On being technically, ethically and politically reasonable: experts, citizens and GM crops

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Abstract

This paper takes issue with a particular conception of public participation operationalised in the 'GM Nation' public debate held across the UK in 2003. The paper proceeds in two parts. In the first, I consider some key conditions of possibility for GM Nation, setting the debate within the social, political, and particularly social scientific developments that created a conceptual space within which an event like GM Nation, and the very idea of public participation in technology decision-making, can be embedded and justified. I then critique that conceptual space by focusing on a tendency to foreground a democratically ideal process whilst shifting attention away from the specificities of any particular decision, its epistemic dimensions, and the quality of decisions taken.
In the second part, I suggest the need to return to questions of epistemology and outline two practically separable domains of expertise pertinent to decision making: technical and politico-ethical. Through analysis of data gathered at eleven public debates on GM crop commercialisation, including eight that were part of GM Nation, I develop a more critical and limited approach to public participation in 'real world' decision-making. I argue that technically reasonable and politically and ethically reasonable are not the same thing, concluding that these domains need to be disentangled and treated separately, but concurrently, iteratively and in dialogue according to the particular decision in hand.

Conditions of possibility for 'GM Nation? The Public Debate'

Between the 3rd of June and the 18th of July 2003, supported by the Government and £500,000, thousands of people attended over 600 public meetings, filled in about 37,000 feedback forms, made around 2.9 million hits on an official website, and wrote over 1200 hundred letters to central organisers. Officially called *GM Nation? The Public Debate*, in the words of the event steering board, set up at distance to the Government to conduct the debate, this 'unprecedented event … was a chance for the British people to come forward and say what they felt about a new technology – genetic modification (GM) – and the commercial growing of genetically modified crops in this country' (Steering Board 2003:10).
The independent debate evaluators also viewed the event as 'unprecedented' (Horlick-Jones et al 2004:7). Such a claim requires support for there have been many other policy oriented public engagements, but it is perhaps in its intention to maximise depth of engagement and representation of people and representation of ideas and issues that GM Nation was unprecedented in the UK.
This event needs to be understood, interpreted and evaluated against the political and social milieu that produced it. GM Nation was the operationalisation of key shifts in political and social scientific thinking. Its roots can be traced back to its particular origins (its chronological story), out in the wider political and cultural

landscape (its contextual story), and then outwards even further to embed GM Nation within contemporary social theory and social scientific thinking (its conceptual story).

Chronological story

The stated aim of GM Nation was to:

> Promote an innovative, effective and deliberative programme of debate on GM issues, framed by the public, against the background of the possible commercialisation of GM crops in the UK and the options for possibly proceeding with this. Through the debate, provide meaningful information to Government about the nature and spectrum of the public's views, particularly at grass-roots level, to inform decision-making' (Steering Board 2003:55).

This deliberative approach had its roots in the 2001 Agriculture and Environment Biotechnology Commission report *Crops on Trial* which, in reviewing the likely ethical and social impacts of biotechnology, recommended to Government that a public debate on GM was required. *Crops on Trial* then went on to set the core agenda for a possible public debate on GM crops: an opportunity for the public to express their views and guide the way in which the issue was to be debated; to have access to information through dialogue with experts; and have the outputs of this engagement taken seriously by Government. By May 2002 Government agreed to the principle of a national debate, with GM Nation being launched a year later.[1]

Contextual story

To set GM Nation in context, certainly the intense media and public challenge to GM crops and food experienced in the UK in the late 1990s indicated the need for Government to be seen to be addressing citizen concerns. The idea of participation as a fix fitted the language of citizenship and democratic participation characteristic of the New Labour Government on their coming to power in 1997, language that encompassed the Government's scientific and technical portfolios (Wakeford 1999, Dean 1999). It also fitted the language of the influential House of Lords Select Committee report *Science and Society* (House of Lords 2000). This urged direct dialogue with the public as part of the policy making process, a view echoed within the Government white paper *Excellence and Opportunity* (POST 2000) and within the European Commission's *Science and Society Action Plan* (European Commission 2002).

