

Germany

Germany's agri-biotechnology policy: precaution for choice and alternatives

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In Germany, the precautionary principle (PP) is a well-established legal principle in environmental law, especially for regulating agri-biotechnology. This article uses the analytical concept of issue-framing to identify different views of the PP and how they have informed changes in the German regulatory arena. In the 1990s Germany's genetically modified (GM) crop policy was dominated by a discourse of innovation and international competitiveness, combined with narrow accounts of precaution. In the early 2000s, agro-biotechnology became subject to changes in the risk regulatory system, new agricultural policies and a broader precautionary scope. After the BSE crisis, German policy promoted sustainable agriculture and organic food, combined with the demand for a precautionary consumer policy and 'consumer choice'. Precaution now encompasses comprehensive mandatory labelling and liability rules to protect non-GM food production from GM 'contamination' in fields and across the food chain.

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THE GERMAN PUBLIC CONTROVERSY about the regulation of biotechnology is long-standing and ongoing. Since 1992, Germany's genetically modified (GM) crop policy was predominantly driven by neo-liberal ideas of innovation, international competitiveness and a 'Standort' discourse about preserving Germany as a business location. Regulation was based on a 'science' rationale, that is, any restrictions must be justified by evidence of environmental risk or hazard, within a narrow interpretation of 'adverse effects'. This approach ignored broader precautionary demands of many biotech critics (Dreyer and Gill, 2000).

This situation changed in the year 2000. After the BSE (bovine spongiform encephalopathy, or mad cow disease) crisis, agro-biotechnology became caught up in broader efforts to reform agricultural and consumer policy. 'Precaution' has taken on a broader meaning, playing a prominent role in political deliberation and legislation.

This paper analyses regulatory developments for German agro-biotechnology during 2002–2004, especially different views of the precautionary principle (PP) in the regulatory arena. It asks: how do policy stances and expert practices relate to precaution? The findings are based on a research project that included a stakeholder workshop (Boschert and Gill, 2003), 24 interviews and extensive documentary research (Boschert and Gill, 2004).

The article uses the analytical concept of issue-framing as an ordering device. According to Rein and Schön (1993), "framing is a way of selecting, organising, interpreting, and making sense of a complex reality to provide guideposts for knowing, analysing, persuading and acting". In this sense, different policy views are framed by specific 'story-lines' that

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selectively problematise certain aspects of socio-material reality, according to Maarten Hajer. These story-lines define problems and solutions, while foreclosing alternative strategies and actions.

Likewise, the emergence of new story-lines can re-order understanding, can provide for a different access to a certain issue and thus facilitate policy change (Hajer, 1995). The concept of framing can thus be used to illuminate policy conflicts in the regulatory arena, as well as to provide clues for how to understand recent policy changes.

Different accounts of precaution

In Germany, the PP is a well-established legal principle in environmental law, especially for regulating agri-biotechnology. Although the PP is widely accepted in Germany as a basis for decision-making with respect to GM crops, there are different views of its interpretation and implementation. In the German biotech controversy, various accounts of precaution can be identified in policy statements, documents or specific practices. These accounts are informed by different judgements on scientific uncertainty, the normative baseline for risk comparison, the role of scientific expertise or different models of agrifood production. The different accounts arise in both explicit and implicit ways.

This article uses the analytical concept of framing to cluster the findings in a three-tiered issue-framing categorisation (Table 1). These framings broadly correspond with stakeholder positions in the PP.

'Innovation' frame Within this frame, biotechnology is considered an innovative problem-solving tool, which therefore should be promoted. This view can be linked to the following account of precaution. The PP is a political idea (*politische Leitidee*) that precedes legislative action, for instance, a general requirement for pre-market risk assessment and authorisation. Risk management is justified only by 'evidence of risk', whereby precaution becomes

merely prevention. Questions about uncertainty are often dismissed as speculative. The state of knowledge about the technology is generally assumed to be high and sufficient.

