

Framing the Debate

Narratives of Risk in Press Coverage of GM Food

Sen-Yin Li

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Department of Media and Communications

Goldsmiths College, University of London

Abstract

This thesis explores how the debate on genetic modification (GM) and the controversial character of GM food are represented in British newspapers. The dominant narrative, which is repeatedly reproduced in news stories of various events concerning GM food, focuses on risk as the crucial issue: GM food is 'riskified' and its risk is represented as an objectified and factual one which can be verified or falsified by scientific practices. The narrative also highlights the significance of the 'scientific fact' which can be used to rationalise the political decision on GM food. This thesis discusses the narrative through its analysis of news stories about five events: the first GM food product in the UK in 1996, the EU approval of importing American GM maize in 1996, the 'controversy' of Dr Pusztai's findings about the risk of GM potato in 1999, the regulation of labelling GM food products in 1999, and the results from the field trials about the risk of growing GM crops in 2003. This narrative represents the reality of GM food in such a way that its readers are led into being more concerned with the effect than the history of GM food. It also leads its readers to expect that science can settle the controversy of GM food. The thesis attempts to search for alternative narratives in which the problem of GM food can be defined and solved in more democratic and productive ways.

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1. Introduction

From the stories in newspapers we learn that there have been debates about the controversy of GM food in recent years. We learn that the government endeavours to find scientific and objective facts in order to justify its decisions. We also learn that there are environmental and consumer groups claiming that GM food is risky and questioning the value of the technology. The controversy seems to be intractable in the press coverage, because there are conflicting facts claiming to reveal the nature of GM food and there are dissenting arguments contesting these facts. Thus we, the readers of these stories, are required to decide which fact or argument we want to believe. It seems that the controversy will only be settled when various debaters find and then agree on one uncontroversial and objective fact. However, what we can see in the news stories about GM food is that until now there is no single fact capable of settling the controversy without being contested and challenged. The debate continues because the debaters cannot be satisfied with all the conflicting facts about the nature of GM food. Political decisions are postponed because there are too many contradictory facts and none of them can be uncontroversial enough to justify a particular political action.

We read newspapers in order to know what happened in the world, and we position ourselves in, and react to the world according to our knowledge about it. We do not always believe what is said in newspapers. We sometimes disagree with the ways in which news stories describe the world. But as a significant source of our knowledge about the world, news stories have the power to determine what is visible to us and how the visible can be perceived (Couldry, 2000; Thompson, 1995). News stories do not truly mirror the world in which we live, and neither do they just produce simplified or distorted representations about the world. Rather, they transform the world into the social reality which we can perceive and react to. They function as 'definers of social reality' (Bennett, 1982: 288) by providing us with certain frameworks for interpreting the reported events and by moulding our consciousness

of social reality in ways that are socially and politically consequential. The reality which news stories represent to us is loaded with socio-cultural meanings so that by reading them we can learn how to make sense of our social lives, how to communicate with each other and how to situate ourselves in our society. Bird and Dardenne argue that 'news offers more than fact – it offers reassurance and familiarity in shared community experiences; it provides credible answers to baffling questions, and ready explanations of complex phenomena' (1988: 70). News stories are the embodiment of our socio-culturally shared imagery of our lives and our society. They are the products of our cultural and symbolic practices of creating a graspable and meaningful reality out of our life world (Hall, 1982). They lead us to accept the reality which they represent to us as the one in which we live, without asking whether or not we can only interpret and produce the reality in this way.

But we should consider why we perceive and produce reality in one way rather than another. We should ask: what will be different if we change our present way of interpreting and producing reality? The knowledge which we gain from news stories is the socially disseminated and culturally legitimated knowledge about the world which we live in. However, this legitimated knowledge can be problematic when it leads us to define a social problem and its solution in a way which completely misses the point. In the case of GM food, we learn from news stories that there are different arguments about the risk of GM food each with its own supporting facts. No matter whether or not we consider GM food to be risky, we tend to assume that risk is the most significant issue which we should be concerned about. No matter which fact about GM food we choose to trust, we tend to believe that we can determine the nature of GM food because it is a clearly-defined and ready-made object. In other words, we learn why GM food is controversial and how we can settle the controversy when we accumulate our knowledge about GM debates from news stories. Then we reproduce this knowledge by engaging in further debates in a way which we consider to be proper according to our knowledge about the controversy. In this situation we consider the problem of GM food to be an intractable controversy instead of asking

why and how it became intractable. We objectify, naturalise and reproduce the reality in which we need to handle the intractable controversy, and our attention is deflected from the possibility of producing a different reality by changing our way of interpreting and reacting to it. We hardly think that the intractable controversy can be the consequence of the way in which we interpret and produce reality, and therefore this controversy can potentially only be settled or solved when we try to interpret and produce the reality differently.

The research question of this thesis asks how the stories in British newspapers lead their readers to interpret and to react to the controversy of GM food in one way rather than another. When news stories ritualise and repeat one particular way of framing and representing the controversy of GM food, their readers are inclined to objectify this controversy as if it was a real problem which we face in reality. These news stories reproduce a dominant narrative in which the controversy of GM food is debated in a particular way. The question of how the controversy is represented in news stories is significant because this representation demonstrates and reinforces a socio-culturally shared expectation about how introducing a new technology should be discussed and managed. News stories, as definers of social reality, lead us to accept that technological progress, the authority of scientific knowledge and the power of free market are all natural parts of the reality which we live in. The frameworks which news stories propose for interpreting the events about GM food reproduce certain socio-cultural meanings about technology, science, risk control and the identity of the consumer. But the frameworks are not as factual, value-free and incontestable as they seem to be. The meanings which they reproduce can be problematic when their readers are led to define the controversy of a new technology restrictively and unproductively. Through exploring how news stories represent the controversy of GM food, this thesis aims to examine how the problem of a new technology is expected to be discussed and managed in our society. We, as readers, are led by the stories to consider our relation to technological progress and scientific knowledge in a particular way. But this relation should not be taken for granted; we

can react differently to the problem of a new technology when we start to interpret the problem differently. This thesis aims to point out the possibilities which result from telling different stories about the reality of GM food.

Different stories, different realities

The problem of GM food can be defined and discussed differently; it can be defined as a scientific, agricultural, economic, environmental and political problem. Especially in the UK, the debate over GM food has expanded to embrace various questions ‘concerning the safety of previously approved GM foods, the labelling of GM consumer products, the environmental impacts of GM crops, the relative merits of intensive versus organic farming, the role of large multi-national corporations in the global agricultural economy, the (im)partiality of government ministers responsible for biotechnology policy, and indeed the uncertainties inherent in the scientific process itself’ (POST, 2000: 1). For some scientists, the GM debate is ‘a classic example of the alleged “mishandling” of science by the media’ (1). When the ‘alleged mainstream scientific opinion’ loses its power to settle the debate, these scientists argue that it is because a scientific problem is politicised or sensationalised by the media. However, their argument does not consider why the problem of GM food should be defined as a scientific one. They define the controversy of GM food as a conflict between scientific and non-scientific arguments, and they tell stories that the authority of science is in danger of being contested or misused. Their stories suggest that the settlement of the controversy should be the scientific fact revealing the true property of GM food.

In other words, these scientists tell us their own stories with their own values disguised as objectivity. I am not arguing that the reality described in their stories is fictional or distorted. Rather I want to demonstrate how their stories lead us to accept that scientists should get in the last word on the controversy of a new technology. In their stories the problem of GM food is identified with its impact on human health and the environment, and science is expected to provide the objective and rational

answer to the question about this impact by means of scientific methods. For example, the Royal Society's report on GM crops argues that:

We recognize the valuable potential and current impact of plant biotechnology on the quality of food and its importance in the development of new crops. We support continuation of research on GM plants as valuable in itself and as the only way to assess the true potential of GM plants... It is important that the public debate about GM food takes account of wider issues than the science alone, but we wish to stress the importance of informing debate with sound science... We believe that the risks to human health associated with the use of specific viral DNA sequences in GM plants are negligible (Royal Society, 2002: 10).

The report assumes that plant biotechnology is a technology ready to be used, and it objectifies the GM plant as an object whose true potential can be determined. The report is concerned only with the impact of the technology when the technology has been developed into its present form; it does not really consider the reason why the technology was developed and applied in one way rather than another. There are two questions not addressed in the report. First, why is science the only way to assess the true potential of GM plants? This true potential seems to be regarded as a property of an existing object instead of a consequence of the way in which the technology has been developed and used. Because this potential is regarded as a fact which can be revealed and determined, science is expected to reveal and to determine it. Secondly, why and how do the potential and impact of plant biotechnology become the most significant issues? The report asks for more research to determine the potential and impact of plant biotechnology, but it does not explore why the technology should be developed and how it has been developed into its present form. In other words, it tells a story in which the existence of plant biotechnology and its present form are taken for granted, and it suggests that we should produce more scientific knowledge about the technology.

Therefore, the Royal Society's report tells us a story with political implications: plant biotechnology is a promising technology that we should try our best to learn how to use and manage. The story represents a reality in which the importance of the

technology in the development of new crops is taken for granted. In this thesis, the term 'reality' refers to the presentation of our life world which is accepted as the world itself. When a representation is accepted as reality, the meanings which are attached to the world by the representation are naturalised. We can only perceive our life world by our cultural and symbolic practices of producing representations of it. 'Representation is a very different notion from that of reflection', because 'it implies the active work of selecting and presenting, of structuring and shaping: not merely the transmitting of an already-existing meaning, but the more active labour of *making things mean*' (Hall, 1982: 64). Hall argues that:

[T]hings and events in the real world do not contain or propose their own, integral, single and intrinsic meaning, which is then merely transferred through language. Meaning is a social production, a practice. The world has to be *made to mean*... Because meaning was not given but produced, it followed that different kinds of meaning could be ascribed to the same events. Thus, in order for one meaning to be regularly produced, it had to win a kind of credibility, legitimacy or taken-for-grantedness for itself. That involved marginalizing, down-grading or de-legitimizing alternative constructions (Hall, 1982: 67).

However, this neither means that all representations are the same (Fairclough, 2000), nor that some representations are truer than others. Rather it means that different representations lead to different ways of making sense of the world and have different implications. Therefore we should evaluate these representations by examining and comparing their implications. The Royal Society's report creates a reality to support its argument that it is important to inform the public debate about GM food with sound science. In this reality, GM plants are valuable and their true potential can only be assessed by the continuation of research. But we should ask: what are the consequences of accepting this representation as reality?

The report suggests that it is important to inform the GM debate with sound science because it regards GM plants as objects with a scientifically observable impact. In its story all the arguments against the development of plant biotechnology are reduced to the questions about the impact of GM plants on human health. When we accept

this story as reality, the question which we are led to ask about the technology is what is its impact but not why it is valuable. And if we reviewed the arguments raised in the GM debate and roughly divided them into two categories of for and against, we can see how this story leads us to put the burden of proof on people who argue against GM food. The advocates argue that GM food can provide several advantages to people:

1. transgenic modification can be used to confer desirable agricultural properties on the plant, and thus the use of chemicals and fertilizers could be reduced;
2. increased productivity and lower costs for the grower can make food cheaper;
3. GM food is able to provide more choices for consumers, such as better nutrition and disease-fighting compounds;
4. the increased efficiency of agricultural practices can benefit the developing world, provide plants which can thrive in hostile environments and thus solve the famine problem in the world (Pilnick, 2002 and Allan, 2002).

On the other hand, the opposition recites the negative impacts of GM food:

1. GM crops will cause unforeseen problems for the environment, such as creating super-weeds through cross-pollination and then threatening biodiversity and whole ecological systems;
2. Eating GM food might possibly have unforeseen consequences for human health, such as producing foreign proteins that have never before been in the food chain;
3. the technology involved will be employed by a small number of multi-national companies to monopolize crop production;
4. genetic engineering is an unnatural technology, and adverse effects of GM products are likely to be irreversible and then beyond the control of scientists (Pilnick, 2002 and Allan, 2002).

In the story which represents the present form of the technology as a natural part of

our reality, the opposition is required to provide evidence for the unforeseen and negative impact which is indicated. However, all the advantages recited by the advocates are not as self-evident as the story implies. At least two important questions are marginalised in the story: one is whether the present development and application of the technology can really bring us these advantages which it promises, and the other is whether the advantages are really desirable. For example, the herbicide-resistant GM crop is not developed for reducing the use of herbicide but for the efficiency of spraying herbicide, and this efficiency could prove to be problematic in terms of preserving biodiversity in the countryside (see chapter 6 and 7). These marginalised questions are not unquestionable but just made invisible in the story, when the story represents a reality in which the present form of the technology is something to accept but not to discuss.

When we accept the story told in the Royal Society's report as reality, we also accept the existence and the present form of the technology without question. We are also led to think that we need to determine the impact of GM food objectively, and therefore we endeavour to find the objective fact as if it could settle the controversy. This is the consequence if the story is accepted as reality. But without agreement on how to determine what is a fact, which fact is relevant and how the fact should be interpreted, the controversy becomes intractable, enduring and immune to resolution by an appeal to facts (Schon and Rein, 1994: 4). In this situation the controversy becomes politically institutionalised and leads 'either to stalemate or to pendulum swings from one extreme position to another' (8). Because we are eager to find the fact about GM food without considering what the fact can do for us and why we need it, we make the controversy intractable and hardly reflect on how unproductive our way of solving the problem of GM food is. In order to be more productive in handling the problem of GM food, we need different stories which represent the reality, define the problem and suggest the solution in different ways.

I use the Royal Society's report in order to demonstrate the limitations of dominant representation within journalism. The story told in the report leads us to think that the

technology of genetic engineering is valuable and that the only problem relates to its impact. But we cannot settle the controversy of a new technology without considering why and how it is valuable. Perhaps we cannot easily achieve a consensus on why and how to develop and use the technology, but at least we know that we should start to discuss it publicly and democratically when we start to accept the existence of different stories. Mouffe argues that ‘the democratic society cannot be conceived any more as a society that would have realized the dream of a perfect harmony or transparency’ (1999: 752). We cannot expect that the controversy of GM food can be settled by a universal and objective fact, even if we could find it. Instead we can only try to organise a more open and democratic debate in which different perspectives on the technology of genetic engineering can be discussed. When our story about the controversy of GM food is the one in which the present form of the technology is taken-for-granted, we deprive ourselves of the opportunity to develop the technology in a more democratic way. When our story is the one in which scientific fact is expected to reveal the nature of GM food, we are led to depoliticise the problem of GM food which cannot be solved by science alone.

Different stories can represent different realities (Toolan, 2001: ch.8). News stories are socio-culturally shared representations about our life world. However, we should not easily accept the stories as reality; rather we should consider the consequences of accepting them as reality. This thesis aims to explore the consequence of accepting, as reality, the reported controversy about GM food. In the next section, I will explain how a story functions in our society.

News narrative: not only a story

When we tell a story about something, factual or fictional, we are not just telling ‘a story’, but we turn this ‘something’ into an organised, graspable and communicable event. Hall argues that ‘the event must become a “story” before it can become a communicative event’ (1980: 129). We often understand and describe an event in the form of a story; we highlight some characters, put a series of their actions into a

chronological order or a causal relation, and indicate the meaning of the whole event (Davis, 2002). Even if a news story describes something which really happened in the world, it is still a story in the sense that it frames the happening into a graspable event and positions this event into its socio-cultural and political context in a particular way. When news stories frame related events in a repeated and ritualised way, they create a sense of recurrence and represent a reality which is familiar and manageable for their readers (Bird and Dardenne, 1988). In this respect, news stories produce a narrative about the related events for their readers to make sense of. And the more a news narrative is accepted as a legitimate way of representing the reality, the more the reality which it represents is objectified and naturalised. But when a news narrative is accepted as legitimised and factual, its readers are seldom aware of its impact on their knowledge about the world which they live in. However factual this narrative seems to be, it still leads its readers to interpret the reality in one way rather than another. To examine news stories as narratives is to consider their power to indicate to their readers how to interpret and react to the world in which they live.