The shift in language and, to some extent, practice can in turn be understood as a quest for legitimacy in response to large-scale technology breakdown and expert controversy in the public sphere, including in the UK: the Pustzai controversy on the safety of GM foods; BSE ('mad cow' disease); the control of Foot and Mouth disease; dispute over the triple-jab measles, mumps and rubella vaccine; and a broader history including the Chernobyl explosion and so on. For the House of Lords, these events had precipitated a shift in science-society relations, and a fall in trust in science-in-policy and the expert systems that support decision-making. This 'crisis' opened up a clear space for public participation to regain the legitimacy of decisions taken. GM Nation momentarily filled that space.

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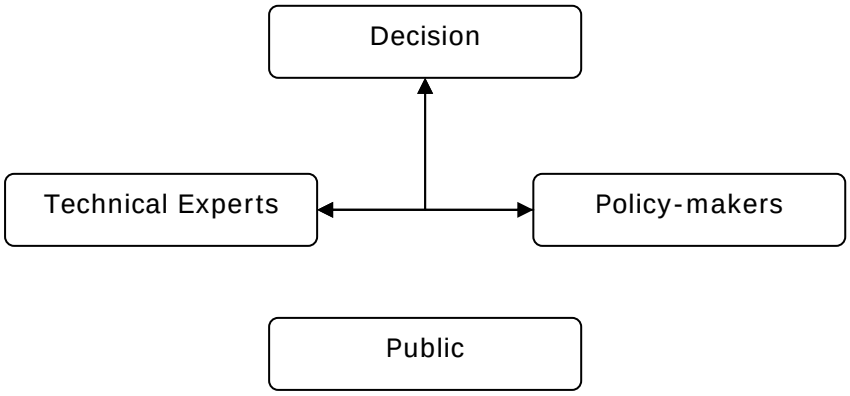
[1] For fuller discussion of the history (and criticisms) of GM Nation, see e.g. Steering Board (2003), Horlick-Jones et al (2004), Select Committee on Environment, Food and Rural Affairs (2003).

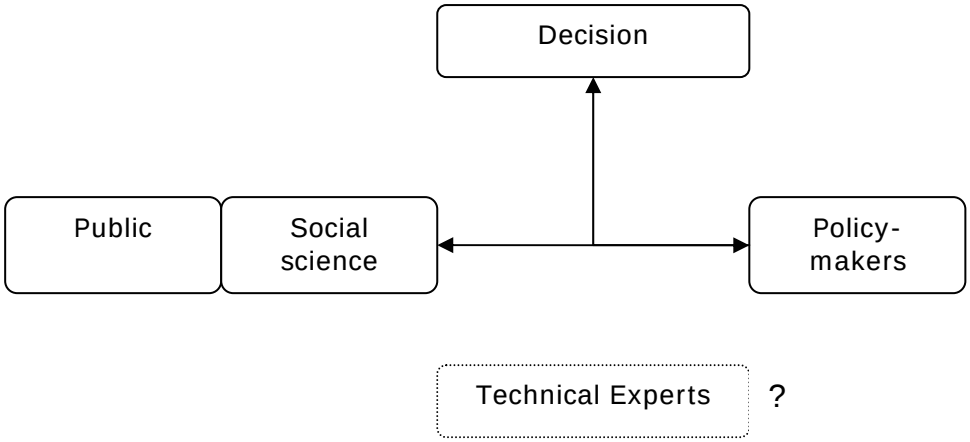
Conceptual story

But the space also opened up for a more idealised movement concerned with the democratisation of science and society relations. For almost a decade prior to 1999s explosion, social scientists had been noting rumbling discontent over GM. In particular, the 1997 report *Uncertain World* (Grove-White et al 1997) is credited with having predicted the crisis of political authority when it observed that ordinary folk, holding a constellation of legitimate and reasonable concerns, were being alienated from GM decision-making, and that government and industry were being driven by a scientific agenda that might otherwise be contested. The report stressed the need for public engagement to fix the problem. But social science is not simply operating in a reactionary and descriptive capacity: social science has helped *open up* the space for the very idea of public participation in science governance, and it has done this through the coalescence of multiple strands of research and theory.