It is assumed that biotechnology poses no specific risks beyond conventional ones, though this needs to be assessed on a case-by-case basis. 'Sound science' is understood as the appropriate tool for objective decision-making and no factors other than science are considered. The level of protection, that is, the type or extent of unacceptable damage, lies in conventional standards in agriculture. This frame is supported by industry, major science organisations and parts of the administration, such as the Robert-Koch Institute (RKI), which led the German Competent Authority (CA) for biotechnology regulation until March 2004.

'Risk' frame Within this frame, risk and safety considerations are pivotal. In this sense, biotechnology is viewed as a risk-creating, but also potentially a problem-solving, technology. In any case, government should consider alternative solutions posing lower risks to the environment. This differs from the innovation frame specially with respect to judgements on scientific uncertainty and normative criteria. The PP is understood as a legal principle that needs to be considered at *all* stages of approval. Recourse to precaution in risk assessment or risk management is justified on grounds of uncertainty and knowledge gaps, given that biotechnological effects on the environment cannot be fully assessed.

The PP is thus also regarded as a decision-making tool triggered in cases of uncertainty. It is furthermore claimed that decisions cannot be based only on science, given that there needs to be a societal consensus with respect to protection levels and acceptable risks. In a similar vein, it is argued that biotechnological applications should be judged relative to sustainability standards. This broader understanding of the PP is supported by critical actors, such as the environmental agency (UBA), though they are not fundamentally antagonistic to biotech.

'Alternatives' frame Within this frame, preventing biotechnology is pivotal because it is perceived as perpetuating and creating problems, and so should be banned, or at least heavily restricted. For the views belonging to this category, the PP is more than just a legal principle. It is a framework or mindset for being precautionary: GM organisms (GMOs) should not be released into the environment. This strong precaution is justified on grounds of systemic uncertainties, for instance, unpredictable and uncontrollable effects.

From this precautionary frame, new technologies should be considered only on the basis of analysing problems and needs. Moreover, new technologies should be chosen in an open, transparent and democratic fashion; they should provide an absolute improvement over conventional practices. Such

Table 1. Framings and contested views on precaution

Issue framing	'Innovation' – making agbiotech possible	'Risks' – making agbiotech safe-	'Alternatives' – preventing agbiotech-
PP in general	Political idea and general legal principle	Legal principle and specific decision-making tool	Mindset, legal principle and quality tool
Trigger for PP	Positive scientific evidence of risk	Uncertainty and knowledge gaps	Systemic uncertainty
Uncertainty	No basis for preventative action, risks will be handled by risk-management practices Uncertainty often dismissed as speculative concept	Basis for preventative action (ban only last resort) Uncertainty changes risk research, risk-assessment (RA) and risk-management (RM) practices Uncertainty can be reduced through research ('need to know more') and risk-reducing measures	Basis for preventative action including banning, since uncertainty cannot be reduced
State of knowledge	'There is considerable knowledge about GM crops'	'We do not know enough about the effects'	'We don't know what we don't know'
Evidence of damage/baseline	Conventional standards in agriculture applied ('as safe as conventional products')	Preferably higher sustainability and nature conservation standards applied (relative improvement)	New technologies should only be considered on the basis of absolute improvement of practices, that is, better than the best available production system
Cost-effective measures	Intervention needs to be cost-effective and 'practical'	Intervention focuses most of all on risk avoidance, yet (cost) limits accepted	Possible costs should not hinder intervention on the grounds of safety
Cost-benefit analysis	In general cost-benefit analysis rejected because these decisions should be left to the market: 'acceptable social demand no legal criterion'.	Cost-benefit analysis as basis for decision-making on risks However, assessment confined to direct and indirect environmental effects Alternative solutions posing lower risk on the environment should be considered	Cost-benefit analysis rejected because: risk avoidance is highest priority, and society should not be forced to bear the costs of expensive technology assessments Problem analysis first! Demands a fourth hurdle, eg a full test for socio-economic need
Burden of proof	Proof of risk lies with regulators However 'reasonable' public safety demands on technology introducer accepted	Principally lies with the regulator However, uncertainty and knowledge gaps may require reversal of burden of proof	Proof of safety and need lies with GM-introducing companies
Science	Science as tool for objective decision-making 'Politicisation of science' to be avoided	Science alone does not provide adequate basis for risk decisions a) Scientific evidence may not be available b) Risk assessment (RA) and risk management (RM) are influenced by a society's moral concepts about protection levels	Science alone (but what science?) does not provide basis for safety and need decisions Question of GMO is beyond science and foremost political 'Scientification' hides political character of decision
Other legitimate factors	Not relevant in RA procedure Individual preferences and societal concerns mainly delegated to market arena	Values necessarily come into research and RA and RM procedure ('What effects are considered to be damage and acceptable?').	Socio-economic and socio-cultural effects of producing, distributing and consuming
Participation	Decisions should be left to experts (scientists) 'Descientification' should be prevented	Experts' judgement should represent scientific controversies Decisions need to be transparent and open for lay people's concerns	Decisions should be taken 'democratically', usually translated into demand for new decision-making procedures that are more transparent and participatory
Sustainable agriculture (SA)	Biotech allows more sustainable agricultural practices	Biotech might provide a tool for SA	Biotech contradicts SA
Biotech in general	Problem-solving technology	Risk-creating but possibly problem-solving technology, alternatives need to be considered	Technology that perpetuates problems and causes new ones
Biotech risk in general	No specific risk beyond conventional ones 'No more or less effects than any other things we do'	Basic risks and uncertainties acknowledged	Stress on 'new quality' of biotechnological interventions Potentially fatal consequences anticipated
Coexistence	Not part of a precautionary rationale Coexistence is an economic concept, not related to safety	As part of a precautionary rationale, coexistence allows keeping natural spaces GM-free and making individual safety judgements	In case of cultivation, a precautionary rationale requires coexistence, which allows for keeping natural spaces GM-free and making individual safety judgements A precautionary rationale also includes economic damage, in terms of 'safeguarding alternatives'