Therefore, a news narrative does not just mirror the world; it functions to shape and frame its readers' perception of the world. In this respect, as in all other kinds of narratives, a news narrative has its constructive, contextual and political functions which its readers might not be aware of. First of all, a narrative functions to transform the described into the describable by structuring the described into a meaningful and graspable order. For example, when people tell stories about their experiences, they actually configure their experiences 'by selecting and plotting events within a temporal order that infuses these events with significance and exploits them for valued ends' (Davis, 2002: 16). A narrative is 'a perceived sequence of non-randomly connected events' (Toolan, 2001: 8), and it connects the events in an artificial order which makes them meaningful, perceivable and communicable. But the order created by the narrative is artificial in the sense that it creates but simultaneously restricts the meaning of the events which the narrative describes. In other words, the constructive function of narrative, which produces an

artificial order and transforms the described into the describable, is creative and restrictive: a narrative functions to make the described meaningful but only meaningful in one particular way rather than another.

Secondly, the meaning created by a narrative for the event is contextual because this meaning can only be understood and communicated properly when both narrator and reader are situated in the same historical and socio-cultural context. 'Since stories are always produced and told under particular social conditions and constraints, historical, institutional, and biographical contexts are always critical to understanding the intelligibility, believability and relevance of stories' (Davis, 2002: 18). However, a narrative is not only contextualised but also contextualising, because people do not only learn how to tell and interpret a story properly from their situatedness in a socio-cultural context, but also establish and confirm their situatedness by telling and interpreting a story properly. As MacIntyre points out:

The story of my life is always embedded in the stories of those communities from which I derive my identity. I am born with a past; and to try to cut myself off from that past, in the individual mode, is to deform my present relationship (MacIntyre, 1985: 221).

The members of a socio-cultural community share a number of narratives to signify their lives and to communicate with others. They demonstrate their sense of belonging to the community by their ability to use these narratives properly. In this respect, the contextual function of narrative is intersubjective and performative: a narrative is a culturally shared skill to signify the world, and it functions to establish the proper context for both its narrator and reader to situate themselves in.

Finally, and most importantly, a narrative implies a political or ethical argument. A narrative always directs its readers toward a specific evaluation of events, and suggests a particular moral position or political action for them. Because 'narrative's endowment of events with coherence, directionality, and emotional resonance provides not only an explanation for events but rationale for participation' (Polletta, 2002: 47), when people are in sympathy with a narrative, they actually accept the

value implied in it. And because 'any narrative inevitably has some effect on its addressees and consequences in the real world', we have to recognise that a narrative is a kind of political action which invariably carries political and ideological freight (Toolan, 2001: 206). Moreover, because a narrative is a configuration of events and often needs not to state its premises or principles clearly, it tends to be more difficult to challenge an argument embedded within a story 'without challenging the story itself, which may seem very real' (Tatum, 2002: 192). In short, a narrative can not be value-free or only descriptive, and it always implies a moral position or suggests a further reasonable action for its readers. As such, the political function of narrative is powerful but often unnoticed: a narrative indicates what is significant in the event which it describes, and its indication is always based on a value which its readers might not be fully aware of.

Therefore, this thesis considers a news story to be one kind of culturally constructed narrative (Bird and Dardenne, 1988: 67), and explores its constructive, contextual and political function of representing reality for its readers. Because a news story is often considered to be objective, value-neutral and factual, its narrative function is often ignored. A news story actually 'inflects the events it describes with cultural and ideological meanings' and 'acts to construct and to naturalize a model of social stability, morality and normality' (White, 1997: 101). A news story functions to represent the here-and-now reality and to indicate to its readers how they should interpret and react to this reality. When we start to consider the narrative function of a news story, we start to examine but not passively accept the reality which it represents to us. This thesis develops this narrative approach to examining the reality of GM food which is represented in news stories.

Five case studies: a note on methodology

The thesis selects five news events as its case studies: the first GM food product (GM tomato puree) introduced into UK supermarkets in February 1996; the EU approval to import American GM maize in December 1996; the controversy around Dr

Pusztai's findings about the risk of GM potatoes in February 1999; the regulation requiring caterers to label their food products with GM ingredients in March 1999; and the results from the field trials claiming that growing GM crops would be harmful for wildlife in October 2003. The news stories which this thesis uses for analysis are from four British newspapers: *The Times*, *The Guardian*, *The Daily Mail* and *The Sun*¹.

The first event was selected because GM tomato puree was the first GM food product available in the UK market and the news stories about this product demonstrate how genetic engineering was regarded as a promising new technology. The second event was selected because it is an example of how a political decision about the approval of a GM food product is made. Dr Pusztai's findings about the risk of GM food stirred up 'the great GM food debate' (POST, 2000) which lasted for more than ten days in British newspapers. This event is significant not only because it attracts intensive media coverage but also because it indicates how scientific knowledge is expected to be produced and to settle the controversy of GM food. About one month after the event of Pusztai's findings, the UK government announced stricter regulation in the form of labelling food products with GM ingredients. This can be regarded as a reaction by the government to the great GM food debate, and it is also a good example of how the government appeals to the ideology of free and autonomous consumers as a strategy to deal with the controversy of a new technology. Finally, by providing scientific facts about GM crops, the results from the biggest field trials in the world were expected to settle the controversy of GM food. However, the trials demonstrated how scientific facts produced in experimental arrangements cannot do the job which they are expected to do.

Three issues concerning methodology need to be clarified here. Firstly, the reason why this thesis chooses news stories in newspapers rather than other media, such as

¹ However, there was no news story about the EU approval and the results from the field trials in *The Sun* at the time.

TV, documentary and Radio news discussions, is because ‘in the UK news agendas are more often driven by newspapers than by broadcast media’ and this appears to be the case in the GM debate (POST, 2000: 16). Some newspapers are even said to adopt a stridently ‘anti-GM campaigning’ stance and to take the lead in raising and pursuing key issues in the GM debate (POST, 2000: 14). These include *The Daily Mail*, *The Independent* and *The Guardian* (15). And because newspapers are more active in raising key issues about GM food and in leading the GM debate in the UK, this thesis tries to explore the impact of focusing on a particular issue about GM food and leading the debate in one direction rather than another.

Secondly, the reason why this thesis chooses these four newspapers rather than others is because it tries to cover different styles and editorial stances. The thesis chooses two broadsheet newspapers (*The Times* and *The Guardian*) and two tabloid newspapers (*The Daily Mail* and *The Sun*), and from each category one newspaper is anti-GM campaigning (*The Guardian* and *The Daily Mail*) and the other is non-campaigning (*The Times* and *The Sun*). As demonstrated in the POST report, the conventional distinction between sensationalist tabloid and specialist broadsheet may not be as obviously applicable to the press coverage of GM food as the distinction between those newspapers that adopt an anti-GM editorial stance and those that do not (2000: 14). Therefore, the thesis tries to cover both the difference between broadsheet and tabloid newspapers and the difference between anti-GM campaigning and non-campaigning newspapers in its case studies. Moreover, the thesis chooses daily newspapers rather than scientific journals, such as *Science* and *Nature*, because the question which it attempts to explore is how public knowledge about the controversy of GM food is framed and shaped by the media. On the one hand, daily newspapers seem to be closer to the public than scientific journals (the public read more newspapers), and therefore newspapers may be more significant in terms of their power to frame and shape public knowledge. On the other hand, news stories from daily newspapers are more relevant to this thesis in the sense that they represent the controversy of GM food from conflicting perspectives, and not only the science

and technology of genetic engineering itself. Therefore, the thesis selects news stories from four different newspapers, in terms of their styles and editorial stances, in order to explore how these stories function to define the problem of GM food and to shape the GM debate in one particular way.

Finally, this thesis does not select news stories on the basis of a well-formed and quantitative sampling process, and its method is different from so-called content analysis. I recognise that it is possible that there are different kinds of stories or counter-examples in newspapers. However, I selected the five case studies in terms of their exemplariness and significance: the first GM food commodity (GM tomato puree), the process of policy-making on GM food (the EU approval and the regulation of labelling), and the representation of scientific evidence in newspapers (Pusztai's findings and the results from the field trials). And if these events were represented in one coherent and similar way, the reason why they were represented in such a way, and the impact of this representation interests me more. Perhaps there are different kinds of stories; even so, the narrative reproduced by these news stories is still influential because it has its impact on our knowledge about the controversy of GM food. Therefore, it might be less important for this thesis to claim that the narrative which it identifies is the only one in newspapers – although it can be the dominant narrative because it is repeatedly used in various news stories – than to explore why the narrative is repeatedly adopted and what its impact is.

Risk and GM food

Through the five case studies I aim to examine the problems associated with the narrative which is reproduced in news stories about GM food. The first problem of the narrative is that it leads its readers to focus on the risk of GM food. The narrative also leads its readers to think that the risk of GM food can be verified or falsified by scientific practices. This thesis develops the concept of 'riskification' to explore how GM food is characterised in news stories as a risk object which might be harmful to human health and the environment. Riskification is a process in which a risk object is

identified and causally linked to a negative effect. It is also a process in which risk knowledge is produced in order to manage the risk object. When we, as readers of news stories, are led by the stories to consider whether it is safe to eat GM food or to grow GM crops, we might hardly be aware that it is not necessary to develop and use the technology of genetic engineering in present ways. We are concerned with the effect of GM food but we seldom consider why and how one particular GM food product is created and produced. We tend to think that GM food is a novel food product which is created by the technological development of genetic engineering. We tend to think that because of the uncertain effect of GM food on human health and the environment, we need to determine its effect before we decide whether to accept it. But when we only pay attention to its effect, we accept the present form of the technology as if it is the only form which the technology can and should take. We fail to recognise that the effect is something which GM food is developed and produced to have but not something inherent in it.

Therefore, the consequence of the riskification of GM food in news stories is that it leads readers to think that risk is the only problem of GM food. News stories represent the GM debate as one in which people debate whether there is a risk and how to determine it. The riskification of GM food leads us to think that we need to produce risk knowledge about GM food in order to demonstrate whether GM food, as a risk object, is causally linked to a putative harm. However, when we learn from news stories that the GM debate is a debate about risk, we seldom think that riskification is not the only way of problematising GM food. And it is not a proper way of problematising GM food because it leads us to find the scientific fact which can either verify or falsify the risk but it does not lead us to examine the present form of the technology. In chapter 3, I analyse the news stories about GM tomato puree and the EU approval of American GM maize in order to explore how the issues about the risk of GM food are highlighted in news stories. This highlighting of risk, I argue, has a politically negative effect which is to deflect our attention from the question of why and how the technology has been developed.

Moreover, the narrative tends to individualise the responsibility of problem-solving by defining the problem of GM food as one of consumption. The public is characterised in news stories as a group of consumers who decide whether to buy GM food products in the market. When the risk of GM food can neither be verified nor falsified by an uncontroversial fact, news stories lead their readers to consider how they, as consumers, can make their choices. But the problem of GM food is neither a problem of its risk nor a problem of consumption. Instead it is a problem of production. We should consider why we produce GM food products *before* we consider how to choose between GM and non-GM food products. In other words, the GM food product is not a ready-made product whose existence we take for granted. We should not consider how to determine the effect before we discuss why we need to create and produce the effect in the first place. The responsibility of solving the problem of GM food should not be privatised and individualised; the problem of GM food just cannot be solved by individual consumers when they have no power to participate in the process of shaping the technology of genetic engineering. In chapter 5, by analysing the news stories about regulation and the labelling of GM food products, I demonstrate how the responsibility of problem-solving is improperly imposed on individual consumers.

Good science and GM food

Another problem with the narrative is that it leads us to think that science can settle the controversy of GM food. News stories lead us to think that we should try to find the scientific fact which can reveal the true property of GM food, such as its risk. However, the controversy is intractable not because we do not have the scientific fact but because we have many scientific facts which are in conflict with each other. In this situation, we need to do the boundary-work of establishing good science in order to determine which scientific fact is credible. The boundary-work of good science aims to produce a cultural map on which the boundary between good and bad science can be clearly demarcated. The boundary is drawn when there is a contest for credibility; and the ways of drawing often reflect the expectation of how scientific

knowledge should be produced (Gieryn, 1999; Prelli, 1997). But when we are led to focus on distinguishing good science from bad science, we hardly consider whether the question which science can answer is the question which we need to ask about GM food. We hardly consider whether science, in order to produce the fact, defines the problem of GM food in an appropriate way. In chapter 4, I explore how news stories do the boundary-work of good science to decide which scientific fact is credible for their readers. By analysing the news stories about Dr Pusztai's findings, I argue that the boundary-work of good science reflects our expectation that science can and should be well fenced from other social worlds, such as the worlds of politics and industry. But because of this expectation, we make the public discussion about GM food unproductive. We expect science, no matter how good it is, to solve a problem which it cannot really solve.

Moreover, the fact produced by scientific practices cannot settle the controversy of GM food as it is expected to do. This thesis argues that a scientific fact is produced in an experimental arrangement which is well-controlled and theory-oriented. The world which the fact aims to represent is simplified and modelled in the arrangement so that it can be theoretically interpretable and scientifically productive (Latour, 1999). In this respect a scientific fact has its limitations because it can only be factual in the experimental arrangement and the arrangement does not fully mirror the world as it is claimed to do (Pera, 1994). News stories lead us to think that we can rationalise and depoliticise our decision regarding the approval of a GM food product when that decision is grounded in a scientific fact. The fact can have power to depoliticise a political decision because it is accepted as a scientific fact which reveals the truth. When we accept the fact produced in an experiment as a scientific fact, we also accept its definition of problem and its representation of the world. But we exaggerate the power of the fact produced in an experimental arrangement when we fail to examine if its definition of a problem is appropriate and if its representation of the world is too simplistic. In the experimental arrangement, GM food is a ready-made and well-defined object whose property can be proved in a

mechanical and causal manner. However, the history of GM food – in which GM food is developed in particular ways by someone for particular purposes – is just made invisible. In chapter 6, I explore how a scientific fact is produced in the experimental arrangement which is designed and arranged to produce it. By examining how news stories represent the results from the GM crop trials, I argue that we are led to think that a scientific fact can answer the question which we ask about GM food and thus can settle the controversy of GM food.

Alternative narratives and GM food

Therefore, the consequence if we accept the narrative reproduced in the news stories about GM food as reality is that we are led to define the problem of GM food restrictively and to solve it unproductively. We need different stories which represent different realities so that we can define the problem diversely and try to solve it productively. Alternative narratives, which represent the reality of GM food differently from the dominant narrative reproduced in news stories, are not better because they are truer. They are better simply because we can avoid the negative consequence of accepting the dominant narrative as reality. They do not lead us to take the present form of the technology for granted; rather, they lead us to consider why the technology has been developed and use in ways which we are familiar with and to imagine alternatives. They do not lead us to identify ourselves as consumers who can only decide whether or not to accept GM food products in the market, but to consider how we can act as citizens and take part in the process of shaping the technology. They do not lead us to be concerned only with the effect of the technology, but to consider how the technology can change our positions in both nature and society and whether the change is desirable and necessary.

In summary, news stories are socio-culturally shared representations of our life world which are often accepted as reality. They reproduce the socio-cultural meanings which we use to interpret our lives. To question the narrative reproduced in news stories is to problematise the meanings which it reproduces and we tend to accept

without question. If the dominant narrative about GM food reproduces particular socio-cultural meanings about technological progress, scientific knowledge and risk control, this thesis aims to problematise these meanings and to propose alternatives. After I illustrate the problems of the narrative which is reproduced in the news stories about GM food, in chapter 7, I suggest how we can find alternative narratives in which the reality of GM food can be represented differently.