With the backing of critical research into the sociology of science, the nature of scientific knowledge, and the public understanding of science, coupled with ideas derived from Beck's *Risk Society* and Habermas's notion of the colonization of the lifeworld, social science defined 'the public' as those excluded and alienated from decision-making culture. Crudely, this:



Social science then set about coming between scientific and political institutions, pointing to the risky consequences and inherently undemocratic character of technoscience and decision-making procedures, and undermining the main symbols by which science and technical expertise became tools for policy-making in the first place: objectivity, disinterestedness, and universalism. Social science therefore reimagined the governance of science and technology, with public engagement moving upstream to shape the way that science relates to public decision-making and the trajectory of technoscientific development. Crudely, this (with the role of technical experts now unclear):



Some - some - of this thinking was operationalised in the intended GM Nation debate, although it fell short of the idealised model. For example, it was insufficiently up stream, and patently did not feed into any policy or decision. (In February 2004 Government approved a GM maize, not because of any view expressed in GM Nation, but because it had passed through the mandatory risk assessment process and the farm scale evaluations). Moreover, GM Nation still seemed to privilege technical thinking and expertise. Separate to the public meetings, two other strands reviewed the science and the economics of crop commercialisation. But this separation of the scientific and social aspects of GM looked for some commentators too much like the old hierarchical model and meant that the event failed to fully implement public engagement. Commenting on GM Nation, sociologist Alan Irwin stated critically that this seemed like a reaffirmation of the presumed-dead 'deficit model', long ago dismissed by himself and others (e.g. Irwin and Wynne 1996);

> The conventional wisdom generally remains that public and expert opinions should not be confused, but kept separate within decision-making processes (thus indicating once again that talk of the old deficit theory's demise is decidedly premature) (Irwin 2006:315).

With a similar complaint, Barbagallo and Nelson felt that;

> Unfortunately, separating the scientific elements from social issues restricted the interaction of scientists, stakeholders, and members of the general public … separating public and scientific dimensions does not progress public engagement with the future of scientific developments (2005:323).

This resistance to the separation of scientific and social concern reinforces a strong democratic model. This begins by granting rights to various publics – citizens, marginalised groups, stakeholders and so on – to be involved in policy and decision making, and then the frames, concepts, issues etc. these different groups hold establish the terms of reference for the decision (cf. Wynne 2003, Irwin 1995). This is an institutional and horizontal reconfiguration of the old hierarchical model, and is founded on a proceduralist understanding of democracy. That is, the outcomes of deliberation are considered legitimate by definition if they are the product of a certain ideal procedure.

Certainly, there is an underlying epistemology. For example, in his opening address to the PATH conference ('European Gover'Science and Framework Programme 7'), Philippe Galiay noted that in the emerging paradigm of cooperative science research, with its strong element of public engagement,

forms of knowledge are to be treated symmetrically. This idea is more fully developed by Wilsdon and Willis:

> Different types of knowledge need to be viewed alongside one another, rather than in a hierarchy which places science above the public. Why? Because this will lead to better science. Better in instrumental terms … but also better in substantive terms: science that embraces these plural and diverse forms of knowledge will be more socially robust science (2004:56).