decisions cannot be left to scientists alone because GMOs lie beyond risk assessment; the issue is primarily political. The PP is thus also used as a principle for introducing quality standards in environmental decision-making, especially for promoting benign alternatives. This broad account of the PP, emphasising alternatives, includes environmental NGOs, organic farmers and other radical critics of agri-biotechnology.

In Germany, specific accounts of the PP informed the GM crop approval procedure in the 1990s. Within the official regulatory arena there was a clash in understanding, especially between the UBA on one side, and the national CA (RKI) with its scientific advisory committee (ZKBS) on the other side. The regulatory procedure excluded fundamental concerns of sustainability and pluralist/democratic decision-making, as exemplified by the second framing, and even more so the third one.

For instance, the RKI regarded conventional, intensive agricultural practices as a baseline for evaluating the effects of GM crops. That is, as long as they did not pose a higher or additional environmental risk compared to conventional plants, their effects were deemed to be acceptable. In this way, the RKI considered the development of pest resistance (that is, regarding Bt insecticidal maize), or indirect effects of long-term use of herbicides (such as Roundup) as acceptable — a position that UBA did not support (Sauter and Meyer, 2000). As another example, the RKI regarded comprehensive labelling simply as a response to marketing constraints, not as a science-based precautionary measure.

By basing its decision on a narrow interpretation of the relevant law, the CA excluded broader environmental and societal concerns, such as concepts of sustainability and biodiversity in agriculture and food production. Regulation was limited to 'sound scientific arguments' alone, while other precautionary accounts were dismissed as 'political' or deemed irrelevant or speculative. From the hegemonic 'innovation' framing, a narrow account of precaution thus rendered very difficult any mediation of conflicts among regulators, as well as between them and public concerns.

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Precautionary consumer protection

Agrarwende

Until the late 1990s, the regulatory arena remained relatively closed to broader accounts of precaution. This general hegemonic policy framing continued even after the 1998 electoral change. After 16 years of Conservative/Liberal rule, the former Government was replaced by a 'Red-Green' coalition between the Social Democratic Party and the Green Party.

Green pressures were eventually manifest in national biotechnology policies. In the year 2000, the PP was invoked to suspend market approval of Bt maize 176, on the grounds that "new scientific evidence" put into doubt the safety of the crop.¹ The role of the UBA, an institution known for supporting more rigorous risk assessment schemes, was strengthened and was given equal status with the RKI.

