 'risk-based regulation'. From the mid-1990s onwards, however, member states increasingly disagreed about the risk-assessment criteria, especially what counts as harm and as meaningful evidence for clarifying potential harm in advance. The normal hazards of intensive monoculture were not necessarily accepted as a baseline for GM crops. These disagreements undermined the technicist harmonisation agenda which had driven EU regulatory standards. Member states raised more uncertainties as grounds for more rigorous evidence of safety, regarding a broader range of potential harms; more stringent agri-environmental standards corresponded to diverse accounts of sustainable agriculture. Risk assessment was opened up as precautionary issue, warranting questions more difficult to answer through the available science.

In all those ways, protest was making Europe unsafe for agbiotech by the late 1990s. GM products were blocked along with the neoliberal policies promoting them. The blockage opened up debate and opportunities for alternative futures. 'Another world is possible', a prominent slogan of the global justice movement, was adapted as 'Another agriculture is possible.' Making Europe safe for such alternatives remains a more difficult task.

References

Barben, D. (1998) 'The political economy of genetic engineering', *Organisation and Environment*, 11(4): 406-20.

Barry, A. (2001) *Political Machines: Governing a Technological Society*. London: Athlone.

Buttel, F. (2000) 'GMOs: the Achilles heel of the globalization regime?', paper for the annual meeting of the Rural Sociological Society, Washington DC, August 2000.

CEC (2000) Communication from the Commission on the Precautionary Principle, Brussels: Commission of the European Communities (CEC), http://ec.europa.eu/environment/docum/20001_en.htm

Cerny, P. G. (1999) 'Reconstructing the political in a globalizing world: states, institutions, actors and governance', in F. Buelens, (ed.) *Globalization and the Nation-State*. Cheltenham: Edward Elgar, pp. 89-137.

EEC (1990) Council Directive 90/220 on the Deliberate Release to the Environment of Genetically Modified Organisms, *Official Journal of the European Communities*, L 117, 8 May: 15-27.

EC (1996a) Commission Decision 96/158/EC of 6 February 1996 concerning the placing on the market of a product consisting of a GMO, hybrid herbicide-tolerant swede-rape seeds, *Official Journal of the European Communities*, L 37, 15 February: 30-31.

EC (1996b) Commission Decision 96/281/EC of 3 April 1996 concerning the placing on the market of genetically modified soybeans, *Official Journal of the European Communities*, L 107, 30 April: 10.

EC (1997a) Commission Decision 97/98/EC of 23 January 1997 concerning the placing on the market of genetically modified maize, *Official Journal of the European Communities*, L 31, 1 February: 69-70.

EC (1997b) Regulation 97/258/EC of 27 January 1997 concerning novel foods and novel food ingredients, *Official Journal of the European Communities*, L 43, 14 February: 1-6.

EC (1997c) Commission decision concerning the placing on the market of a genetically modified oilseed rape (*B.napus* L.*oleifera* Metzg. MS1, RF1), in conformity with Council Directive 90/220/EEC, *Official Journal of the European Communities*, 6 June, L 164: 38-39.

EC (1998a) Directive 98/44/EC of the European Parliament and of the Council on Protection of Biotechnological Inventions, *Official Journal of the European Communities*, 30 July, L 213: 13.
EC (1998b) Council Regulation 1139/98 concerning the compulsory indication on the labelling of certain foodstuffs produced from genetically modified organisms, Official *Journal of the European Communities*, 3 June, L 159: 4.
EcoSoc (1998) Opinion of the Economic and Social Committee on 'Genetically modified organisms in agriculture — impact on the CAP', Official Journal of the European Communities, C 284: 39-50.
EcoStrat (2000) Angelika Hilbeck, Matthias Meier, Andrea Raps, *Review on Non-Target Organisms and Bt Plants*, EcoStrat GmbH, Zurich, Switzerland, http://www.greenpeaceusa.org/media/press_releases/gmo-report-complete.pdf
Emmott, S. (2001) 'No patents on life! The incredible ten-year campaign against the European Patent Directive', in B.Tokar, *Redesigning Life? The Worldwide Challenge of Genetic Engineering.* pp.373-84. London: Zed.
European Parliament (1997) Report by the Temporary Committee of Inquiry Into BSE on Alleged Contraventions or Maladministration in the Implementation of Community Law in Relation to BSE, Without Prejudice to the Jurisdiction of the Community and National Courts, PE 220.544/fin
FoEE (1997) 'France authorizes cultivation of GM maize', *Biotech Mailout*, 15 December, vol. 3(8), Brussels: Friends of the Earth Europe Biotechnology Programme, www.foeeurope.org/biotechnology
FoEE, 1999, 'EU Environment Council adopts de facto moratorium on GMOs', *FoEE Biotech Mailout*, 5(5), 31 July: 1-4. Brussels: Friends of the Earth Europe, www.foeeurope.org
GenetiX Snowball (1998) leaflet: 'A campaign of civil responsibility'.
Greenpeace (1997) 'From BSE to Genetically Modified Organisms: Science, Uncertainty and the Precautionary Principle', London: Greenpeace.
Heller, C. (2002) 'From scientific risk to *paysan savoir-faire*: peasant expertise in the French and global debate over GM crops', *Science as Culture,* 11(1): 5-37.
Hilbeck, A., Baumgartner, M., Fried, Padruot, M. and Bigler, F. (1998a) 'Effects of transgenic Bt corn-fed prey on mortality and development time of immature Chrysoperla carnea', *Environmental Entomology,* 27/2: 480-87.
Hilbeck, A., Moar, W., Pusztai-Carey, M., Filippini, A., Bigler, F. (1998b) 'Toxicity of Bt Cry 1 Ab toxin to the predator Chrysoperla carnea', *Environmental Entomology,* 27/5: 1255-63.
Imhof, H. (1998) 'Challenges for sustainability in the crop protection and seeds industry', talk by Novartis officer at Rabobank International's Global Conference.
Jasanoff, S. (1997) 'Civilisation and madness: the great BSE scare of 1996', *Public Understanding of Science,* 6: 221-32.
_____ (2004) 'Ordering knowledge, ordering society', in S. Jasanoff, (ed.) *States of Knowledge: The co-production of science and social order.* London: Routledge, pp.13-45.
Jasanoff, S. (2005) *Designs on Nature: Science and Democracy in Europe and the United States*, Princeton: Princeton University Press.
Kay, L. (1992) *The Molecular Vision of Life: Caltech, the Rockefeller Foundation and the Rise of the New Biology*. New York/Oxford: Oxford University Press.
Levidow, L. (2000) 'Pollution metaphors in the UK biotechnology controversy', *Science as Culture,* 9(3): 325-51.
_____ (2001) 'Precautionary uncertainty: regulating GM crops in Europe', *Social Studies of Science,* 31(6): 845-78.
_____ (2005) 'Governing conflicts over sustainability: agricultural biotechnology in Europe', in V. Higgins and G. Lawrence (eds) *Agricultural Governance: Globalization and the New Politics of Regulation.* pp.98-117. London: Routledge.
Levidow, L. and Bijman, J. (2002) 'Farm inputs under pressure from the European food industry', *Food Policy,* 27(1): 31-45.
Levidow, L., Carr, S., (eds) (2000) 'Precautionary Regulation: GM Crops in the European Union', special issue of the *Journal of Risk Research,* 3(3): 187-285.
Levidow, L., Carr, S., von Schomberg, R., Wield, D. (1996) 'Regulating agricultural biotechnology in Europe: harmonization difficulties, opportunities, dilemmas', *Science & Public Policy,* 23(3): 135-57.
Levidow, L., Murphy, J., and Carr, S. (2007) 'Recasting "Substantial Equivalence": transatlantic governance of GM food', *Science, Technology and Human Values,* 32(1): 26-64.