This epistemological nod needs however to be understood as a rhetoric used to defend political ideals, for it is again a demand for the reorientation of the institutions of science and the public ('viewed alongside one another, rather than in a hierarchy which places science above the public') but one particular question remains unaddressed in this reorientation: forms of knowledge are to be treated symmetrically *but with respect to what*?; different types of knowledge need to be viewed alongside one another rather than in a hierarchy *but with respect to what*? The behaviour of gut bacteria?; farming practices in the developing world?; legal consequences of crop contamination?; ethical limits of transgenesis?; …

I agree that social science has exposed a democratic deficit, but the correct tools to address it have not been provided. Prescriptions for a more inclusive approach to governing science have been within the context of existing power relations, and articulated through established concepts and categories. The problem has become focused on the relationship between the public on the one hand, and science, scientists and policymakers on the other. But re-using the same categories has not led to an exploration of how decision-making and science might be dealt with in properly novel ways.

Moreover, matters of knowledge and epistemology have become displaced, and by treating the boundaries between expert and non-expert as social artefacts, it is no longer possible to determine the particular capacities and capabilities of different communities that might usefully contribute to decision-making. More problematic still, sight of the very phenomenon to be discussed (GM crop commercialisation or nanotechnology, say) becomes in danger of being lost in the urgency to set up an ideal deliberative procedure.

A critical and limited approach to participation

In response, my argument is that we need to avoid the polemical stand off between the institutions of science and policy makers on the one hand, and the public on the other, and that we need to develop a critical and limited approach to participation. Following Collins and Evans' (2002) call for a new approach in science studies, termed Studies of Expertise and Experience (SEE), this should be done by reconfiguring social order as it pertains to decision-making in terms of epistemically grounded categories of experiential expertise. This keeps in mind that there is a decision to be made and something substantive to discuss. The SEE approach is discussed in detail in Collins and Evans (2002, 2003), but the following set of propositions will set out some pertinent features of their argument quickly:

- A person does or does not *just have* expertise; they have some or none with respect to a particular knowledge or practice domain in the social or natural world. This expertise is a product of experience.
- There are two general classes of knowledge and expertise pertinent to science decision-making: technical (pertaining to propositional questions in principle open to empirical validation) and politico-ethical (which are asked with respect to the social and political world). The class of technical domains containing fewer actors than the class of politico-ethical domains.

- Because only some knowledge domains will be relevant to each case of decision-making, the relative contribution of citizens and experts would depend on the specificity of the decision or policy in hand. 'Citizens' here means those without technical expertise in a given context.

It is the distinction between technical and politico-ethical expertises that I want to focus on now by drawing on transcript data collected at eleven public meetings on the commercialisation of GM crops. I use this data to show three things. First, to show that the technical/politico-ethical distinction needs to be taken seriously; second to show some seemingly impassable issues around which technical, political and ethical expertises are differently configured, and to show these expertises cannot be confounded because the response they give to particular questions is informed by different knowledge bases and rationalities, rationalities that can however always be considered reasonable; and third to show that participation is supposed to empower citizens, but in the GM Nation model it does the opposite because: a) it falsely promotes citizens to expert on all matters from where they are vulnerable to attack from technical experts; and because b) it does not recognize and privilege the particular expertise that citizens do have.
These themes are discussed through five substantive topics comparing technical and politico-ethical expertise.

Debating the commercialisation of GM crops: technical and politico-ethical expertises compared

1. Particularisation and categorisation

Much discursive labour at GM meetings was invested in constructing the boundaries between categories in which GM is and is not a member. This boundary work can be understood through the twin processes of categorisation and particularisation: categorisation is the process by which a phenomenon is placed in a general category or grouped with others, whilst the oppositional process of particularisation refers to the process by which a phenomenon is distinguished from a general category or group (Billig 1985). Technical experts tended to categorise the process of GM with other techniques for crop breeding and improvement, and focus on and particularise the *products* of that process demanding that each be considered case by case contextually and relatively. This suits empirical concern. Citizens on the other hand tended to particularise and focus on the GM *process* thereby creating the general category GM products; this suits political and ethical concern (see Table 1).

Table 1. Particularisation and categorisation processes in expert and citizen discourse.

	Process	Product
Technical Expert	Categorised	**Particularised**
Citizen	**Particularised**	Categorised

This difference is played out in stories told about the risk (or otherwise) of GM crop commercialisation.