2. Literature Review

I discuss three topics in this chapter in order to provide the theoretical framework for further analysis in this thesis. First of all, I distinguish my narrative approach of analysing news stories from two other approaches: one is the sociological approach, which concentrates on identifying the political, institutional and cultural factors that influence the process of news production, and the other is discourse analysis of news texts, which regards news texts as a particular genre and focuses on identifying their textual characteristics. In this thesis, I argue that news stories should be regarded as narratives because they are socio-culturally shared representations of our life world in which certain socio-cultural meanings are reproduced and naturalised. They are representations which are often accepted as reality without question. However, both the stories and the meanings which they reproduce should be examined and not merely accepted. Secondly, whether GM food is considered to be one significant application of scientific progress, or a dangerous intervention of humans into nature, or as a controversy which is expected to be settled by credible scientific knowledge, it seems to be impossible to discuss GM food without presupposing one particular concept of science and scientific knowledge. In this thesis I try to explore how a particular concept of science is reproduced in news stories and then to reflect on the socio-cultural meanings embodied in this particular way of conceptualising science. In order to do this, in this chapter, I review the arguments which explore how science, as a cultural practice, can endow the knowledge, which is produced in the name of it, with the authority and the character of being rational, credible and objective. Finally, the news stories about GM food tend to define the problem of GM food as a problem of its risk. Therefore, it is also necessary to review different ways of conceptualising risk in this chapter. And having briefly discussed three main approaches – the risk society, anthropological and Foucauldian approaches – to the conceptualisation of risk, I argue that to produce risk knowledge about a particular risk object is a story-telling practice. Risk knowledge is a story in which a risk object is identified and causally linked to a putative harm. Based on this argument, I can explore how

GM food is riskified in news stories and what the impact of riskification is in chapter 3.

To analyse news stories as narratives

To regard news stories as narratives is to emphasize their power to represent social reality and their function to reproduce particular socio-cultural meanings in their representations. In order to clarify this point, I distinguish my narrative approach from two other approaches to analysing news texts. One approach is the sociology of news production, which is mainly concerned with the reasons why news can not truly or wholly represent reality and with the powers which influence the process of news production. The other is the discourse analysis of news texts, which focuses on identifying the linguistic or structural specificities of news texts as a particular genre. Both approaches have their advantages: the former can provide us with insight into the process of news production, and the latter can help us to elaborate on the relationship between the symbolic forms of news texts and the ritualised meanings embodied in them, such as objectivity. However, both approaches are inadequate for the analysis which this thesis attempts to do. On the one hand, news texts are not only the end products of news production which are influenced by political-economic powers, professionalism, and socio-cultural ideologies, but also a kind of social knowledge which functions to 'orient man and society in an actual world' (Park, 1940: 685) and provide 'the basis for the discussions in which public opinion is formed' (684). Hence, it is inadequate to point out the reasons why news stories represent reality in one way rather than another. It is more meaningful for this thesis to explore how a particular representation, which is reproduced in news stories and accepted as reality, functions to lead the readers of news stories to interpret and react to reality in one way rather than another. On the other hand, it is obvious that news texts, as a genre, have particular linguistic and structural characteristics. However, when we are concerned only with the linguistic and structural characteristics of news texts, we might analyse news stories only as literal texts and ignore their power to define social reality. The approach of discourse analysis might lead us to focus on the

symbolic forms and linguistic characteristics of news texts without reflecting on the socio-cultural meanings embodied in them. In the following section, I briefly discuss both approaches and their inadequacy for this thesis, and then I define my narrative approach by reviewing two exemplary case studies.

The sociology of news production: three sub-approaches

For media sociologists, news 'is not, and never can be, neutral and objective, but is fundamentally interpretative, embodying the dominant values and explanatory frameworks of the society within which it is produced' (McNair, 1996: 43). In order to prove this argument, they need to explain why and how news can not be objective. Therefore, they focus on the process of news production and try to identify the factors which influence this process. This sociological approach can be categorised into three sub-approaches (Schudson, 1989, 2000 and McNair, 1996). Firstly, the political economy approach argues that news production is inevitably influenced by the powers of the nation-state and by capital. Secondly, the organisational approach explores how the professional paradigm of journalism and the routinisation of news-processing influence the end products of news production. Thirdly, the cultural approach attempts to discover the socio-cultural factors which constrain and shape the process of news production in a particular cultural tradition and symbolic system. Although these three approaches are not mutually exclusive, 'they are premised on profound differences as to the nature of the state's functioning, of journalism's role, and the concept of ideology' (McNair, 1996: 61).

The propaganda model of mass media, which claims that news production is in fact dominated or controlled by the political and economic powers, is a good example of the political economy approach. Herman and Chomsky argue that the contemporary news media are actually propaganda systems, in which 'money and power are able to filter out the news fit to print, marginalize dissent, and allow the government and dominant private interests to get their messages across to the public'(1988: 2). They further point out five news filters in their model: the size, concentrated ownership,

and profit orientation of the mass media; advertising as the main income source of the mass media; the reliance of the media on government, business and experts to provide information as news sources; flak, which means negative responses to a media statement or programme, as a means to discipline the media; and anticommunism as a control mechanism. Except for the fifth filter which should be considered as an ideology which only prevails in particular historical periods and countries, all other four filters represent the materialised power of the so-called conspiracy between the government and economically dominant interests which is exercised in news production. Herman and Chomsky even argue that these filters are 'so powerful, and are built into the system in such a fundamental way, that the alternative bases of news choices are hardly imaginable' (2).

The organisational approach can be roughly divided into two subcategories: one focuses on the routinisation of the process of selecting and producing news in news institutions, and the other focuses on the professional paradigm of journalism which can also influence the process of news production. As one example of the former subcategory, a classical metaphor to describe the selective process of news production in news institutions is the metaphor of 'gatekeeper', which means that an individual or group has the power to decide which material is included or excluded (White, 1950: 162). According to White, the decisions of gatekeepers are highly subjective, and 'based on the "gatekeeper's" own set of experiences, attitudes, and expectations' about what news means (171). In addition, Rock also argues that because the world 'does not seem to be arranged for reporting purposes', and because the entire reporting exercise needs to translate the world into a reportable succession of coherent events which could ensure that 'a constant volume of news is produced at regular and frequent intervals', some certainties must be built into the process of news production (1981: 65-6). Therefore, reporting becomes a ritualized activity and newsgathering takes routine forms, which is 'supported by a set of operating assumptions about the world' (68). These assumptions 'transform a possible anarchy into a more or less stable universe of events in which there is some

predictability and rationality' (68). News becomes 'a product of men who are members of a news-gathering (or a news-originating) bureaucracy' (Gieber, 1964: 180), and news stories are shaped and controlled by the frame of reference which is created by this bureaucratic structure as a routinised everyday work. For example, Berkowitz argues that when news workers deal with highly unusual and unexpected events, they try to find routine ways of dealing with the non-routine (1997: 362). News workers adapt strategies from everyday work routines to do their non-routine work but seldom develop procedures which are 'entirely different from routine coverage' (363). Hence, because of this routinisation of news production in news institutions, news conveys an impression 'of society as a social order which is made up of movement but no innovation' (Rock, 1981: 69).

Another subcategory of the organisational approach explores how professionalism influences the process of news production. The most significant professional paradigm of journalism might be the paradigm of objectivity (McNair, 1996). However, Tuchman argues that the paradigm of objectivity is actually a 'strategic ritual' for news workers to protect the professional from mistakes and from their critics (1972: 678). Moreover, Soloski argues that the norms of news professionalism can function as the strategies to 'determine the legitimate arenas and sources of news', to 'legitimize the existing order by making it appear to be a naturally occurring state of affairs', to 'produce news stories that permit news organizations to maximize audience size', to 'maintain firm control over the marketplace', and finally to 'bias news at a societal level' (1989: 225). News professionalism is considered to be able to limit the manipulation of news by the owners of the news institutions who seek to push their particular political convictions or interests (Hallin, 2000: 233). But Soloski argues that news institutions can still rely on the interplay of the 'trans-organizational control mechanism represented by news professionalism' and the 'intra-organizational control mechanism represented by news policy' to establish the boundaries for the professional behaviors of journalists and to constrain their actions (1989: 226). These boundaries permit some creativity in reporting and editing

news stories, but they also impose restriction on journalists 'to act in the interest of the news organization' (226). Professionalism functions not only to protect journalists' autonomy but also to restrict their creativity.

The cultural approach attempts to illustrate how the possibility of news production is constrained by its socio-cultural environment. News value or news judgment, as the criteria by which news workers determine which event can be represented as news, actually reflects 'economic, social, and ideological values in the discourse reproduction of society through the media' (van Dijk, 1988: 120). For example, Galtung and Ruge identify several culture-bound factors which influence the transformation from events to news, such as elite-centredness, personification, and negativity (1981). Tuchman also argues that 'common sense plays a central role in the assessment of news content, since the content of a news story is multitudinous "facts", and common sense may determine whether a piece of information may be accepted as a "fact"' (1972: 674). However, Schudson argues that 'the cultural knowledge that constitutes "news judgment" is too complex and too implicit to label simply "ideology" or the "common sense" of a hegemonic system' (2000: 191). He argues that news judgment is not 'so unified, intentional and functional a system' as this term suggests, and in some respects it is rooted 'much more deeply in human consciousness and can be found much more widely distributed in human societies' (191). In addition, it is also difficult to clearly distinguish the cultural approach from the organisational approach. If journalists, who are professionals and at the same time members of a particular cultural community, build up their values and beliefs in both organisational and socio-cultural contexts, it turns out to be difficult to determine whether their news judgment is influenced by organisational, professional or cultural factors, because their judgment is actually the result of the compromise between all these influences.

These three approaches have some disadvantages. Because they 'are often inclined to ignore the possibilities for change in the nature of newswork', and 'tend to be indifferent to comparative as well as to historical studies', they might weaken their

long-term values as social sciences (Schudson, 1989: 280). Moreover, the three approaches are all premised on one particular way of conceptualising news, which regards news as a medium through which reality is mirrored. The mirrored reality in news stories might be biased or manipulated. However, these approaches imply that if we can identify the factors in order to weaken their influences, whether they are political-economic, organisational or cultural, we might be able to expect a 'better' function of the mirror. In other words, these approaches presuppose the separation between reality and news. They suggest that there can be a true reality existing out-there to be compared with the imperfect representation of news stories. Perhaps each of the approaches has a contribution to make to the understanding of how and why journalism is produced (McNair, 1996: 62). However, they are inadequate for this thesis because, to some extent, they ignore the fact that news stories also function as an important source of social knowledge which transforms the world into a graspable and interpretable reality for their readers. They are more concerned with the reason why reality is represented in news stories 'as such', but they pay less attention to the question of how the represented reality in news stories leads their readers to perceive the world in which we live in a particular way. Moreover, these approaches tend to discuss the function of news on a general and macro level. But when this thesis aims to explore the function of news stories to communicate and reproduce social knowledge, it is necessary to adopt a more contextualised and case-based strategy to explore how the reality of particular events or objects is represented in news stories.

Discourse analysis of news: the structure of news texts

To tell a news story is not only a language-use activity, but also a social practice and a speech act, which functions to report the truth. And because a news story is assumed to have its specific role and function in the society, it has to develop its specific linguistic formats and narrative structures, which are able to be recognised as one particular genre and therefore to be clearly distinguished from other story-telling practices in society, such as novels, dramas and personal narratives in everyday

conversations. The identification of these formats and structures through the methods of linguistics has been well developed as a discipline which can be referred to as the discourse analysis of news. Van Dijk argues that news as a discourse is 'not just a text but also a form of interaction', and 'a full-scale analysis of discourse involves an integration of text and context in the sense that the use of discourse in a social situation is at the same time a social act' (1988: 29). By conceptualising news as discourse, the discourse analysis of news offers us an insight into the relationship between the linguistic and structural characteristics which differentiate a news story from other practices of story-telling, and the socio-cultural functions which a news story is supposed to perform. However, this approach tends to concentrate on the linguistic and structural elements of news texts. Therefore, it is inclined to generalise and decontextualise the discursive structures of news texts, and to ignore the socio-cultural and political functions of news stories in terms of how they produce a social reality shared by members of society. In other words, the discourse analysis of news might be restricted if too much emphasis was put on the textual elements of news texts at the expense of their wider context.

In comparison with the personal narratives told in everyday conversations, a news story has a distinct narrative structure (Toolan, 2001). Bell uses the five structural elements of a personal narrative to illuminate the sameness and the difference between a news story and other practices of story-telling (1991). These five structural elements are: Abstract, Orientation, Complicating Action, Evaluation, and Resolution (or Coda). First of all, Bell identifies the function of the lead in a news story with the function of Abstract, but he argues that the lead is obligatory for a news story since the lead is a device by which the 'audience can get the main point of a story from reading a single opening sentence, and on that basis decide whether to continue' (1991: 149). In this sense, the lead of a news story functions as 'a directional summary' and 'a lens through which the point of the story is focused and its news value magnified' (183). Secondly, he claims that Orientation (who, where, when, what) in a news story is also obligatory; it is the basic fact which is often presented at

the beginning of the story and may be expanded further down. Thirdly, Evaluation is the means by which the significance of a story is established; in a news story, the lead is the nucleus of Evaluation because it 'focuses the story in a particular direction' and points out the news worthiness of the story (152). Fourthly, Action in a personal narrative is invariably told in a chronological order, but Action in a news story is 'seldom if ever told in chronological order' (152), because in order to enable the news story to be updated day after day, 'it is not the action or the process which takes priority but the outcome' (153). It is the news value of the news story which 'overturns temporal sequence and imposes an order completely at odds with the linear narrative point' (153). Finally, a news story often does not present such a clear-cut result as what a personal narrative does, because the news is 'more like a serial than a short story' (154). A news story 'consists of installments of information of perceived decreasing importance' and 'is not temporally structured or turned into a finished fashion' (154). And therefore, there is no Coda in a news story, because its finishing function is not necessary for a news story.

These comparisons do not only demonstrate the significant distinctions between news stories and personal narratives, but also illustrate one important structural character of a news story, namely its non-chronological and theme-oriented structure. According to van Dijk, a news story may exhibit 'a thematic realization structure that is basically (1) top down; (2) relevance controlled; and (3) cyclical (in installments)' (1988: 48). That is to say, in a news story 'main acts and participants that are politically relevant come first, followed in each cycle by details of main participants, identity of secondary participants, components/conditions/consequences/manner of acts, time and location details' (48). In this thematic structure of a news story, Bell argues that 'order is everything but chronology is nothing' (1991: 172). The thematic structure is 'a consequence of news obeying news values rather than ordinary narrative norms' (172). The function of a lead in a news story exemplifies this consequence of news obeying news values. The topic of a news story is always summarised in its lead, but this lead is more than a summary, it

is a 'micro-story' which 'compresses the values and expertise of journalism into one sentence' (Bell, 1991: 176). To construct the lead is to abstract the most 'newsworthy' and 'uncontroversial' fact from the news story as a kernel or gist of the whole story. Therefore, the lead functions to direct the unfolding of the whole story. In other words, the lead, as the first-coming paragraph of a news story, does not only point out the topic of this story but also the value of this story.

In order to organise a news story into a thematic structure and to construct an appropriate lead, several 'macrorules' (van Dijk, 1988) are necessary for reducing the available information of a news story into the lead. According to van Dijk, there are three types of macrorules. Firstly, the information which is no longer relevant, such as local details, can be simply deleted. Secondly, a sequence of propositions can be replaced by one generalization: for example, a dog, a cat, and a canary can be generalized as the pets. Thirdly, a sequence of propositions that denote the usual conditions, components, or consequences of an event can be replaced by a macroproposition that denotes the event as a whole, namely to construct an 'umbrella term' as an overall event for a series of actions. These three macrorules – deletion, generalization, and construction – are used to summarize the information of a story into an abstract. Hence, in order to construct a lead or a headline for a new story, it is necessary to use these macrorules to process the available information in a news story and to arrange it into a theme-oriented order.