New issues were becoming prominently controversial, such as nature conservation considerations in relation to GM crops. Out-crossing of genes into neighbouring fields, and GMO contamination of non-GM products, started to become legal and economic problems. At the European level, the deregulatory phase of the mid-1990s had turned into the opposite: stricter European Union (EU) regulation now supported national demands for more precaution.

Major changes in the German regulatory arena resulted from the biggest post-war food and agricultural crisis. At the end of 2000, the BSE crisis sent the agricultural and food-related system into turmoil. The crisis led both the health and agricultural ministers to resign their posts, and the Agriculture Ministry to change its focus from agriculture to consumer protection.

More importantly, the crisis stimulated a restructuring of the German risk regulation system and triggered a fundamental turn in agricultural policies. Under the term *Agrarwende*, agricultural policy now gave priority to sustainable production, consumer concerns and food safety. Industry and the Red-Green Government had previously negotiated plans for a large-scale, three-year GM cultivation programme, but this initiative was now dropped.

It was eventually replaced by a public debate, the *Diskurs grüne Gentechnik*, now under the political lead of the new Consumer Protection Minister Renate Künast, a Green Party member. After the re-election of the Government in 2002, the political responsibility for agro-biotechnology was wholly shifted from the biotech-friendly Ministry of Health to the new Ministry for Consumer Protection, Food and Agriculture (BMVEL). The CA was subsequently changed from the RKI to the Federal Agency for Consumer Protection and Food Safety (BVL), a newly created subordinate agency of the BMVEL.

As promoted by the BMVEL, the new GM policy line was framed around *Agrarwende* and 'consumer

choice'. A new way to conceive agro-biotechnology applications was officially promoted by linkage to the broader problematic of agriculture and food production. For the sake of agricultural change, Minister Künast strongly promoted organic agriculture as a model for more sustainable forms of farming.

Given the problems in conventional agricultural production, new technologies needed to demonstrate their contribution toward the goal of sustainable agricultural change. More importantly, new technological applications needed to stand the test with consumers and producers and their food/feed/seed choices. As a political baseline, the introduction of new technologies should not compromise consumer choice. This choice was seen as being about more than simply GMO versus non-GMO. Rather it concerned social preferences about what we eat, how we live, and what farming structures we want and support (Künast, 2001).

From environmental risk to coexistence

Not surprisingly, this new framing of the issue was highly contested. It openly politicised the issue of technology introduction and opened up the policy arena to broader, more fundamental discussions and accounts of precaution, as exemplified by the third framing of agri-biotechnology. Rather than focus on environmental risk alone, the new discourse emphasised wider options for agri-food systems (for instance, Öko-Institut, 2002a; 2002b).

In particular, the *Agrarwende* advocated an increase in organic cultivation to 20% of the total. Unintended gene flow from GM crops to non-GM crops took on an entirely new character in relation to demands for consumer choice and new agricultural policies. How can those who want to guarantee consumer choice prevent crop-to-crop gene flow? How can 'contamination' be prevented along the food chain? Even more urgently, how could organic cultivation be increased if those different forms of land cultivation could not coexist in close proximity?

These issues of segregation, and conflicting interests between non-GM and GM production, became increasingly important in the policy community. Such issues were regarded as a central problem to be solved in future legislation (BMVEL, 2002). Following the recommendations of the expert/stakeholder debate, *Diskurs grüne Gentechnik* in 2002, coexistence and consumer choice were identified as the new policy goals of the re-elected Red-Green Government.

Expertise, coexistence and the PP

In the last few years, new developments have fostered stronger accounts of precaution, opening up space for the 'risks' and 'alternatives' framings in the regulatory field. There is a broadening of research into agro-environmental effects of GMOs;

alternatives to biotechnology are being promoted as more sustainable practices of land cultivation.²

In Germany's new law, the composition of the scientific advisory body ZKBS has been broadened to include additional expertise in farming, consumer protection and nature conservation. Environmental expertise in risk assessment has been shifted from the UBA to the nature protection agency, the Bundesamt für Naturschutz (BFN), an institution known for applying the PP stringently. The expertise of non-mainstream scientific research institutions, such as the Öko-Institut, has gained a standing in GMO risk judgements. Furthermore, different precautionary accounts inform the risk judgements of the new CA, the BVL.³

In Germany, debates over the issues of choice and coexistence have reframed the former agronomic-environmental issues. Moreover, the change in subject and discourse has brought in new actors, such as the organic and conventional farmers, and created new coalition dynamics (Boschert, 2005). Risk and safety issues remain important and disputed themes of precaution. However, precaution takes on a broader meaning, now that agro-biotech is embedded in a more complex debate on consumer and producer choice and coexistence.