2. Risk and naturalness

A familiar argument against GM is that it is not natural, tampers with species boundaries, or crosses a line in human interference in autonomous organisms: GM is particularised. This is the basis for a powerful and defensible ethical argument, but it transgresses into the technical domain when it is argued that this unnaturalness or interference is the *cause of new risks*. Accordingly, it is the very fact that genetic modification is unnatural or is a different class of interference that means that the modified products have the potential to be hazardous to health or the environment. For example, as one participant explained;

When we're actually putting new substances that are new to our bodies, by mechanically engineering nature to be something other than it is, when we ingest that our natural immune system wouldn't hold the mechanisms to block and prevent an unpleasant effect that may or may not arise from the ingestion of something that is foreign, which is the basis of most infections and diseases; it's our ability or inability to fight foreign bodies that gives us the state of ease or disease … the body is actually out of balance, and by loading it with something that it doesn't recognise … [it] wouldn't be within peoples natural immune system.

However, whilst arguments-from-the-natural may be reasonable intuitive or ethical reactions, technically they are not sophisticated for naturalness cannot cause harmfulness. Participants with limited technical expertise borrowed concepts and ideas from domains in which they are more familiar – in this case knowledge of a sensed natural order – to argue that the very fact genetic modification is unnatural means that modified products have the potential to be hazardous. But this argument became an easy target for technical experts who know it is not the naturalness or otherwise of an ingested substance that is connected to health (there are plenty of 'natural' substances and products that damage our health, and many 'unnatural' ones that do not).

The technical argument instead focuses on whether there is a mechanism by which the process of modification may lead to deleterious effects such as the unintentional creation of toxic or allergenic substances (for example, such a substance may arise from the little-understood action of genes within a genome). But this possibility is not unique to GM and if the concern is the introduction of potential hazards, then the place to test for those hazards is the products; a process itself is not amenable to empirical testing. This, and the variety of possible end products, means that for the technical expert, products must be treated case by case just as with *any* foodstuff.

The move here is the reverse of that of the citizen. For the citizen the categorisation of GM products is based on the ethical particularisation of the process, but that ethical particularisation does not lead to a robust technical argument. For the technical expert, the categorisation of the process means that the products need to be treated on a case by case basis like those produced by any other technique, but that leaves any question of the ethical acceptability of the process untouched.

3. Risk and Cross contamination

Cross contamination between GM and non-GM crops was another matter over which the technical and the politico-ethical became confounded. Contamination was often used as a platform for discussing matters like liability, responsibility, and compensation, shown in the following extract from a discussion between citizens;

CW: What we haven't talked about is the effect that cross contamination will have on the organic farmers

M: Quite, yes
F: yes
CW: Who's going to have to pay compensation if they are driven out of business
F: Quite. Once they're contaminated I mean they're not valid as
CW: no, the soil association will withdraw their certificate.

In discussing cross breeding in this way, some assumptions are made about scientific and technical aspects, in particular the implicit assumption that contamination between organic and GM crops can or will occur. This is an innocuous enough assumption that serves the wider political purpose of the discussion, but this general assumption became a target for technical experts because it omits the possibility that contamination varies with particular species.
For example at one meeting, citizens discussed the 'inevitable' contamination of organic crops by GM crops and the consequences of this for public choice and organic livelihoods. But a technical expert interjected that sugar beet is harvested before it flowers and so there no contamination risk from GM sugar beet. This effectively silenced the other participants, and after a pause the topic of discussion shifted. Experts tended to adopt this contextual style of reasoning and avoided generalisation; on the issue of cross-contamination, it was important for the expert to speak about specific crops.
Note however that the expert also makes an assumption – that sugar beet would be harvested before it flowers. This assumption may not be borne out in practice (Kearney 2001), yet in the absence of a participant with comparable expertise, the expert remained unchallenged. Experts could out maneuver other participants by mobilising their command of 'the facts', and in this way expertise itself became a resource of power, silencing less experienced participants.
But knowing that there are different probabilities of contamination tells you nothing about what to do if and when it happens. Although citizens felt that scientists were implicated in the problem, scientists distanced themselves from this question, preferring to ignore or reframe the problem as a technical legal matter (it will be worked out in the courts), or an empirical matter (as in the sugar beet example), terms quite different to the political and humanistic frame first favoured by citizens.