Finally, it is also important to explore how a news story demonstrates its own factuality by using specific rhetorical strategies. A news story needs to formulate the event which it reports in a way that it is 'not merely understood but also accepted as the truth or at least as a possible truth' (van Dijk, 1988: 83). This acceptance is premised on 'some minimal coherence, if not consistency, with the other knowledge and beliefs we already have' (83). Although those exceptional or unexpected news stories might be evaluated as more newsworthy, they have to be restricted 'within the boundaries of the understandable' (86). Hence, a news story will be more factual (or more persuasive) if it is able to be constructed to fit our cognitive models without

being completely predictable. For example, journalists often use some rhetorical strategies to enhance the truthfulness, plausibility and credibility of their stories (93). These strategies include using numeric descriptions, selecting official and well-known persons or institutions as reliable and credible sources, describing the concrete and material details of the fact; quoting from eyewitnesses or direct participants. However, although these strategies can be used to increase the factuality of a news story, they are also the constraints for writing a news story because a news story has to be understood and accepted as a description of fact.

Discourse analysis of news can be a very useful tool for exploring how a news story highlights the most important or valuable fact of the story through its narrative structure, for example, the information summarized in its lead. The highlighting of a news story often embodies and reproduces the socio-cultural meanings attached to the event which it reports. And the linguistic format and narrative structure of a news story are not just value-neutral ways of organising and representing the information; they transform the text into news which can perform its socio-cultural function. To tell a news story is a social practice. If we only described the discursive character of a news story without expanding our inquiry into the function which discourse performs, our analysis is insufficient because it is only an analysis of text but not of news. Therefore, it is necessary for the analysts to step forward from the general descriptions about the narrative structure of a news story to explore how a news story functions in society.

The narrative approach and two examples

A news story is a narrative; to analyse a news story as a narrative means to consider it as 'a way in which people create order out of disorder, transforming knowing into telling' (Bird & Dardenne, 1988: 70). A news story is not a mirror reflecting the social reality; rather, it is a part of the reality which it represents. It is a signification and exemplification of the social reality. A news story provides people with 'a schema for viewing the world and for living their lives' (82). Hence, a news story

does not only tell a story 'like it is', but also tell it 'like it means' (71). This narrative approach is different from the organisational approach: although both of them are concerned with the ritualisation of a news story, the narrative approach is more concerned with ritualisation of the reality represented in the story rather than the ritualised practice of producing the story. And the narrative approach is also different from the cultural approach: although both of them focus on the socio-cultural meanings embodied in a news story, the narrative approach does not assume the socio-cultural meaning as a pre-existing variable that influences news production, but considers how a news story constructs and reproduces meaning. In other words, a narrative approach does not separate a news story from the reality which it represents; it regards the story's ability to define and to produce the reality for its readers.

I want to introduce two case studies as examples of this narrative approach. The first example is from research exploring how news media establish the interpretative frame to deal with an initially ambiguous news event (Bennett et al., 1985). This research clearly shows how one particular version of reality is defined and represented in the continual coverage of an event. On March 4th 1983, Cecil Andrews phones the WHMA-TV in Alabama, USA, and says that he is going to 'set himself on fire'. The WHMA-TV phones the police and assigns a camera crew to the square which Andrews mentions on the phone. When the camera crew arrives, Andrews approaches them and starts to 'burn himself'. At that time the camera crew just sets up their equipment and begins to film the action of Andrews burning himself. When this happening finally becomes a significant news event which is reported nationwide in America, the focus of news stories is shifted from the action of Cecil Andrews to the responsibility of the WHMA-TV camera crew. Then, the original event of a man burning himself is marginalised in all the news stories: Cecil Andrews is cast in a 'minor and decidedly apolitical role'; his story is 'newsworthless'; and finally he becomes 'a stranger in his own story' (Bennett et al., 1985: 64). The news stories in this example not only reestablish the professional paradigm for the controversial and problematic situation, but also rewrite the whole story from an accident in which a

man sets himself on fire to a case about the conflict between human morality and the professional role of the journalist. To be sure, the accident is not truer or closer to reality than the case; they are different versions of the reality which suggest different ways of interpreting and evaluating the event morally and politically.

Another example is an analysis of the representation of Bovine Spongiform Encephalopathy (BSE) in British newspapers. Adam points out that the news stories about BSE, instead of focusing on the risk of contracting nvCJD from the beef contaminated with BSE, are 'still full of calculations about lost export revenues, the impact on gross national product (GNP) and the costs to farmers and retailers, as well as the rendering and slaughter industries' (Adam, 2000: 127). She argues that the reason why this 'economic frame of reference' can become the mainstream way of reporting the event is because this frame can bring the event of BSE 'back within the fold of the familiar news world of reportable statements and events, describable disasters and quantifiable economic facts and figures' (128). The economic frame of reference allows journalists to stay in 'the now-here world of political wrangling in the politico-economic present' rather than address 'a matter suffused with uncertainty in terms of tangible, material outcomes' (128). Although it is apparent that her argument is based on the organizational approach of considering news-production as a routinising activity, it is interesting that news stories in British newspapers frame the event of BSE as an 'economic beef crisis' and marginalise the arguments which consider BSE as a risk to public health. This frame turns the problem of BSE into a problem impacting on the whole economic system and the agricultural industry in the UK, but not a problem related to public health and the ecological system. Adam points out the implications of this economic frame: 'citizen's concerns about a potential health hazard are sidelined', 'the government can legitimately concentrate exclusively on the material task of rescuing a dire economic situation', and 'awkward questions about the industrial methods of food production can be avoided' (127). Therefore, this frame does not only transform the event of BSE into a reportable economic issue, but also effectively silences 'all and everything that threatens the

status quo' (128).

These two examples illustrate that the analytic focus of the narrative approach is to reflect on the reality represented and reproduced in news stories. As mentioned above, a news story can achieve its factuality by fitting the reported event into the existing system of social knowledge and cultural beliefs. However, this factuality is achieved because the reported event is transformed into the social reality which we feel familiar with and know how to react to. In this sense, the status quo reported in news stories is something naturalised and reproduced by the recurring news narratives which turn the ambiguous world into the familiar and known reality. However, as Bennett and Edelman argue:

The idea here is not just that stories are selective representatives of reality; there would be no point to any symbolic form if it were not selective in its representation. The issue with selectivity is whether a representation funnels emerging reality back into stereotypical terms, or whether it introduces new information in terms of unfamiliar dilemmas, puzzles, and contradictions of the sort that promote critical thought and a self-consciousness of problem-solving behavior (Bennett and Edelman, 1985: 164).

They correctly point out the political implications of the reality represented in news stories: news naturalises one particular way of interpreting the reality and thus restricts our potential to react to it. They argue that the 'recurring and stereotypical narrative accounts in the mass media can elicit powerful responses of belief or disbelief in distant audiences without bringing those audiences any closer to practical solutions for the problems that occasioned the stories in the first place'(156). However, because the narrative approach examines the naturalised representation of reality in news stories does not mean that it attempts to find the best representation of reality or claims that every representation should be considered equivalent. Rather, it means that this approach is an ongoing political project which attempts to promote critical and reflexive consideration about the naturalised and normalised representation of reality. Fairclough argues that:

All we have are different representations of reality, drawing on different

discourses. But that does not mean that all representations and discourses are equally good. They are still representations *of* something, and while no one can get at the 'something' except through representations of it, the 'something' nevertheless still exists separately from the representations. People are constantly evaluating different representations, and looking for better ones. We don't usually do this abstractly, merely as a matter of speculation, we usually do it practically, in the course of trying to get something done, which entails working on (often trying to change) the 'something' (Fairclough, 2000: 155).

Deciding which representation is better is a practical and political decision. It is a decision which should be made after the available representations and their implications are critically and reflexively assessed. It is a decision about value; it is a decision based on how we should view the world which we live in and what we expect from our lives. It is only possible to live in a different reality after we start to think reflexively about it and to act on it in alternative ways. Therefore, to search for alternative narratives is to resist the power of the prevalent and dominant narrative which leads us to accept one particular representation of our life world without question. Finding alternative narratives is a political action and it involves introducing alternative meanings about our existence into our lives. I elaborate more on how the power of the dominant narrative functions and how to search for alternative narratives in chapter 7.

Science in the GM food debate

It is obvious that science plays an important role in the public discussion about GM food. And the importance of science embodies a particular way of considering what science means and what its function is. The reason why science is so important is not only because GM food is considered to be an innovation resulting from scientific progress, but also because science is expected to settle the controversy of GM food by providing facts about the nature of it. The news stories about GM food reproduce a particular way of conceptualising science which has its roots deep in our culture. In order to explore the conceptualisation of science in news stories and its implications, I will examine how science is conceptualised more generally. Firstly, scientific

practice is a cultural practice which has its own history. The facts produced in the name of science are a product of systematic methods used in well-designed experimental arrangements. Therefore, facts are conditioned but not as universal as they are supposed to be. Secondly, because science is regarded as being rational and credible, an argument will often try to establish its credibility by showing its 'scientific-ness'. However, when there is a conflict between different scientific positions, it becomes necessary to distinguish good science from bad science in order to decide which argument is credible. Therefore, as we can see in the public discussion of GM food, conflicting arguments often do the boundary-work of distinguishing between good and bad science. However, the outcome of boundary-work is the establishment and naturalisation of scientific rationalism. It leads people to pay more attention to the scientific-ness of an argument but not its relevance to the discussion. In the final part of this section, I briefly review some arguments about how science functions in the GM debate.

Science as a cultural practice

Let us begin with a contrast between philosophy and science. Searle argues that both philosophy and science are universal in subject matter and aim for knowledge and understanding (Searle, 1999). However, 'when knowledge becomes systematic, and especially when systematic knowledge becomes secure to the point that we are confident that it is knowledge as opposed to mere opinion, we are more inclined to call it "science" and less inclined to call it "philosophy"' (Searle, 1999: 157). Because 'philosophy is concerned with questions that we do not yet have an agreed-on method of answering', there can be 'no agreed body of expert opinion in philosophy' as in science (158). Searle argues that the contrast between science and philosophy illustrates the reason why science is always right and why there is never any progress in philosophy: 'as soon as we are confident that we really have knowledge and understanding in some domain, we stop calling it "philosophy" and start calling it "science", and as soon as we make some definite progress, we think ourselves entitled to call it "scientific progress"' (158). But the characteristics which

differentiate science from philosophy, such as systematic knowledge or the agreed-on method of answering, are not inherent in science but the consequences of the historical development of science. Science is historical because its systematic method of producing knowledge is the consequence of its own development.

Haraway argues that scientific practice is a 'story-telling practice' and 'a rule-governed, constrained, historically changing craft of narrating the history of nature' (1989: 4). Science is often considered to be the 'craft for distinguishing between fact and fiction, for substituting the past participle for the invention, and thus preserving true experience from its counterfeit' (4). However, Haraway argues that science is 'culturally and historically specific' and modified within the processes that give it birth (12). Therefore, science is 'subject to cultural and political evaluation "internally", not just "externally"' (13). She argues that scientific knowledge is a story 'with a particular aesthetic, realism, and with a particular politics, commitment to progress' (4). And the history of science is 'a narrative about the history of technical and social means to produce the facts' (4). Therefore, the scientific method of producing scientific knowledge is a consequence of its own history; it embodies its own values and culture which are the product of its own development.

I use two examples to illustrate this point. For example, Hacking demonstrates that laboratory science tends to produce a sort of self-vindicating structure that can keep it stable and practicable (1992). Laboratory science has developed the apparatuses, instruments and methods of processing data which make its job of testing theories possible. The theory which an experiment is set up to test in a laboratory determines how the apparatuses should be used and how data should be collected and interpreted. The theories of laboratory science can persist because 'they are true to phenomena produced or even created by apparatus in the laboratory and are measured by instruments' (30). Therefore, Hacking argues that the experiment in the laboratory does not report any preexisting phenomena but actually makes them (58). The reason why laboratory science can produce stable and predictable theories is because it has

developed those apparatuses, instruments, and methods of processing data in order to produce the phenomena which can support the theories. With the theories, the methods, and the apparatuses which have evolved in conjunction with the theories, laboratory science constructs a self-vindicating structure in which any test of theory can be done practicably and efficiently. This structure is the consequence of the development of laboratory science, and it turns out to be the necessary condition for laboratory science to produce systematic knowledge which can be labelled as science.

Science also develops a systematic method to produce stable scientific facts across different social worlds. Fujimura develops the concept of a 'standardized package' to explore how 'both collective work across divergent social worlds and fact stabilization' can be handled by scientific practices (1992: 169). A standardized package consists of 'a scientific theory and a standardized set of technologies which is adopted by many members of multiple social worlds' (169). Through using standardized packages, Fujimura argues, scientists can 'constrain work practices and define, describe, and contain the representation of nature and reality' in different social worlds (205). She argues that 'packages of ambiguous concepts and standardized tools, of theory and methods, are powerful tools for insuring fact stabilization' (204). Therefore, both Hacking and Fujimura illustrate that scientific practice builds up a self-vindicating and stabilized system to produce constructive and fact-like stories about nature without necessarily referring to the actual nature existing 'out there'. Science is a systematic method of producing knowledge with its own history and culture, and therefore the systematic knowledge which science produces about the world is more relevant to the system in which the knowledge is produced than to the world which the knowledge is claimed to represent.

Therefore, to regard science as a cultural practice is to contextualise scientific practice and the knowledge which it produces with reference to its own history and culture. We need to reflect on the aesthetic and political value embodied in scientific practice. However, this position should not be confused with 'relativism', because

relativism is the ‘mirror twin of totalization in the ideologies of objectivity’, and both of them ‘deny the stakes in location, embodiment, and partial perspective’ (Haraway, 1991: 191). Latour argues that ‘we do not need a social world to break the back of objective reality, nor an objective reality to silence the mob’ (1999: 15). For him, to talk about scientific practice is to offer ‘a more realistic account of science-in-the-making, grounding it firmly in laboratory sites, experiments, and groups of colleagues’ (15). Moreover, Latour also argues that to say that facts are clearly fabricated is to stop talking about objects and objectivity but rather to ‘speak of *nonhumans* that were socialized through the laboratory and with which scientists and engineers began to swap properties’ (15). To regard science as a cultural practice, therefore, is not to claim there is no scientific fact anymore, but to explore how this fact is produced by the self-vindicating and systematised practice performed in the name of science. I discuss this contextualisation of scientific facts in more detail in chapter 6. The discussion is based on my analysis of news stories about the field trials of GM crops.

If scientific knowledge is contextualised within its own history and culture, its characteristics which are accepted socio-culturally, for example, universality, objectivity and value-neutrality, will turn out to be an ideal or even a myth which has a negative impact. For example, Harding elaborates on the political and scientific costs of the ‘universality ideal’ of modern science (2000: 133). She argues that the universality ideal supports ‘the devaluation of forms of knowledge-seeking that have proved valuable in other cultures’, and legitimates the movement of nature’s resources ‘from those who are already the politically and economically most vulnerable to those who are already the best positioned to take advantage of such access’ (133-4). Hence, the universality ideal supports ‘the construction of models of the rational, the objective, the progressive, the civilized, and the admirably human in terms of distance from the non-European, the economically frugal, as well as the feminine’ (134). The ideal is not at all politically neutral. Moreover, Harding argues that the universality ideal legitimates ‘decreasing cognitive diversity’, ‘accepting

less-well supported claims over potentially stronger ones', and resisting 'some of the deepest and most telling criticisms of particular scientific claims' (134-5). Because this ideal 'promotes only narrow conceptions of both nature and science', 'other ways of understanding nature's order will be devalued', and the fact that any system of knowledge generates systematic patterns of ignorance as well as of knowledge will be obscured (135). In sum, it is harmful to presume that scientific knowledge is universal, value-free or fundamental but not to reflect on its history, values and limitations. And we can try to avoid the negative impacts of the universality ideal of modern science if we start to reflect on the historical and cultural context in which particular scientific knowledge is produced.