Levidow, L., Søgaard, V. and Carr, S. (2002) 'Agricultural PSREs in Western Europe: research priorities in conflict', *Science and Public Policy,* 29(4): 287-95.
LGC (1991) *Biotechnology: A Plain Man's Guide to the Support and Regulations in the UK,* Cambridge: Laboratory of the Government Chemist, UK Department of Trade & Industry.
Magnien, E. and de Nettancourt, D. (1993) 'What drives European biotechnological research?', in E.J.Blakelely and K.W.Willoughby (eds) *Biotechnology Review no.1: The Management and Economic Potential of Biotechnology*, pp.47-48. Brussels: Commission of the European Communities.
Millstone, E. and van Zwanenberg, P. (2001) 'Politics of expert advice: lessons from the early history of the BSE saga', *Science and Public Policy,* 28(2): 99-112.
Monsanto (1984) *Genetic Engineering: A Natural Science*.
Monsanto (1997) *Report on Sustainable Development.* St Louis, MO: Monsanto Company.
Murphy, J. and Levidow, L. (2006) *Governing the Transatlantic Conflict over Agricultural Biotechnology*. London: Routledge.
Rich, A. (1997) 'Après la vache folle, récidive sur le maïs transgénique', page 1; 'Pourquoi ce maïs transgénique et quelles garanties sanitaires', page 8; '"Une décision réfléchie" ou "Une décision dans l'urgence"'?, page 8, *Le Soir*, 27 January, Brussels.
Roy, A. and Joly, P.-B. (2000) 'France: broadening precautionary expertise?' *Journal of Risk Research,* 3: 247-254.
Sagoff, M. (1991) 'On making nature safe for biotechnology', in L. Ginzburg, (ed.) *Assessing Ecological Risks of Biotechnology*, pp. 341-65, Stoneham, MA: Butterworth-Heineman.
Schweiger, T. (2001) 'Europe: hostile lands for GMOs', in B.Tokar (ed.) *Redesigning Life? The Worldwide Challenge of Genetic Engineering.* London: Zed, 361-72.
SCP (1998) Opinion of the Scientific Committee on Plants Regarding Pioneer's MON9 Bt, glyphosate-tolerant maize, 19 May.
Terragni, F. and Recchia, E. (1999) 'Italy: Precaution for Environmental Diversity?', report for 'Safety Regulation of Transgenic Crops: Completing the Internal Market', DGXII RTD project coordinated by the Open University, http://technology.open.ac.uk//cts/srtc/index.html
Toft, J. (1996) 'Denmark: seeking a broad-based consensus on gene technology', *Science & Public Policy,* 23 (3): 171-74.
Toft, J. (2000) 'Denmark -- potential polarization or consensus?', *Journal of Risk Research,* 3(3):
_____ (2005) 'Denmark: co-existence bypassing risk issues', *Science & Public Policy,* 32(4):
Torgerson, H. and Seifert, F. (2000) 'Austria: precautionary blockage of agricultural biotechnology', *Journal of Risk Research,* 3(3): 209-217.
Torgersen, H. and Bogner, A. (2005) 'Austria's agri-biotechnology regulation: political consensus despite divergent concepts of precaution', *Science & Public Policy,* 32(4): 277-84.
Yoxen, E. (1981) 'Life as a productive force: capitalizing the science and technology of molecular biology' in L. Levidow and R.M. Young (eds) *Science, Technology and the Labour Process*, vol. 1, pp. 66-122, London: CSE Books & Atlantic Highlands, NJ: Humanities Press; reissued by Free Association Books, 1983.