For coexistence measures, EC Directive 2001/18 was amended so that member states can specify protective measures to avoid the adventitious presence of GMOs in non-GM products. BMVEL has based its approach on that legal authority. Although coexistence does not constitute an (official) part of risk regulation, precaution has been linked to the choice and coexistence discourse in many ways. The debate about coexistence rules again illustrates the disputed nature of expertise, scientific evidence and regulatory measures by the three frames in question.

'Coexistence' denotes compromise measures to ensure 'the freedom of choice' to produce and consume GM, conventional or organic crops. Major arguments arise as to the basis on which such a compromise could be reached. Managing coexistence under circumstances of gene transfer is disputed on the question of thresholds and responsibilities. GMO proponents define coexistence on the basis of 'practical thresholds', that is, allowing high contamination, whereas the opponents understand coexistence as clear-cut alternatives, that is, GMO-free meaning 100% free.

From the start, environmental NGOs emphasised that coexistence was impossible, since GMO contamination threatens the right to choose. Later, however, they intervened in the debate by demanding stringent rules. For environmental NGOs, coexistence is an environmental and ethical issue, not just an economic one. Beyond economic risk to non-GMO farming, outcrossing or unwanted spread of reproductive material poses an environmental risk, they argue that this spread would be irreversible. On grounds of precaution, introgression of GMOs,

especially in seed or 'conservation areas', should be avoided, not just minimised.

Strict coexistence rules are thus fully part of the precautionary rationale, as they alone provide the necessary conditions that would allow product withdrawal in case of damage, to keep certain areas free from GMOs and to protect alternatives. Accordingly, environmental NGOs, together with the organic farmers, demand the strict application of the 'polluter pays' principle. This would mean that the GMO introducer would have full liability for preventing and compensating any damage, along with low thresholds for seed contamination, that is, the level of detectability.

Künast and the BMVEL have strongly supported the demand for strict coexistence rules, to safeguard non-GM forms of farming and to "prevent war in the villages", for instance, disputes among farmers. Coexistence rules would become central once cultivation started, so Künast argued the need for clear legislation, beyond voluntary agreements. Such rules were included in the new bill (GenTG) for transposing EC Directive 2001/18 into national law, formulated by the administration and passed by Parliament at the end of 2004.⁴

That law called upon a "duty of precautionary practices" (*Vorsorgepflicht*) to strengthen damage prevention and to safeguard coexistence. The law obliges GMO operators to take precautionary action to prevent an "essential reduction of value" being inflicted on non-GMO crops. Most controversially, planters of GMO crops are held liable for economic damage to adjacent non-GM fields even if they follow planting instructions and other rules.

For the BMVEL, coexistence is not primarily a matter of safety considerations, although the Ministry concedes that there are links to risk assessment, with respect to monitoring and traceability; rather, coexistence is about fundamental choices and diversity. In this respect, even nature protection is framed as a coexistence issue by allowing a "GM-free Nature", in particular with regard to "ecologically sensitive areas". Most importantly, and reflected in their framing of the PP, precaution allows for an individual choice in terms of what is regarded as being better for the environment (for instance, organic agriculture) and human safety.

However, agro-biotechnology proponents disagree. They argue that coexistence is a purely economic issue having nothing to do with risk/safety considerations, much less the precautionary principle. For them "coexistence is feasible" on the basis of practical (that is, high) contamination thresholds and "reasonable measures" to prevent the influx of GM material into neighbouring fields. From this "innovation" perspective, they claim that the new law makes unreasonable demands and imposes harsh economic penalties thus threatening GM cultivation; they criticise it as a "biotech prevention law" and a "blow to research".