The form and the substance of science

However, scientific knowledge is tacitly considered to be rational and credible. *People are more concerned with the form than the substance of science.* As mentioned above, the universality ideal of modern science tends to seize on a particular pattern of thought as the only thought which can properly be called 'rational'. Because this particular pattern of thought has been historically and culturally 'idealised, stereotyped and treated as the only possible form for rational thought across the whole range of our knowledge', the development of modern science becomes synonymous with an 'intellectual imperialism' that insists on exporting the scientific method to all sorts of topics (Midgley, 2003: 13). Midgley argues that intellectual imperialism constantly favours 'the form over the substance of what is being said, the method over the aim of an activity, and precision of detail over completeness of cover' (13). Science has been formalised: the form of knowledge and the method of producing it become more important and crucial than its substance and purpose. We tend to be more concerned with the question of whether the knowledge is formally and methodologically scientific than the question of why this knowledge is produced and how it is supposed to be used. It seems that the scientific form of knowledge, but not its substance, becomes the guarantee of good, objective and rational knowledge. Latour clearly illustrates this point:

The moderns confused products with processes. They believed that the production of bureaucratic rationalization presupposed rational bureaucrats; that the production of universal science depended on universalist scientists; that the production of effective technologies led to the effectiveness of engineers; that the production of abstraction was itself abstract; that the production of formalism was itself formal... The words 'science', 'technology', 'organization', 'economy', 'abstraction', 'formalism', and 'universality' designate many real effects that we must indeed respect and for which we have to account. But in no case do they designate the cause of these same effects. These words are good nouns, but they make lousy adjectives and terrible adverbs. Science does not produce itself scientifically any more than technology produces itself technologically or economy economically (Latour, 1993: 115-6).

Therefore, science is good and rational simply because of its scientific-ness. However, we often ignore that science, as a form of story-telling, is made and produced in 'a constellation of human and non-human actors' (Prior et al., 2000: 115). For example, Actor-network theory (ANT) suggests that a reality is '*done and enacted* rather than observed' (Mol, 1999: 77). A reality is 'manipulated by means of various tools in the course of a diversity of practices' (77). And in their practices of enacting one particular reality, scientists are 'multifaceted entrepreneurs who with skill and aplomb engage in activities that might be deigned political, sociological or economic, as well as those practices traditionally assigned the label "scientific"' (Michael, 1996: 53). Scientists attempt to 'harness a multiplicity of humans and nonhumans, materials and techniques to extend their influence beyond the laboratory' (53). In order to achieve this goal, scientists 'organize and structure the movement of materials, resources and information', and then accumulate those useful materials to render the actor-network which they attempt to build up more durable (54). But 'these accumulations need to be rendered invisible, made natural and unproblematic', and finally the internal workings of calibrating, organizing, aligning, and coordinating different materials would be constituted as a 'black box' (54). Because the process of building up the actor-network in the name of science is 'black-boxed', we tend to regard scientific knowledge as a product without the process of production, and we tend to be ignorant of its history, its conditions and its

limitations. We tend to accept scientific knowledge as good knowledge because of its scientific-ness but do not consider how it is produced and why it is good.

And when the quality of particular scientific knowledge is determined by its form rather than its substance, it might lead to a situation in which ‘the meanings and symbols of science may be unconnected to either the substantive content of scientific knowledge or the logical structure of scientific reasoning’ (Toumey, 1996: 56). In this situation, ‘science is believed to be objective, nonpartisan, and able to fix the worst of our social problems (and without upsetting our social structure!), even while the intellectual content of scientific knowledge and reasoning is not particularly relevant to this power of science’ (58). Science is considered to be able to solve our problems, but this belief is too naïve and dangerous, based as it is on form not substance.

Moreover, because the form of scientific knowledge can empower knowledge without referring to its substantive content, presenting an argument based on scientific fact is more like a performance of factualness. For example, Hilgartner uses the metaphor of performance to analyse the production of science advice (2000: 8). He argues that ‘self-presentation is central to the science advisor’s work’, because the science advisor ‘does not merely offer recommendations but also conveys an impression of the advisory body’s character’ (8). In order to win the confidence of the audience, the advisor needs to actively display his/her competence and to present him/herself as knowledgeable and trustworthy (8). He argues that the science advisor often uses rhetorical and narrative techniques, such as defining the boundary that separates science from policy and using quantitative methods to create a form of ‘mechanical objectivity’, to persuade audiences of their credibility (9-10). Moreover, the success of the performance also depends on its stage management: in order to make knowledge credible, it is necessary for science advisors to hide some bits of information ‘backstage’. The performance of science advice has to be staged on an elaborate control of information, and the information which is hidden backstage or ‘black-boxed’ needs to be well controlled and fenced in order to make audiences interpret and appreciate the performance appropriately on the front stage. But ‘if

science does not simply reveal the facts of nature but is socially conditioned', the procedures for producing knowledge become politically significant and we should pay more attention to them (5). However, because the procedures for producing knowledge are 'black-boxed' or hidden backstage from us, we can only have scientific knowledge without knowing why and how the knowledge is produced.

The boundary-work of science

When people are more concerned with the form than the substance of science, they often accept scientific knowledge as good knowledge because of its scientific-ness but not because of its relevance to the question which they ask. They tend to assume that science always produces rational and credible knowledge. Therefore, when there are conflicting arguments in front of them, they tend to seek the scientific argument because it should also be the credible and rational argument. Conflicting arguments often try to establish their credibility by showing people their scientific-ness but not their relevance to people's concern. In other words, the arguments try to draw a boundary between science and non-science so that they can define themselves as scientific arguments and discredit others as non-scientific arguments. Gieryn argues that 'science is a kind of spatial "marker" for cognitive authority, empty *until* its insides get filled and its borders drawn amidst context-bound negotiations over who and what is "scientific"' (1995: 405). He argues that 'whatever ends up as inside science or out is a local and episodic accomplishment, a consequence of rhetorical games of inclusion and exclusion in which agonistic parties do their best to justify their cultural map for audiences whose support, power, or influence they seek to enroll'(406). Moreover, the boundary-work of science becomes a feature of 'professionalizing projects of scientists, a rhetorical form well suited to the seizure, monopolization, and protection of those goodies' (440). As such, the boundary-work of science is to define science in order to achieve the power of science which has been taken for granted, but it does not involve reflecting on how and why science should be endowed with this power.

For example, Mulkay uses the concept of boundary-work to analyse British parliamentary debates over research on human embryos (1995). He points out that religious opposition to embryo research is repeatedly attacked in the debates ‘by means of a stereotyped contrast between religious and scientific styles of thought’ (499). In the debates, he argues, leading figures in the movement for embryo research attempt ‘to discredit their opponents by claiming that, whereas their own case is built upon reasoned assessment of the facts, the other side relies on religious dogma, clerical authority and faith’ (499). But in fact, he further argues, ‘reliance on dogma, authority, and faith is at least as characteristic of the public discourse associated with science as it is characteristic of the discourse associated with religion’, and ‘in the later stage of scientific supremacy, dogma, authority and faith become increasingly evident in the discourse supporting embryo research’ (524). His analysis clearly illustrates ‘how the scientific community is able to exert considerable influence on developments in the wider society when such developments are seen to pose a serious threat to the cultural ascendancy of science’ (525). Through the boundary-work of distinguishing science from religion, people who approve of embryo research can discredit opposite arguments as irrational and dogmatic, and at the same time authorize their own arguments as being more factual and credible.

Therefore, to examine the boundary-work of science is not only to know how science is defined ‘by attributing characteristics that spatially segregate it from other territories in the culturescape’, but also to understand how the pursuit of power or wealth is carried out through such boundary-work (Gieryn, 1995: 440). But the boundary of science is not given or concrete in a way which would enable people to use it in order to classify and arrange their worlds. On the contrary, the boundary is locally and continually (re)constructed and (re)drawn in the practices of classification and arrangement. Glasner reminds us that the boundary is permeable rather than concrete, and ‘there is a clear danger that an unreflexive approach could gloss the re-naturalising implications associated with the conceptions of boundaries’ (1998: 39). The boundary is the product of the rhetorical and political practices of

definition and classification, but it is not the pre-existing criteria for definition and classification. As a result, boundary-work should be examined practically and contextually, because it is always a local and practical achievement which can lead to different consequences in different contexts.

Although the boundary between science and non-science is not given and concrete, it is still necessary for science to (re)draw the boundary against other cultural worlds in order to achieve and protect its power. Martin and Richards argue that the artificial separation of scientific knowledge 'from its political contexts and from the social distribution of power' functions to 'protect the authority of scientific and technical experts and to exclude or disadvantage the public' (1995: 525). Science is 'inherently political' because 'scientists help define a large part of what is taken for granted by billions of people', and this is 'a type of influence that in some respects is the ultimate form of authority' (Cozzens and Woodhouse, 1995: 551). In order to execute this ultimate form of authority, science needs to demonstrate its pure scientific-ness so that its inherently political character can be black-boxed but its authority can be guaranteed and confirmed. The boundary-work of science is in effect a rhetorical and political strategy of empowering particular arguments in the name of science without examining the content of the arguments. The controversy over Dr Pustzai's experimental findings on the risk of GM potatoes is a good example to illustrate how the boundary-work of science functions to empower some arguments while discrediting others, and I analyse the news stories concerning this controversy in chapter 4.

Science in the GM debate

Science is expected to settle the controversy of GM food, but this expectation is created by the myth that scientific knowledge is always good knowledge. Science is expected to produce an uncontroversial fact about the nature of GM food, but this expectation is also generated by the myth that a scientific fact is universally true. People are expected to make political decisions about GM food on the basis of

scientific facts so that the decisions can appear to be rational and objective. But the facts provided by scientists are unsatisfactory, because scientists can only indicate the existence of an acceptable risk rhetorically and their promise to provide a quantitative risk assessment often faces the dilemma of the uncontrollability of field experiments and the limitations of microcosm-based experiments (von Schomberg, 1998: 238). Moreover, van Dommelen illustrates that the notion of 'familiarity' is propagated as 'a new policy tool to bridge the gap between scientific expertise and regulatory practice in the context of biotechnology risk assessment' (1998: 219), but this appeal to 'familiarity' tempts us to 'foster a simplified understanding of the biological complexity involved' and leads to 'a neglect of possibly relevant risk concerns' (220). He argues that 'no familiarity can be claimed without first agreeing about the system under consideration' (229) and thus the efficiency of familiarity criterion is dependent on the constitution of a related model as 'a framework for deciding whether we are indeed seeing our findings in a proper light' (228). Both von Schomberg and van Dommelen point to the gap between the facts produced by the systematized and experimental methods of science and the facts expected by policy-makers and the public. Science cannot provide an objective and uncontroversial fact for decision-making as it is expected to do. I explore this further in my analysis of the news stories about the field trials of GM crops in chapter 6.

The identity of the consumer is continually constructed and reproduced in the GM debate. The consumer needs to be informed, making it necessary to produce scientific knowledge about the effects of GM food. Murcott argues that apparently conflicting arguments in the GM debate collaboratively produce the concept of the consumer (1999: 4.7). With reference to the need for information, labelling, informed choice, risks, benefits, and ethical concerns, the arguments actually 'share a slightly more technical vocabulary enshrining the knowledge to be purveyed about the consumer' (Murcott, 1999: 4.14). Identifying the public as consumers can be a strategy to promote biotechnology because it can marginalise the criticism of the technology in public discussions about GM food. For example, in their analysis of

the 1995 survey conducted by FDF (the Food and Drink Federation) into the desirability of labelling GM food, Hill and Michael demonstrate that the survey proposes a demand for clear labelling (1998: 210). It does this by suggesting that the public will want to make decisions at the point of purchase and by implying that the public is already aware of the need for such labelling (210-11). Hence, this survey highlights particular versions of biotechnology and promotes its acceptability through effectively emphasising the autonomy and rationality of the layperson as citizen and consumer (202). Through the identity of the consumer, GM food is constructed as a ready-made product to be accepted and evaluated by individual consumers, and the action of decision-making is at the same time individualised and privatised. The focus of the debate is put on the attitude of the consumer to accept or to reject it rather than on the scientific uncertainty about it (Murcott, 1999). I elaborate on this issue through my analysis of the news stories about the regulation of labelling in chapter 5.

Perhaps, as Strathern argues, the prospect of future enterprise which science and technology brings to us produces as much hope as fear: on the one hand, new choices and new possibilities for the realisation of human desires are opened up; on the other hand, new possibilities might create desires 'that from our present vantage point do not seem human at all' (1992: 60). And when we consider these new choices and new possibilities, we should be more reflexive and deliberative in order to avoid presumptions about what science, technology and human desire should and will be. It is very easy to become trapped in 'technological determinism', and to take 'the influence of technology upon social relations' for granted (MacKenzie and Wajcman, 1999: 23). The introduction of the technology of genetic engineering into agriculture and food production should be questioned; but it tends to be characterised as inevitable technological progress in public discussions about GM food. Therefore, when we expect science to solve the problem of GM food, we seldom examine how scientific practices define the problem and whether the definition is appropriate. Science defines the problem as a problem of the effect of GM food; however, it does

not consider why and how the effect is brought into existence in the first place. We should realise that science alone can not solve the problem of introducing the technology of genetic engineering into our daily life. We need to reconsider the function which science is supposed to perform in the GM debate. Perhaps we just exaggerate the power of science and define the problem of GM food in an inappropriate way.

Risk: a story-telling practice

The risk of GM food is a significant issue in the GM debate. There are different ways of conceptualising risk, and different concepts of risk suggest different ways of managing and allocating responsibility for it. In social scientific studies, there are three main ways of conceptualising risk, and each of them implies a different ontological understanding of the term. Each approach establishes its theory on its own particular way of imagining what risk is. Because all three approaches have their own advantages and limitations, it is not necessary to determine which one of them is correct. It is more productive to reflect on their assumptions and implications, as well as their advantages and limitations, than to argue which one of them is correct. If a way of conceptualising risk implies a way of handling it, it is more important to ask why we choose one way rather than another and to investigate the consequence of this choice than to determine which way tells the truth. In the following section, I briefly discuss three approaches in terms of their advantages and limitations. Firstly, Beck's theory of the 'risk society' is very influential, but his concept of risk seems to be confused because risk is both real and constructed in his theory. Secondly, from an anthropological perspective, Douglas develops her inspiring theory about the relation between culture and risk, but her theory implicitly argues that the relation between risk and culture is static and inflexible. Finally, the Foucauldian approach, which regards risk as a form of governmentality, can be very productive as a means of examining the power of one particular way of conceptualising risk. But its analysis can be too technical in as far as it does not go further to reflect on the political and moral values which are implied in this particular way of conceptualising risk.

Following my discussion of the three approaches, I will use two examples to illustrate my argument that risk-talk is a story-telling practice. In chapter 3, I discuss my concept of riskification by referring to this argument.

Beck's risk: risk society and reflexive modernization

Beck defines risk as 'a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself' (1992: 21). Risk is different from older dangers because it is a consequence of the threatening force of modernization. Giddens argues that risk is 'stemming from the *created environment* or *socialised nature*', which results from 'the infusion of human knowledge into the material environment' (1990: 124). Both Beck and Giddens consider risk to be the product and the consequence of modernization. Because of the techno-economic development of modernization, nature has been 'societalized' and become a historical product. The 'societalization' of nature has an unseen side effect which is the transformation of the destruction and threats of nature into economic, social and political contradictions and conflicts (Beck, 1992: 80). Beck argues:

We are therefore concerned no longer exclusively with making nature useful, or with releasing mankind from traditional constraints, but also and essentially with problems resulting from techno-economic development itself. Modernization is becoming *reflexive*; it is becoming its own theme. Questions of the development and employment of technologies (in the realms of nature, society and the personality) are being eclipsed by questions of the political and economic 'management' of the risks of actually or potentially utilized technologies—discovering, administering, acknowledging, avoiding or concealing such hazards with respect to specially defined horizons of relevance (Beck, 1992: 19-20).

The problems resulting from techno-economic development become new sorts of challenges to the social and political institutions of highly industrialised global society. The risks associated with modernization are politically reflexive because they are concrete challenges to the social, economic and political order of modernization itself.