4. Uncertainty and the future

Uncertainty is another matter over which citizens and technical experts clashed. Two classes of uncertainty can be described. General uncertainty is the recognition that the future just *is* uncertain, we cannot know in a fundamental sense, what is going to happen. This is part the problem of induction, part the problem of ignorance. Specific uncertainty on the other hand is the recognition that there are specific aspects of, say, the GM process or its products that are uncertain. Whilst the existence of two classes of uncertainty were acknowledged and articulated by all participants, quite how one should act accordingly was disputed depending on whether one looks at the problem technically and empirically, or ethically and politically.
For citizens, the 'decision' – the policy, the action – was to be guided by general uncertainty and ignorance; by what we do not, and cannot know to be the case. Given the ubiquity of general uncertainty, and the possibility that a hazard we do not know about now may be revealed at a later time, we should not proceed with commercialisation. Further, given that we cannot prove safety, the chance that a specific product may turn out to be hazardous is never zero. Therefore the position reached was the strong precautionary principle. For these participants it is immediately apparent that if a technology may be risky it should be stopped.
However for the technical expert, the ubiquity of ignorance and uncertainty *cannot* govern our decision. Uncertainty is a fact of life. That very inescapable ubiquity means that we must base a decision on what we know now, or what we

can come to know. The underpinning discourse is that of scientific and technical progress: if we based decisions on the ubiquity of uncertainty, then progress would always be paralysed (see Fig. 1).

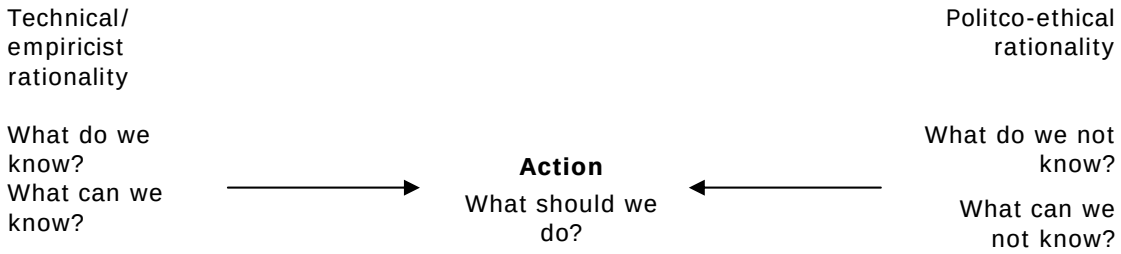


Fig 1: Two different rationalities and their relationship to action.

Implicit in these differing orientations to action are differing commitments to time, which can be represented thus (Fig. 2):

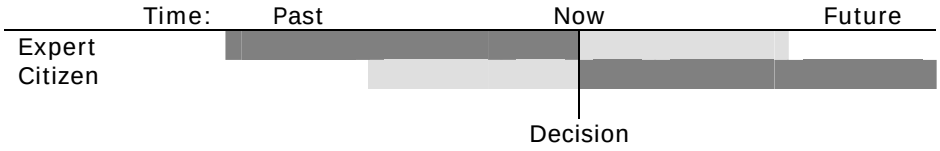


Fig 2: Uncertainty: expert and citizen orientations toward time.

The dark bars represent that period of time that should inform the decision that needs to be made now. For the technical expert, documented evidence gathered up to the point of the decision needed to be considered, along with the proviso that the status of uncertainties can be changed, in principle, to probalistic statements of risk or certain statements of harm. The key period for decision-making was therefore the past. There was some limited orientation toward the future (shown by the light bar), but this was in terms of building into the system a commitment to testing and monitoring whether potential problems we are aware of become actuality.