As the analysis shows, the precautionary principle is caught up in the continuous political-scientific controversy about agro-biotechnology. In this way, the coexistence issue extends the scientific debate and political controversy on the PP, that is, what is meant by precaution for decision-making. What needs to be protected — productivist innovations, the environment or alternatives — remains subject to fierce debates.⁵ Yet clearly, policy shifts across the three framings of precaution have occurred as novel precautionary 'risk' and 'alternatives' elements are introduced into legislation, especially in precautionary approaches to coexistence.

PP linking politics with the market

With coexistence rules, new biotech regulation should henceforth not only protect health and the environment but also safeguard socio-political demands of consumer choices and agricultural diversity. This new focus on 'consumer choices and rights' has widened the arena for the PP from the political to the market arena.

The reorientation towards consumers responded to significant shifts in market demand. Producers' agendas are being led by products catering to individual tastes, rather than mass consumption. The "consumer as a chooser" (Gabriel and Lang, 1995) actively selects and judges products in the light of individual preferences. The issue of how food is produced, handled and processed has gained in importance as products are increasingly enriched by individualistic, symbolic meanings. This in turn has created profitable commercial opportunities for commodities produced on different quality standards, for instance, with respect to animal welfare, sustainable land cultivation or non-GM.

In this sense, the GM products currently under debate, so-called 'first-generation' products with changed agronomic traits, can be classified as innovations within an older, Fordist bulk-commodity production system not yet adapted to post-Fordist variations of consumer taste (Harvey, 1990). Such a system contradicts the very notion of consumer

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choice, which would require a system to separate various production and distribution channels in order to identity/preserve food products.⁶ 'First-generation' GM products have become vulnerable within the neo-liberal hegemonic framework for exactly this reason: The neo-liberal discourse emphasises efficiency and individual liberty, while opposing state interference with innovation, thus precluding choices of market participants.

In this situation, agbiotech-critical politics could appropriate 'consumer choice' from its neo-liberal context and instead give it an opposite meaning. They asserted the state's duty to shape innovation in a way that empowers consumers to choose or oppose specific developments and innovations. In the post-BSE phase of new consumer policies, the demand for coexistence, and the story-lines of "safeguarding the alternatives in agriculture and food production", have strengthened the basis of the agbiotech-critical coalition.

Environmental groups moved away from their negative 'risk' discourse on biotechnology, to promote alternative market developments, especially organic farming. Other policy actors followed that lead towards protecting non-GM forms of farming; even the powerful mainstream farmers' organisation (DBV) moved towards the side of the agro-biotech sceptics, on the basis of economic arguments. Thus precautionary measures, including labelling schemes, liability rules, crop separation regimes and so on, go beyond political considerations; such measures also result from shifting market relations and self-perceived economic interests of market participants.

Conclusion

A major crisis in the German agri-food system, BSE, has led to significant institutional and policy changes with a profound impact on agbiotech regulation. As the most important result, the official risk debate has shifted. While public concerns have always gone beyond biophysical risks to include alternatives in agriculture, the *Agrarwende* has finally pushed these issues into the regulatory arena. On the basis of precaution, new biotech regulation should protect not only health and the environment, but also safeguard socio-political demands of consumer choices and agricultural diversity.

The analytical concept of issue-framing helped to illuminate the policy conflicts by providing tools to map different accounts of precaution surrounding GMOs. Equally, issue framing provided an explanation for the policy shift. The emphasis on framing and discourse showed how new issues, such as choice and coexistence, shifted attention from one practice to another — from innovation to agriculture. This shift strengthened some political arguments over others, for instance, more versus less regulation. This process eventually opened up ways

for Germany to develop biotech policies based on broader accounts of precaution.