Beck argues that risks are both real and unreal (1992: 33). On the one hand, many

hazards resulting from the development of modernization are already real today, such as pollution and the destruction of the forest. On the other hand, 'the actual social impetus of risks lies in the *projected dangers of the future*' (34). The future, in place of the past, determines our actions in the present: 'we become active today in order to prevent, alleviate or take precautions against the problems and crises of tomorrow and the day after tomorrow' (34). He further argues that risks can become a political issue only when people are generally aware of them: 'they are social constructs which are strategically defined, covered up or dramatized in the public sphere with the help of scientific material supplied for the purpose' (Beck, 1999: 22). However, Beck does not go further in this direction to take the extreme position which he calls 'naïve constructivism'; but rather he takes a more balanced position which he calls 'reflexive realism'. For him, reflexive realism means examining the immateriality and materiality of risks at the same time. He argues that we need to investigate 'how self-evidence is produced, how questions are curtailed, how alternative interpretations are shut up in black boxes, and so on' (26). And based on this reasoning, Beck finally argues that the perception of risks can be politicised: for him, when awareness of the dangers spreads, the risk society becomes self-critical and self-reflective (46).

Beck's concept of risk has thus two aspects: risk as the side effect of modernization and risk as the public perception of the effect. He argues that the risks associated with modernization contain a 'boomerang effect' which will sooner or later also strike those who produce or profit from them and break up the pattern of class and national society (Beck, 1992: 23). These risks will lead to 'the end of others' and transcend all social and economic differentials (Giddens, 1990: 125). These risks cannot be restricted by time or place, they are not accountable according to the established rule of causality and liability, and they cannot be compensated for or insured against (Beck, 1996: 31). But these risks can be politically reflexive only when people are aware of them. The public perception of risk is socio-culturally and scientifically constructed: risk is based on causal interpretation and initially only

exists in terms of the (scientific or anti-scientific) knowledge about it (Beck, 1992: 22). Risk can be 'changed, magnified, dramatized or minimized within knowledge' and 'open to social definition and construction' (22). Beck's argument about the reflexivity of modernization is based on the growing public awareness of the 'out-there' risk produced by modernization. For him, risk is real because it is the consequence of modernization and can cause catastrophic effects, but it is unreal because its political potential depends on how people perceive it. In this sense, Beck's definition of risk is confusing because it is ontologically realistic but epistemologically constructive. Risk cannot be the product of modernization but at the same time exist only in terms of the knowledge about it.

Wynne argues that the basic model of Beck's theory is that 'lay people reflect critically upon the failure of modern scientific institutions to control risks such as ecological and nuclear risks adequately' (1996: 56). This basic model is generalised and therefore Beck's theory of reflexive modernization tends to ignore the diversity of different kinds of risk. For example, Kerr and Cunningham-Burley argue that in the case of human genetics, the institutional reflexivity of professionals is too protective of professional authority, but at the same time lay ambivalence is too constrained to support reflexive modernization (2000: 297). In this case, 'privatization of risk and lack of collective expression both further curtail the radical potential of lay ambivalence and therefore reflexive modernity' (297). Perhaps, the theory of reflexive modernization is attractive because it appeals to political openness and reflexive change, and because it requires us to consider how people can 'claim to offer solutions when their analyses of the situations are based on claims that the situations exceed the explanatory limits of the tools at their disposals' (Nugent, 2000: 230). However, without engaging with one particular case of risk and exploring its history and socio-cultural context, Beck's theory of risk society tends to overestimate the radical and political potential of risk awareness, and to generalise the experiences of nuclear risk and environmental crisis as the example of all other risks. Therefore, both his confusion in the conceptualisation of risk and his

oversimplification of the historical and contextual specificity of particular risks undermines his theory of reflexive modernization and his expectations for the political potential of risk. Although Beck provides a persuasive description about the development of modernization, his concept of risk seems to be over-generalised. His idea of reflexive realism is not able to illustrate how particular risks are defined and represented through socio-cultural practices.

Douglas' risk: risk and culture

Douglas argues that each culture is designed to use danger as a bargaining tool, but different cultures select different kinds of dangers for their self-maintaining purposes (1992: 47). Risk is similar to taboo or sin because it is also a way of moralising or politicising the selected dangers. However, the modern concept of risk is different from the concept of sin or taboo because it is 'part of the system of thought that upholds the type of individualist culture which sustains an expanding industrial system' (28). Because of industrialisation, members of small local communities are drawn into larger national and international spheres. The liberation from the small community means losing the old protections and turns people into unencumbered actors who are mobile in a world system but feel vulnerable (15). In this modern individualistic culture, people need new kinds of protection. All the elements of the modern concept of risk – its universalizing terminology, its abstractness, its power of condensation, its scientificity and its connection with objective analysis – make it perfect for a modern society (15). Risk rhetoric transforms the exposure to danger into the calculation of probability, and therefore it provides individuals with the apparently neutral and objective knowledge which they can use to protect themselves from the misbehaviour of the community. While the sin/taboo rhetoric is 'used to uphold the community', the risk rhetoric is invoked to protect individuals against the encroachment of others (28).

But risk is still a way of moralising or politicising the dangers which are selected or highlighted in a particular culture, even though it seems to be a purely neutral and

objective tool of analysis. Douglas argues that risk is 'not only the probability of an event but also the probable magnitude of its outcome', and the evaluation of the outcome is a 'political, aesthetic, and moral matter' (1992: 31). Hence, instead of isolating it as a technical problem, risk should be formulated to include its moral and political implications, and it is necessary for the study of risk perception to take the cultural bias into account. Douglas is mainly concerned with the cultural values and judgments embodied in risk perception and with the moral and political implications of this perception. For her, to examine risk perception in a particular culture is to consider 'how safe is safe enough for this particular culture' (41).

Lupton illustrates how Douglas' concept of risk revolves around the importance of risk for social groups, organizations or societies and their ability to maintain boundaries between self and other, to deal with social deviance and to achieve social order (1999: 36). Cohn argues that Douglas' concept of risk is influential because of 'its insistence that risk is socially constructed', and because of its insistence that 'the perception of risk is a result of cultural factors as well as individual psychological processes' (2000: 206). Moreover, although Hannigan refuses to take the position of 'absolute relativism' which he criticises Douglas for, he still follows her argument, in the case of environmental risk, arguing that 'as a society, we still have to make social judgments about the magnitude of risk' (1995: 95). In addition, in her case study exploring how British Pakistanis perceive genetic risks, Shaw demonstrates that information about risk is 'received and interpreted within a pre-existing framework of social organization and cultural values' (2000: 94). She argues that 'a person may perceive the "same" genetic risk differently in these different social circumstances' (104). All these examples illustrate that Douglas' cultural theory of risk is a powerful and productive framework for analysis because it contextualises the perception of risk politically and socio-culturally. In other words, the advantage of Douglas' concept of risk is in its recognition of risk assessment as a value-laden practice and risk perception as a socio-culturally contextualised behaviour.

However, the advantage of Douglas' cultural theory of risk can also indicate its

disadvantage, because to embed risk perception into its socio-cultural context might lead people to consider risk perception as being uni-directionally determined by culture and to ignore the fact that the relation between culture and risk is mutually constitutive. Lupton argues that Douglas' theory tends to be 'somewhat static' and 'typical of functional structuralist analyses of sociocultural phenomena', and therefore she maintains that her theory cannot provide explanations about how things might change (1999: 56). Douglas' concept of risk might finally result in cultural determinism or structural determinism. Douglas implies that culture is preexisting and static, because risk perception presupposes a pre-existing and well-structured culture and thus risk is merely the product of the self-maintaining practices of this culture. However, risk-talk is a cultural and political practice, not because it is determined or uni-directionally influenced by culture, but rather because the practice of talking about risk is itself the embodiment of culture. In this sense, culture and risk-talk are mutually constructed; to talk about a particular risk is to reproduce and construct the culture which the risk embodies. It is correct for Douglas to argue that risk is always political and has its own cultural bias and value, but it is going too far to assume that the cultural bias and value are realistic and given, and at the same time that risk perception is merely the consequence of them. Risk is cultural not because it is produced by culture but rather because it is culturally produced, and culture is not inherent and unchangeable but is reproduced and transformed through the practices of risk-talk.

Foucauldian risk: risk and governmentality

Lupton summarises the Foucauldian concept of risk as 'a governmental strategy of regulatory power by which populations and individuals are monitored and managed through the goals of neo-liberalism' (1999: 87). From a Foucauldian perspective, 'nothing is a risk in itself; there is no risk in reality'; but on the other hand, 'anything *can* be a risk' and 'it all depends on how one analyzes the danger, considers the event' (Ewald, 1991: 199). In other words, '*the notion of risk is made autonomous from that of danger*', and a risk does not arise from the presence of a particular

precise danger embodied in a concrete individual or group but is 'the effect of a combination of abstract *factors* which render more or less probable the occurrence of undesirable modes of behaviour' (Castel, 1991: 287). Therefore, risk is a strategy to 'dissolve the notion of a subject or a concrete individual, and put in its place a combination of factors, the factors of risk' (281). New expertise is developed to identify the factors of risk and to produce risk knowledge; and through the efforts of this expertise, risk is rendered calculable, identifiable and governable. Through the same efforts particular social groups or individuals are identified as 'at-risk' or 'high risk', requiring particular forms of intervention (Lupton, 1997: 87). The activity of expertise serves to label an individual and constitute for him/her a profile which he/she can use to construct his/her own selfhood or subjectivity (Castel, 1991: 290). The risk knowledge produced by expertise is 'employed in advice to individuals about how they should conduct their lives' (Lupton, 1997: 88). In late modern societies, individuals are required to take care of themselves. When an individual is identified by expertise as 'at-risk', risk-avoiding behaviour for him/her becomes 'a moral enterprise relating to issues of self-control, self-knowledge and self-improvement' (91).

In this respect the concept of risk as a strategy or a technique of governmentality redirects the responsibility of managing risk to individuals and therefore this concept is in favor of the ideology of neo-liberalism. Pratt demonstrates that the shift in the political rationality of regulatory power from welfarism to neo-liberalism can be exemplified in 'the creation of new risk groups and new strategies of risk management' (1999: 136). Moreover, the new knowledge about the factors of risk, which is produced by the system of expertise, also contributes to the creation of new risk groups to which individuals can be assigned and then monitored. For example, Novas and Rose illustrate that the development of genetics has created a new risk group of people who are 'genetically at risk' (2000). And when an individual is identified as being 'at risk' of something, he or she has to take responsibility for developing his/her own strategy of avoiding and managing the risk. In other words,

risk becomes a form of governmentality in which the responsibility of risk-management is privatised and individualised. The regulation of GM food labelling is a good example of the individualized responsibility of risk-management, and I explore this issue more in chapter 5.

The privatisation and individualisation of the responsibility of managing risk is grounded in the ideology of 'prudentialism'. Prudentialism assumes that 'the rational individual will wish to become responsible for the self' (O'Malley, 1996: 200). It also assume that shifting the responsibility of risk-management to the individual 'will produce the most palatable, pleasurable and effective mode of provision for security against risk' (200). Prudentialism does not merely privatise risk management, but also transforms many governmental relations. Prudentialism constructs the liberal subject as an active and self-directive subject, and then it reshapes the relation of this subject with authority and expertise, either through the partnership between a prudential subject with the public authority, or through the consumption of various marketized services of risk-avoidance, such as insurance (203). As a result, this ideology of prudentialism provides the necessary ground for governmental techniques dealing with 'one of the central problematics of liberal governmentalities', which is to define 'the minimal parameters of State activity consistent with an ordered, prosperous and peaceful nation' (204).

This Foucauldian concept of risk can be more productive than the other two approaches because it considers neither risk nor culture to be real and pre-existing but rather it illustrates how the concept of risk, as one of key governmental techniques, is both the embodiment and the constitution of the ideology of neo-liberalism. However, the Foucauldian concept of risk tends to under-examine 'the question of how risk-related discourses and strategies operate', and 'how they may be taken up, negotiated or resisted by those who are the subject of them' (Lupton, 1999: 102-03). In other words, the Foucauldian approach tends to focus more on the 'technical' dimension of risk as a governmental strategy than on the practical operations of this governmental strategy of risk and the possibility of

resisting it in everyday life. For example, Baker argues that insurance is often described in the 'governmentality' literature as a 'rationalizing' and 'amoral technology' (2000: 559). But in his analysis of the concept of 'moral hazard' which is used by the insurance industry, he illustrates that the actuarial way of thinking 'does not eliminate appeals to the good, true, or beautiful', but 'it simply introduces a different frame for those appeals' (560). In other words, insurance is not only a rationalizing and amoral technology of risk; rather, it is necessary for the insurance industry to distinguish insurable risks from uninsurable ones, as well as compensatable losses from those that cannot be compensated for. These distinctions can only be defined and negotiated morally and politically. Furthermore, the Foucauldian approach tends to portray the individual or the liberal subject as being powerless to resist the governmental technique of risk. However, there are different ways of responding to the governmental strategy of risk, as the cultural theory of risk suggests, and there can still be the potential to politicise risk, as the theory of reflexive modernization proposes. In sum, the Foucauldian approach might overestimate the power of risk as a governmental technique without considering how it can function diversely in the complexity of contemporary society.

Risk-talk is a story-telling practice

Although all three approaches discussed above have their disadvantages, they are still useful for my analysis. Firstly, Beck's concept of reflexive modernization outlines the potential of risk perception to politicise and to democratise the process of technological development. Secondly, Douglas' culture theory of risk illustrates the cultural and political nature of defining and perceiving risk. Finally, the Foucauldian approach examines how the concept of risk functions as one key governmental technique in modern society to individualize the responsibility of risk-management in favor of the ideology of neo-liberalism. However, all these approaches are inadequate in the sense that they do not provide a theoretical framework for analysing how one particular risk is discursively and socio-culturally constructed. It is necessary for this theoretical framework to be able to illustrate the process of

(re)producing and modifying the construction of a particular risk in a particular socio-cultural context. Here, I want to propose that risk-talk is also a story-telling practice, which constructs a narrative about the danger existing out-there. And because the representation of risk is a narrative, it also has the three functions – constructive, contextual and political – which I have already discussed in the introduction. To tell a story about a risk is to identify a risk object as the cause of some negative or hazardous consequences. A risk story is political and indicates the distribution of responsibility as well as possible strategies of control. In the following section, I use two examples to illustrate how a particular risk is constructed and communicated through story-telling practices. I show how the risk story reproduces particular power relations and suggests further political action.

The first example is Moore and Valverde's analysis of the risk of so-called 'date rape drugs' (2000). They argue that the information on date rape drugs is a combination of semi-medical, semi-popular facts and tales, and that the definition of a date rape drug is not at all clear (517-8). However, when the date rape drug is recategorised as a 'club drug', a risk object is identified. By means of 'the combination of space (club rather than restaurant) and time (after licensing hours)', a narrative about the risk of the 'club/rave' is created and then used to give content to the otherwise terminally vague phrase 'club drugs' (520). In other words, the risk of the date rape drug is constructed and objectified in the narrative about the danger of being at a night club. This narrative defines the properties of the date rape drug or club drug 'more by the space/time in which it is consumed (the after-hour rave club) than by its pharmacology': the drug becomes a category of governance even though its content cannot be either legally or pharmacologically identified (523). Moreover, this narrative of risk has several political implications. Firstly, it constructs the problem as 'the drug in the night club' rather than 'the crime in the night club', and therefore it invokes the fight against drugs rather than the need to protect women from violence (522). Secondly, this narrative personifies the drug as the agent that commits the crime, and then it de-genders the problem of sexual assault but

transforms the problem into the one of drug-control. Therefore, this narrative does not only identify the date rape drug as a risk object, but also suggests how to avoid this risk politically and gender-specifically.