For the citizen, the key time dimension was the future: it is what may happen in the future that should determine the decision that is taken now. There was limited orientation toward the past, in terms of specific incidents that demonstrate that, for example, surprises do happen and that GM products have been shown to be hazardous. But these incidents (the tryptophan and StarLink maize cases were most often referred to) were taken to be indicative that the future is always unknown. When these products were introduced, they argued, it was presumed that they were safe but they turned out to be otherwise. Thus, through a process of categorisation, all GM products need to be prevented.

When these differing commitments to time clashed, antagonistic communication resulted and became sources of frustration. For the technical expert, citizen emphasis on the future, uncertainty and ignorance was frustrating because it lent itself to speculation. Further, the claim that something may happen that we do not know or cannot imagine falls outside the parameters of science. For citizens, an unwillingness to take the future seriously and the argument that ignorance is just a fact of life, indicated complacency, recklessness, and a loss of control.

To illustrate the inherent frustration, in an incident at one meeting a participant argued against commercialising GM because of future uncertainties about safety. A biotechnologist countered this argument by stating that “we cannot know 100% that the ceiling won't fall down tonight”. The audience member involved replied

“don't patronise me”. The biotechnologist’s argument was that general uncertainty couldn't be used against the specific case of GM; we would not want to ban ceilings. However, for this citizen, such uncertainty is every reason to ban GM. To add weight to this case, citizens often made connections between GM and other deleterious incidents and technologies. The constructed relationship between GM and these other incidents further contrasted expert and non-expert discourse.

5. BSE and other stories

BSE, and to a lesser extent CJD and nuclear power, were common reference points for people to articulate their concerns about GM. This is found in most research on public views on the technology and is usually interpreted to be an expression of concerns related to trust in assurances of safety and the institutions that make them, and trust in regulatory bodies and procedures. For example, Grove-White et al note that people’s subjective assessment of the risk from GM is determined by their experience of the performance of responsible institutions in incidents like BSE, and they argue for the ‘essential reasonableness of the broad patterns of association people appeared to be making between the BSE experience and the widespread diffusion of biotechnology in daily life’ (1997:19).
This was the case at these meetings too, but the reference to incidents like BSE served another, more frequent, but less explicit purpose amongst citizens: to argue that we can, therefore, expect deleterious consequences from genetic modification. This is a technical judgment used to reinforce the danger of entering a period of ignorance where we cannot foresee what might happen. As one citizen ventured in a discussion on risk and GM;

> Everyone seems to agree that it was actually feeding animals – herbivores – on animal products that made it [BSE] happen. I just, I dunno, if that can happen then anything can happen.

More obscure stories were also used to make these sorts of technical judgements. For example, one suggestion was that other substances or technologies have or have had negative consequences, so why not GM? In the following extract, a participant recounted an incident of chemical poisoning in France, and through linking this to other incidents and harmful substances, drew the conclusion that GM wheat may be harmful too (GM wheat had been the previous topic of conversation);

> Something that we haven't yet brought into the debate is that things that, well it was actually [NAME] that referred to it, I do believe the health impact isn't in the realms of the yet unknown, and there was a valley in France which in 1992 there was, I don't know, 13 cases of children there born with features that where actually misplaced on their head. What was actually seen to be a catalyst for that unaccountable particular idiosyncratic medical condition - it wasn't known anywhere else in the country - came back to the water table. It was just something - I couldn't tell you what chemical it was - that happened to be in the water stream. We've also seen deformities over a normal level from the Chernobyl fall out which we would expect to see, but very small adjustments have massive effects on the human body and deformities. As we know [inaudible] can actually give you disabilities as can lead poisoning, all are causes of disabilities so, you know, why not wheat?