Notes

1. This decision was taken against the advice of the Zentrale Kontrollstelle für biologische Sicherheit (ZKBS), the Scientific Advisory Committee on Biological Safety. According to the ZKBS, the information did not show any new evidence of risk, and some of the studies were methodologically flawed.
2. This is illustrated by the field trial case of a GM apple in 2003. After a favourable decision of the scientific advisory body (ZKBS) on the case, in October 2003, the BMVEL stopped the trial from going ahead. There was no official justification for the measure, though Green parliamentary members argued that "the development of alternative measures would be more promising".
3. In the 1990s, the German CA always supported approval of GM products in the EU regulatory committee. By contrast, since 2003, the German CA has always abstained in such EU decisions (FoEE, 2005). There are ongoing arguments amongst German regulators as to what constitutes a proper risk judgement, reflecting different issue-framings of the national authorities. Abstention thus reflects their disagreements.
4. Liability and coexistence regulation were highly disputed. The second, Opposition-dominated law-making chamber, the Bundesrat, proposed almost 100 changes to the Government proposal. To avoid lengthy conciliation procedures between the two chambers, the Red-Green Government split the law such that it no longer needed consent in the Bundesrat. The remaining issues, such as administrative rules for "good agricultural practices" and rules for disclosing fields cultivated with GM crops, will have to be clarified in a second law.
5. In the most extreme polarisation of the issue, the PP is even used for both support and opposition to agro-biotechnology. For instance, during the *Diskurs grüne Gentechnik* one of the experts claimed that a precautionary approach towards land cultivation demanded the use of biotechnological applications.
6. New GM products with supposed 'advantages for the consumer' (for instance, potatoes for more healthy fried chips) may have a better market position also, because here, right from the start, innovators and producers have an interest in keeping products separate and preventing mixtures, which critics call "pollution". Yet even there the problem of pollen contamination and seed germination remains acute.

References

- BMVEL, Ministry for Consumer Protection, Food and Agriculture (2002), *Ergebnisbericht des Lenkungs Ausschuss zum Diskurs Grüne Gentechnik vom 27.8.2002*, available at <www.transgen.de/diskurs>, last accessed 12 December 2004.
- Boschert, K (2005), *'Agrarwende': cognitive-normative approaches to policy change in German agro-biotechnology*, PhD thesis, Open University, Milton Keynes, UK.
- Boschert, K, and B Gill (2003), *German workshop report for PEG project*, available at <http://technology.open.ac.uk/cts/peg/index.htm>, last accessed 11 August 2005.
- Boschert, K, and B Gill (2004), *Germany — precaution for choice and alternatives*, national report for PEG project, available at <http://technology.open.ac.uk/cts/peg/index.htm>, last accessed 11 August 2005.
- Dreyer, M, and B Gill (2000), "Germany — 'elite precaution' alongside continued public opposition", *Journal of Risk Research*, 3(3), pages 219–226.
- FoEE, Friends of the Earth Europe (2005), *How member states have voted on GM products*, available at <www.foeeurope.org/GMOs/pending/votes_results.htm>, last accessed 25 February 2005.
- Gabriel, Y, and T Lang (1995), *The Unmanageable Consumer: Contemporary Consumption and its Fragmentation* (Sage, London).

- Hajer (1995), *The Politics of Environmental Discourse. Ecological modernisation and the policy process* (Clarendon Press, Oxford).
- Harvey, D (1990), *The Condition of Postmodernity. An Enquiry into the Origins of Cultural Change* (Basil Blackwell, Cambridge).
- Künast, R (2001), "Rede der Bundesministerin für Verbraucherschutz, Ernährung und Landwirtschaft, Renate Künast. Auftaktveranstaltung 'Diskurs grüne Gentechnik'", Berlin 12 December 2001, available at <www.transgen.de/diskurs>, last accessed 22 December 2004.
- Öko-Institut (2002a), *Genetic Engineering and Organic Farming* (Umweltbundesamt (UBA), Berlin:).
- Öko-Institut (2002b), *Forschungsvielfalt für die Agrarwende* (Umweltbundesamt, Berlin) available at <www.dfg.de/foerder/sfb>, last accessed 11 August 2005.
- Rein, M, and D Schön (1993), "Reframing policy discourse", in F Fischer and J Forester (editors), *The Argumentative Turn in Policy Analysis and Planning* (Duke University Press, Durham/London) pages 145–165. .
- Sauter, A, and R Meyer (2000), *Risikoabschätzung und Nachzulassungsmonitoring transgener Pflanzen*, Sachstandsbericht, TAB-Arbeitsbericht Nr 68, available at <www.tab.fzk.de>, last accessed 11 August 2005.