The second example is Levi's analysis of the risk posed by sex offenders as outlined in 'Megan's Law' (2000). Levi illustrates that Megan's Law, which means the adjudication that puts sex offenders on community notification status, constructs the risk of sex offender's recidivism as a narrative about the risky sex offender living with us (589). In order to manage the sex offender who is living with us and who is held to be unavoidably risky, the informed community has to act as the rational calculator of risk which can govern itself and the 'unwelcome others' through its rational and protective measures (592). Therefore, the community in this narrative is represented as 'a trusting place' which is in need of information in order to protect itself properly (599). And because of the narrative of the risky sex offender living with us and the representation of community as an 'agent' able to protect itself, Megan's Law becomes one effective and necessary measure to control the risk of sex offender's recidivism. However, this narrative shifts the responsibility of crime-control from the state to the community. This narrative implies that the community is in need of information from the state in order to protect itself, but it no longer expects 'the state to be accountable for crime or its control' (578).

These two examples clearly demonstrate that to talk about one particular risk is to construct a narrative about it. This narrative does not only give content to the risk, but also suggests who should be responsible for this risk and how can we act to avoid or to control it. In this sense, risk-talk is always political; to construct a risk object is to objectify it, to assign responsibility for it and to link it to a chain of cause and effect. In the next chapter, by analysing news stories about the first GM food product in the UK, and the EU approval to import American GM maize, I develop the concept of 'riskfication' and explore how GM food is 'riskified' in news stories.

3. The Riskification of GM Food in News Stories

This chapter explores how the controversy of GM food, which refers mainly to its risk, is framed and represented in news stories. The public debate about GM food is represented in news stories as a debate between the arguments warning of its risk and the arguments claiming its benefit. However, in this debate, the burden of proof seems to be put on those arguments for the risk but not on those for the benefit. The debaters seem to agree on an assumption that if there was no risk involving in eating GM food or growing GM crops, then there needs to be no other question about the technology of genetic engineering. Moreover, this risk is considered to be an observable object and a determinable property of GM food. This risk exists out-there; therefore, it can and should be verified or falsified objectively by scientific methods. But to consider the risk of GM food in this way is also to objectify GM food as a concrete and well-developed object whose properties can be determined. Because of this objectification, the reason for developing GM food into its present form remains unconsidered and unquestioned. However, the properties of GM food, both its risks and benefits, are something which GM food is developed to have but not something inherent in it. In other words, the properties should be considered to be the consequence of the decision to develop the technology in its present form. To regard the risk of GM food as a scientifically-provable fact has a negative impact on the public debate about it. It diverts public attention away from the history of GM food to its effects, and it leads the public to consider how this effect might be proved but not why it is brought into existence in the first place. In this chapter, I explore how GM food is 'riskified' in this way within news stories about the first GM food product in the UK and about EU approval to import American GM maize.

Following my discussion about the three approaches of conceptualising risk in last chapter, I develop the concept of 'riskification' in this chapter in order to indicate the process in which a particular risk is defined and considered in one specific way. The process of riskification also involves the practice of legitimating one way but

marginalising other alternative ways of riskification. Hilgartner points out that the definition of a particular risk includes three conceptual elements: an *object* deemed to pose the risk, a putative *harm*, and a *linkage* alleging some form of causation between the object and the harm (1992: 40). He further argues that:

To assume that objects are simply waiting in the world to be perceived or defined as risky is fundamentally unsociological. Even less can one assume that linkages among objects simply exist 'out there' in reality. Nor should we assume, even implicitly, that definitions of objects or the linkages among them are invariant, either historically or across social groups. Finally, we cannot assume that the process of linking an object to a putative harm is independent of the process that defines the object as an *object* (Hilgartner, 1992: 41).

However, if a risk tended to be defined in one way rather than others, we should consider why we riskify in such a way and what the impact might be. In the GM debate, the risk of GM food seems to be discussed in terms of an object whose existence can be proved or falsified. But as Hilgartner reminds us, 'risk is not something that gets attached to technology after the engineers go home, when the press and the public arrive. Risks are constructed constantly as technological networks evolve' (1992: 52). When the risk of GM food is regarded as something attached to GM food 'after the engineers go home, when the press and the public arrive', the questions about the evolution of the technology are inclined to be marginalised in public debate. Risk is not the only way in which we can define and frame the problem of GM food. The apparently objective discourse of science, which requires that risk to be proved in a well-controlled experimental arrangement, is restrictive. We can have alternative narratives which are different from the objective risk-talk. For example, GM food can be considered to be a socio-technical innovation which aims to change our lives, or an industrial product which is developed for profit-making in the political-economical context of global capitalism. When news stories lead us to pay too much attention to the risk and to consider how to find the scientific facts about it, they riskify GM food in a way which excludes other possibilities of defining its problem.

Therefore, this chapter does not aim to determine which way of riskifying GM food is correct and objective. Instead, it aims to explore *how* GM food is riskified in news stories and how this riskification leads to a narrow definition of the problem associated with GM food. News stories function to 'create order out of disorder' and to offer 'reassurance and familiarity in shared community experiences' (Bird & Dardenne, 1988; 70). Therefore, when news stories repeatedly represent GM food as a risk object and confine the GM debate to the issue of risk, they actually (re)produce a socio-culturally shared definition of the problem of GM food and suggest what the appropriate solution to this problem is. Different and conflicting arguments about the risk of GM food are represented in news stories, but the unasked question is why and how the risk is the only significant issue which we should debate about the technology of genetic engineering.

This chapter, starting with a discussion about the concept of riskification, explores how the issue of risk is gradually centralised in news stories. In the news stories about GM tomato puree, the GM food product is simply represented as an example of technological progress which has been brought directly from laboratory to supermarket. And ten months later, in the news stories about EU approval of imported American GM maize, both the risk of GM food and the scientific evidence for it become crucial for the EU decision. However, in the news stories about both events, GM food is considered to be problematic only when its risk can be proved objectively. These news stories represent the GM debate as a debate in which the debaters are only concerned with the issue of risk and dispute on the evidence for and against it. And we, as readers and consumers, can only decide whether we trust the evidence or not. The news stories not only riskify GM food, but also depoliticise and scientise the public debate about it. They marginalise the questions about other possible ways of developing the technology of genetic engineering. When the GM debate is confined to the issue concerning the effect rather than the value of the technology, GM food can only be discussed as a ready-made object without its own history. But risk-talk is certainly not the only way of considering the problems

associated with GM food; and this chapter tries to argue that it is not an appropriate way.

The Concept of Riskification

Riskification is 'the process through which actors are induced to voluntarily reproduce "risk" as the natural way of talking about a variety of concerns' (Heller, 2002: 9). Through the process of riskification, 'actors come to regard risk as the most suitable frame for discussing arenas ranging from business investing and marital questions to career development and social work' (9). Therefore, riskification is a process of identifying a risk object and at the same time framing the discussion about this object into risk-talk. On the one hand, a narrative, which describes how the identified object is causally related to a putative harm, is constructed and accepted (or disputed) in the process of riskification. On the other hand, this risk object is discussed and handled in the particular way which a risk is supposed to be discussed and handled. For example, Heller demonstrates that French scientists, working in a laboratory or for government, tend to define 'gene flow' as a primary problem for the assessment and management of the risk associate with GM organisms (2002: 8). They transform the idea of gene flow into an object and design safety protocols for the laboratory and field trials in order to discover it. In this way, these scientists implicitly propose that determining and managing the risk of a GM organism is a scientific and objective endeavour 'falling within the jurisdiction of risk experts' (8). These scientists not only construct a narrative of risk, in which gene flow is identified and objectified as a potential harm, but they also suggest that the risk of the GM organism should be determined and managed by scientific practices. Therefore, riskification is a process of identifying a risk object and applying a socio-culturally authorised method of risk-management. Through this process of riskification, a range of risk knowledge about the risk object is produced. When this process is institutionalised, the risk object which is identified is naturalised and the risk knowledge which it produces is considered to be a factual description about the risk object. In other words, if the process of riskification is successful, it can produce

risk knowledge which is accepted as the natural and legitimate way of defining and managing the risk object.

Therefore, the end product of a successful process of riskification is a range of risk knowledges about an identified risk object which are accepted as the facts about the object. We produce risk knowledge in order to manage and control the risk; however, we are seldom aware that this risk knowledge is only one possible way of defining and handling it. When risk knowledge is produced by the legitimated method of risk-assessment and risk-management, it is often accepted without question and its impact is hardly examined. As such, we can question at least two aspects of the process of riskification: on the one hand, we can question how the socio-culturally legitimated method of producing risk knowledge, with its claims to scientificity, can dismiss the knowledge produced by other methods. On the other hand, we can question the implications of accepting risk knowledge as the only way of defining and managing GM food or crops.

The first question leads us to reflect on the power of risk discourse which considers risk-management to be a scientific task and risk knowledge produced in the name of science to be objective and factual. For example, Wynne argues that the myth of 'real versus perceived risk' is deeply institutionalised in modern risk-management culture, and that this myth represents 'the pervasive modern model of the relationship between scientific knowledge and public culture' (2001: 450). The myth demarcates scientific knowledge, which is grounded in reality, from lay knowledge, which is 'politically real but intellectually unreal' (452). This demarcation can function to protect scientific knowledge from 'critical collective public examination including critical self-reflection on the part of those institutions defining and dominating the policy agenda' (453). Moreover, Levidow and Carr argue that official policy language in the safety regulation of biotechnology sets up a boundary between risk and ethics, and at the same time considers both realms to be the tasks of expertise or specialists (1997). This boundary encourages 'deference to the expert assessment of both safety regulators and professional ethicists', and therefore the issues of

biotechnological control and dependency become 'displaced and fragmented into various types of administrative controls' (40). Both arguments demonstrate how risk discourse functions to legitimate scientific risk knowledge and to draw boundaries excluding other risk knowledge. In this sense, riskification often goes with 'scientisation', because the risk knowledge produced by the scientific method is more often considered to be objective, factual and rational. However, the more scientific risk knowledge is accepted without question, the less we are aware of its power to dismiss other ways of representing reality.

However, scientific risk knowledge is seldom as uncontroversial and fully stabilised as it is expected to be. It is challenged and contested not only by the non-expert or lay risk knowledge which it aims to marginalise, but also by other scientific risk knowledge which is produced by different scientific methods or in different experimental settings. Risk knowledge is produced in order to make the identified risk governable. In other words, particular risk knowledge is a particular way of representing the risk so that the risk can 'be made governable in particular ways, with particular techniques, and for particular goals' (Dean, 1999: 131). However, there are plural and heterogeneous techniques of determining and managing risk. And different risk knowledge, produced by different techniques, suggests different types of agency and identity and refers to different political and social imaginaries (131). For example, 'insurance risk' is a technique which produces risk knowledge by the quantitative calculation of probabilities. 'Epidemiological risk' is a technique which is similar to insurance risk in identifying abstract risk factors and their correlation within populations, but it is different from insurance risk because it is concerned more with prevention than restitution (142). Moreover, 'case-management risk' is a technique 'linked to a clinical practice in which certain symptoms lead to the imputation of dangerousness', and therefore it focuses more on 'the qualitative assessment of individuals and groups' who are categorised as 'being-at-risk' (143). These different techniques all produce risk knowledge which can be regarded as scientific risk knowledge, but they suggest different ways of determining and

managing the risk which they identify.

And if riskification produces risk knowledge in order to manage the risk identified, it can only be partially successful, even if it aims to institutionalise and naturalise the risk knowledge which it produces. The reason why riskification can only be partially successful is because it tries to put our life world into an order so that a problem can be transformed into a manageable risk. However, the world around us often resists being so simply ordered. Crook argues that 'order is the imaginary, the dream with reference to which myriad programmes for the ordering of social (and cultural, political, economic) life take their bearings' (1991: 161). But an ordering practice can never complete this dream, because ordering is 'always and everywhere in process' (163). Therefore, as an ordering practice, riskification often faces a challenge from the things which it can not put into its order. The cultural, political and social dynamics of a society often appear disordered or too confusing for one technique of riskification to manage (164). Riskification tends to produce 'more risks than it can abate or control' (182), because the world resists being ordered and the order which it aims to impose is always contestable and questionable.

Here we can ask the second question about riskification: if there were different forms of riskification but none of them could be fully successful in terms of putting the world in order, what are the implications of ordering the world by the process of riskification? The concept of risk connotes the expectation of order, management and control. However, the expectation of managing and controlling a risk diverts our attention away from the constructive nature of risk knowledge towards the efficiency and correctness of the method of management. The process of riskification is expected to produce risk knowledge which can transform a problem into a governable risk, but in this process people become more concerned with the correctness of the transformation than with the reason for it. Therefore, scientific risk knowledge, which is considered able to provide objective and factual descriptions of the risk object, tends to have power without being contested and questioned.

Riskification can be used to motivate people to take particular political actions, but its political potential is restricted by its own risk discourse. For example Van den Daele argues that to propose a new form of riskification in the debate about a new technology is a way of 'conveying fundamental motives of opposition to technology' (1993: 173). However, he also argues that this political potential of riskification can only meet qualified success:

The semantic content of the concept of risk cannot be modified ad infinitum and charged with more and more political aspirations. For this reason, the definitions that ultimately gain widespread social acceptance can only imperfectly accommodate the diverse range of objections to technology. This situation confronts political attempts to control risks with an ultimately insoluble latency problem: one can tackle the manifest issues of criticism of risk and yet fail to address the effective motives of opposition to technology that fuel the criticism. But one must also take into account that the 'perceived' risk remains a moving target which one can never be certain of hitting with present-day definitions and regulations (van den Daele, 1993: 173).

Therefore, the attempt to transform the problem of a technology to a governable risk has political implications: it confines public discussion about the technology to the issues of management and control. Riskification can only lead people to raise questions about the effect of the technology but not its value. The more people are concerned with the management and control of technology, the more they take the present form of the technology for granted. In other words, riskification marginalises a range of issues about technological development and leads the public to consider only how to determine and manage the risk posed by the technology.

The riskification of GM food also has a negative impact on the GM debate. The process of riskification leads people to be concerned only with the production of correct and reliable risk knowledge and the management of the identified risk. The GM debate is depoliticised and scientised in this process because public attention is deflected away from the social, cultural, political and economic context in which the technology of genetic engineering is developed and used, toward the supposed risk of GM food which must be determined by scientific practices. A range of issues about

the technological development of genetic engineering – for example, the history of GM food, its alleged benefit, and the political-economic investments in it – are all marginalised in the public debate, since the debate is confined to the issues of risk assessment and management. In following section, I demonstrate the impact of riskification on the GM debate through two case studies.

GM tomato puree and technological progress

On February 5th 1996 GM tomato puree, the first GM food product approved for sale in the UK, appeared on the shelves in British supermarkets. It might be a surprise that news stories about this event at the time were brief. For example, the news story in *The Times* constitutes only one paragraph of News in Brief on page 4, and the story in *The Guardian* is also only one paragraph on page 6. However, the ‘brevity’ of the news stories shows that GM tomato puree was not considered to be controversial at all, and its newsworthiness was a factor only of its novelty as an example of technological progress. GM tomato puree was represented as a high-tech innovation which was sold for the first time in the UK and which could provide a different choice for the consumer. However, this representation naturalised and decontextualised the development of GM tomato puree. It suggested that the GM product was the consequence of technological progress, and that the product came directly from the laboratory, where scientists invented it, to the supermarket, where consumers could buy it. But the reason for developing this novel product was marginalised in the news stories, and the product was only represented in a positive way for its consumers.

Except in the story in *The Daily Mail*, the people who developed the technology for GM tomato puree are described only as a group of anonymous scientists. For example, in the story in *The Guardian*, the technology is simply described as follows: scientists have taken one of the “rotting” genes out of the tomato to allow growers to produce longer-lasting, firmer-textured fruit’ (‘Genetic food first’, 5/2/1996, *The*

Guardian, [240])¹. Also in the stories in *The Times* ('Hi-tech puree', 5/2/1996, [240]) and *The Sun* ('Tomatoes are puree gene-ius', 5/2/1996, [240]), the agents who developed this technology are only anonymously identified as 'scientists', and the technology is portrayed as an 'operation' or 'manipulation'. The story in *The Sun* describes how the technology of genetic engineering allows scientists to 'tinker with' the tomatoes and to 'remove' the gene that 'speeds up rotting'. Only in the story in *The Daily Mail* are those scientists who invented GM tomato puree clearly identified: 'the breakthrough is the result of 21 years' research by professor Don Grierson of Nottingham University, who teamed up with scientists from the Zeneca drugs company to study the hormone in tomatoes which triggers ripening, colour, flavour, aroma and texture' ('On sale now, the puree taste of the future', 5/2/1996, *The Daily Mail*, [241]). News stories represent GM tomato puree as a novel product developed by anonymous and plural scientists and the technology which brings the puree into existence is represented as the consequence of 'scientific progress'. In other words, the context in which GM tomato puree is produced is marginalised and only its scientific character is described in news stories.