Put simply, whilst arguments from these cases are intuitively appealing and instructive *politically* (for example by emphasising precaution, or questioning the trustworthiness of key institutions), they tell us nothing *technically* about the case of GM. Because of BSE or chemical poisoning in France, it does not follow that

GM is necessarily hazardous. These cases therefore show political rationality, but not technical sophistication.
The importance given to these parallel cases can be illustrated thus (Fig. 3), which builds on the previous Fig. 2:

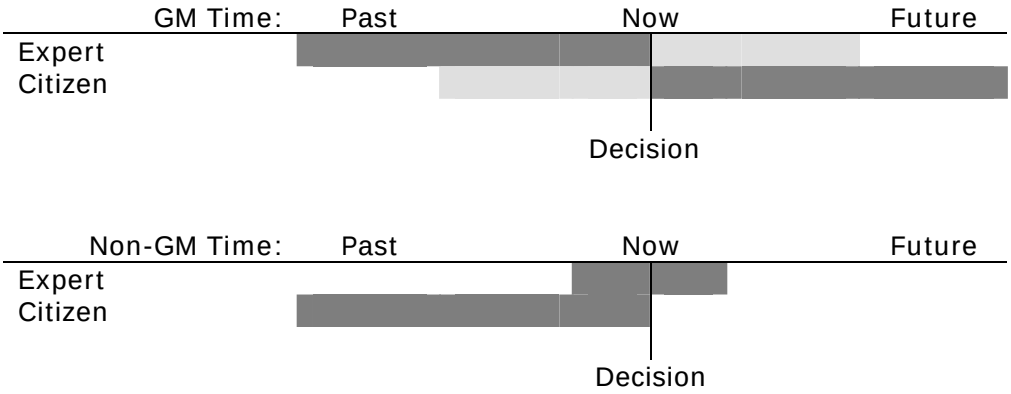


Fig 3: Uncertainty in GM and Non-GM time: experts and citizens compared.

Fig. 3 shows that in contrast to 'GM time', the past for the politically and ethically rational citizen was important in what we could call 'non-GM time' (BSE or nuclear power time for example). In fact, it was this non-GM past that informed, for the most part, their view on future GM time. For the technical expert however, non-GM time was relevant only in a very limited sense: it was restricted to now, and concerned only with comparable GM and non-GM technologies and products.

Conclusion

I want to use these examples (naturalness, cross contamination, uncertainty and the future, BSE and other stories) to demonstrate the need to reconstruct the participation problem in terms of capacities and capabilities developed through experience, and to turn the focus toward expertise, not institutional affiliation. We need to disentangle legitimate ethical, political and technical positions and treat them, pragmatically and practically, as separate domains with associated expertises.
Through this paper, I have suggested that any extended claim to public participation into the technical aspects of a policy or decision-making process must be limited to those with genuine technical expertise. However, the reverse holds for the political and ethical aspects of a decision. As de Wilde (2004:10) points out, embodied in science is a very specific attitude toward the future, and the empirical rationality utilised by technical experts, particularly from scientific communities, is inadequate to cope with the complex demands of technoscience in public policy. A model of decision-making and participation is required that, for the practical purposes of getting business done, separates technical and politico-ethical capacities and decision-making procedures, and experts and citizens respectively.
The claim that matters of facts and values or science and politics can be separated is traditionally problematic, and as sociology of science has shown, any attempt to disentangle them is theoretically and practically impossible (Jasanoff 2003, Dyer 2004). The difficulty then is not demonstrating that alongside complex politico-ethical issues, there are technical elements and propositional questions too, but in developing demarcation criteria between knowledge claims and claimants with a view to building new decision-making institutions that are democratically robust, yet which respect a division of labour. This is the continuing project of SEE.

Some consequences of such a non-linear and non hierarchical rearrangement will be that ethical and political argument will find their proper place in a more widely framed process; Citizens will become empowered through drawing on and legitimizing their particular expertise without trying to defend their technical sophistication; and the role of technical experts is reduced and their powers are limited yet valued.

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