Moreover, this representation has its roots in the image of science and technology associated with modernity: scientists, as a group of people who work together and are independent of any political-economic interest, can manipulate nature in order to serve humans. News stories signify that scientists, like surgeons performing operations, can take the rotting gene out of tomatoes so that the modified tomatoes can be better for human consumption. But in news stories the GM tomato is a product of scientific progress whose value and benefit are not examined. Maybe we can ask why slower-rotting fruits are desirable? Are longer-lasting tomatoes good because consumers are able to keep them longer in the fridge, or because supermarkets can display them longer on the shelves? What is the point of investing in research to make tomatoes longer-lasting? When we start to consider these

¹ The full text of the story is cited in the appendix. The number in the square bracket indicates its page number.

unasked questions, we start to examine the necessity and desirability of GM tomato puree and do not simply accept it as a novel product invented by disinterested and anonymous scientists.

However, when news stories simply represent GM tomato puree as the result of technological progress, they suggest that this progress is inevitable and desirable but lead their readers away from considering questions such as those posed above. As van Lente points out:

Indeed, one of the striking things about technological futures is that they often appear in the imperative mode. That is, once defined as promise, action is required. Statements about future technological performance are not received as factual descriptions to be verified or falsified in due course. Instead, they mobilise attention, guide efforts and legitimate actions (van Lente, 2000: 43).

As a result, 'what starts as an *option* can be labelled as a technical *promise*, and may subsequently function as a *requirement* to be achieved, and a *necessity* for technologists to work on, and for others to support' (60). Presenting concrete technological developments as instances of technological progress becomes a strategy to mobilise and legitimise support for the developments (60). When news stories put the technology of genetic modification into the category of technological progress, they transform a technological option, which should be discussed publicly and democratically, into a technological promise or even a necessity. They simply suggest that people should accept this technological progress without explaining the reason why it is necessary or desirable.

Therefore, in news stories GM tomato puree is described as a technically innovated product which has come from the laboratory directly to supermarket, and we, as the readers of the stories and the potential consumers of this product, can only decide whether to buy it or not. This product is portrayed as being positive and future-oriented: it is just the first of many products which the technology of genetic engineering can bring to us. For example, the story in *The Daily Mail* states that 'the firmer tomatoes will not go squashy when they are handled, more tomatoes are

harvested, more arrive at the shops intact, and once there they do not deteriorate as quickly', and that 'caffeine-free coffee could also be produced, genetically rather than chemically, as at present, and the process could next be applied to melons and bananas' ('On sale now, the puree taste of the future', 5/2/1996, *The Daily Mail*, [241]). And also the story in *The Guardian* says that 'the result of this technology is initially only available as puree, but shoppers could eventually buy slower-rotting fruit and vegetables of all kinds' ('Genetic food first', 5/2/1996, *The Guardian*, [241]). The technology is simply described as offering us a promising future, but the agents who apply the technology to produce a marketable product, and the process of this production are left out in news stories. The future of the technology is spotlighted, but the past of the technology is 'hidden backstage' and 'black-boxed'. In other words, news stories reproduce the idea that the technology has its own agency which evolves in the laboratory, and that it is self-evident that the technology can bring us a better future. The value of developing the technology is unquestioned and under-examined; news stories simply suggest that the technology of genetic engineering is progressive and good.

At this time the issue of risk seems also to be marginalised in news stories about GM tomato puree. For example, in one leader comment in *The Guardian*, it is said that 'if they (GM food products) don't meet consumer resistance then more and more of our food and drink will be affected by genetic engineering' ('Just add DNA to taste', 6/2/1996, *The Guardian*, [241]). And 'there are grave potential dangers', but 'there are also huge opportunities for enrichment'. Therefore, 'most people will agree with the Consumers Association that, providing the products are properly tested, there is no reason why they should not be sold – as long as the consumer is given a choice'. It is apparent that there are concerns about the risks of GM food products at this time, but they are considered to be grave but manageable. And the 'grave potential dangers' are contrasted with the 'huge opportunities for enrichment'. The comment implicitly argues that if no risk can be proved in the proper testing of GM food products, people have no other reason to reject them because they provide consumers

with a choice. The contrast between risk and benefit suggests that the risk and the benefit of GM food are two separable issues: they can be examined separately and weighed against each other. The risk of the technology is considered to be an object which can be identified by a proper test, but not to be one part of the properties which the technology is developed to have. Moreover, the comment suggests that GM food products need to be tested for their risk but not for their benefits. The comment seems to argue that the more choices we have the better, so that there is no need to consider why we need genetically modified tomatoes, or what 'the huge opportunities for enrichment' mean to us.

Therefore, in the news stories about GM tomato puree, the technology of genetic engineering is represented as having its own agency to produce novel food products. Provided the risk of the products can be determined and managed, there is no further need to question them because they provide more choice for consumers. The technology has no history and its present form is taken-for-granted. And we, as the readers of news stories and the consumers of GM food products, can only be led by the technology to the future which it promises. If the technology can do something, either to produce longer-lasting GM tomatoes or caffeine-free coffee, we should allow the technology to do it unless we can prove that there is a risk. Because the technology is self-evolving, we have no choice but can only follow the direction it takes. In other words, a technological option is transformed into a promise and then a necessity. As a result, when the promise of the technology is weighed against its risk, as argued in *The Guardian*, it seems to be self-evident that we should attempt to make its risk manageable and controllable but not examine its promise. But in this situation, we forget that the promise is actually a decision made by someone seeking to develop the technology in particular direction. And we also forget that both the risk and the declared benefit are the properties which the technology is developed to have. That is to say, the present form of the technology is what it was intended to be, but not what it has to be. Although the issue of risk is marginalised in the news stories about GM tomato puree, a fundamental argument which is reproduced in

subsequent news stories is established here. This argument is that if there is no proven risk, we have no reason to reject GM food products because they constitute technological progress. But what is missing in this argument is the reason why we should accept GM food as an example of technological progress in the first place.

American GM maize and risk

The European Commission decided to allow GM maize to be imported from the US and to be sold in the EU on December 18th, 1996. The Commission's decision was based on scientific advice saying that GM maize holds no threat to animal or human health. But this decision was drastically challenged and questioned by environmental groups. For example, Greenpeace argued that 'no one knows the long-term threat to the environment or human health' ('Brussels opens Britain to mutant maize from U.S.', 19/12/1996, *The Daily Mail*, [242]). In news stories the EU decision was debated by two opposite camps: on the one hand, the EU spokesman claimed that there is no proven risk of GM maize, but on the other hand, environmental groups argued that GM maize is not as safe as it seems to be. But even if their arguments seemed to be incompatible, both camps accepted that risk is the only significant issue which should be considered when the decision is made. In other words, they were debating whether there is a risk, but not why they should talk about risk. Moreover, although environmental groups argued that the risk of GM maize is still unknown and science may not be able to reveal it, they seemed to agree with the European Commission that the risk of GM maize can be determined as an observable and provable object. And because the risk is regarded as an object, its existence can be verified or falsified by scientific methods. In this way, GM maize was riskified in news stories and the political decision to import it was scientised and depoliticised.

For example, in a news story in *The Guardian*, it is said that 'the EU has dithered for months over admitting the maize because of concerns about its potential effect on human and animal health' ('Greens attack EU go-ahead for genetically modified crops', 19/12/1996, *The Guardian*, [244]). Ritt Bjerregaard, the Danish environment

commissioner, is quoted in the story as saying that 'the scientific advice provided a sufficiently strong basis to go ahead and approve this product'. The EU approval of American GM maize is thus represented as a decision which is grounded on scientific evidence. And this scientific evidence falsifies the arguments claiming that GM maize has a 'potential effect on human and animal health'. But the story also suggests that 'some environmentalists and scientists' worry about the risk of GM maize, and argue that 'although the gene is eradicated by processing', it 'could enter the food chain through animal feed'. Moreover, in another story in *The Daily Mail*, the people who oppose the EU approval are quoted as saying that 'even government scientists have expressed concern that antibiotic resistance will spread through the human food chain if the maize is fed to livestock', no one knows 'the long-term threat to the environment or human health', so 'the government must ignore Brussels and impose its own ban to safeguard UK consumers from potential risks' ('Brussels opens Britain to mutant maize from U.S.', 19/12/1996, *The Daily Mail*, [242]). In both news stories, the EU decision is debated because two opposite camps disagree about the scientific advice which the decision is grounded on. The problem of GM maize is defined restrictively as 'the threat to human and animal health'. Perhaps present science can not reveal the existence of the threat, as the opposing environmentalists argue; but this threat is considered to be an inherent property of GM maize and therefore both camps argue that it can be identified and determined. However, what is unexamined in both news stories is the reason why 'the threat to human and animal health' is the only problem of GM maize which we should be concerned about.

The story in *The Guardian* indicates that there might be other political and economic aspects of the EU approval. The story describes that 'the move does reduce one potential source of conflict between the EU and US', and that the EU president 'is understood to have promised President Clinton that the embargo on genetically modified maize would be lifted' ('Greens attack EU go-ahead for genetically modified crops', 19/12/1996, *The Guardian*, [244]). It also describes how 'the

go-ahead for the modified maize to be exported to Europe is now expected to double the company's (Ciba Geigy) share of the world corn market', and how 'the decision has come in the nick of time for the US, which has a \$500 million annual corn trade with the EU'. The story situates the EU decision to import American GM maize in an international context, and then suggests that the decision is made in favour of particular political and economic interests. The story alludes to the fact that the EU approval is not simply grounded in scientific advice. The approval is not only based on the issue of food safety, but also on issues of international politics and global capitalism. Perhaps the story in *The Guardian* refers to issues of international politics and trade because it tries to implicitly undermine the credibility of the scientific advice which the EU approval is grounded in. But if we followed this argument to question whether the EU approval is based on disinterested scientific advice, we still confine the debate about GM maize to the issue of risk. Instead we might start to consider the problem of GM maize not only in terms of its threat to human and animal health but also in terms of its political and economic implications.

In other words, the question which we should ask is not whether the EU approval is based on credible scientific advice, but rather whether risk is the only significant problem which we should be concerned about GM maize. The riskification of GM maize not only leads people to be concerned only with its physical risk to human and animal health, but also disembeds GM maize from its context. The scientific advice, which claims that there is no potential threat posed by GM maize to human and animal health, actually functions to define the problem of GM maize as a physical risk which can be proved by science. However, importing GM maize can also be considered to a political-economic event, and its implications can not be reduced to its potential threat to the environment or human health. However, the debate between the EU and environmentalists in news stories is about the uncertainty of GM maize but not the uncertainty of the approval. They dispute whether there is a risk and how to determine it. Therefore, in news stories, the problem of importing American GM maize is not represented as a problem about a political decision but a problem about

a risk object, namely GM maize. As such, the riskification of GM maize also functions to shift the political responsibility of decision-making from the politicians to the science advisors. It also reproduces the fundamental argument mentioned in the last case study: if there is no proven risk, there is no other reason to reject GM food products.

Moreover, the riskification of GM maize not only functions to marginalise the questions about the political and economic implications of GM maize, but it also marginalises the questions about why we need to import it. Perhaps in this case, it is not relevant for the EU to ask why genetically modified maize should be developed. But when we read the news stories about EU approval, we seem to be led by the stories to pay much attention to the risk of GM maize but not to the reason why we need GM maize. We, as readers and consumers, are led by news stories to think that it is a problem of food safety but not a problem of technological development. Perhaps GM maize can provide consumers with one more choice, but the reason for this new choice is not clarified in news stories. We seem to be asked to decide if we trust the scientific advice saying that GM maize is safe, but we do not know why we need GM maize. A new technology might be able to create a new option, but it does not mean that this option is unquestionable and always beneficial. The riskification of GM maize functions to objectify GM maize as a ready-made object whose property can be clearly determined by scientific practice. However, because of riskification, we tend to forget that GM maize is produced for particular purposes and in favour of particular interests. We are concerned with the effect of GM maize but not with its history. We consider the future in which we live with GM maize but not the past when GM maize was brought into existence.

Therefore, the news stories about American GM maize focus on the debate about the uncertainty of GM maize. But they marginalise the discussion about the reason why we need to bring this uncertainty into existence and then live with it. The European Commission and the opposing environmentalists are represented in news stories as having different opinions about the potential threat of GM maize. But they have the

same opinion that the risk of GM maize is the only significant problem which should be considered. Finally, the riskification of GM maize functions to depoliticise and scientise the process of decision-making, because it makes people think that the decision should be made on the basis of scientific fact. The responsibility for making the decision is shifted from policy-makers (or citizens) to scientists.

Riskification and its impact on the GM debate

In the news stories about GM tomato puree, the application of genetic engineering to food production is represented as promising and inevitable technological progress. Then in the news stories about American GM maize, the issue of risk is focused on in the debate about the EU approval as if it is the only reason to reject GM food products. However, the riskification of GM food in news stories not only leads people to focus on a particular kind of risk, namely the physical risk of GM food to the environment and human health, but it also leads people to think that this risk can be proved and managed by scientific practices. So the riskification of GM food has two implications. On the one hand, it requires us to produce more scientific risk knowledge about the GM food product by ‘testing it properly’, as we saw in the lead comment about GM tomato puree in *The Guardian*. On the other hand, it turns the public discussion about GM food into a debate over conflicting scientific arguments claiming that they reveal the true property of GM food. We saw this in the news stories about GM maize.

However, when we define the risk of GM food in one way rather than another, the definition also indicates how we should evaluate the world around us. For example, when we define the problem of GM food in terms of its risk to human health, the definition also indicates a particular concept of health. But the concept of health might not be as self-evident as it seems to be, and there are often divergent views of health between scientific experts and lay people (Roth et al., 2004). Scientific experts often adopt ‘the medical approach’ of defining health as the absence of disease and to emphasise the physical effect of the risk object concerned. By contrast, lay people

often adopt 'the socio-environmental approach' of defining health in its broadest sense. This involves considering many determinants of health and emphasizing that health-supporting actions go beyond simply dealing with disease-treatment. It also involves seeing personal experiences of health as 'phenomenological experiences, constructed through social interactions with others and a shared repertoire of intersubjective meanings' (165). When the risk of GM food is defined in terms of its physical impact on human health, the definition adopts the medical approach but not the socio-environmental approach to defining health. As a result, when scientists adopt the medical approach to defining health and to producing risk knowledge about GM food, the knowledge which they produce becomes irrelevant to the people who adopt another approach to defining health.

Therefore, we should not only consider the appropriateness of particular risk knowledge about GM food, but also the values embodied in the knowledge. When we determine particular risk knowledge as factual and objective, we not only dismiss other risk knowledge but we also accept the values which it embodies. Concerns about the physical risks of GM food lead us to treat the risk as an object which can be observed and determined by scientific methods. They lead us to think that we can reveal the facts about the risks and forget that we should also consider the values which the definition of risk embodies. They lead us to consider the accuracy but not the relevance of risk knowledge. But GM food can be problematised in various ways, and not only in terms of its physical risk. For example, if we thought that 'a healthy mind in a healthy body can be achieved only by harmonizing life with the ways of nature' (Dubos, 1995), then GM food products can only be unhealthy because of their 'unnaturalness'. And different ways of problematising GM food embody different ideas of a good life. As Gofton and Haines argue:

To refuse GM tomatoes is not only to ('irrationally') deny the hegemony of science and the scientific way of thinking, but represents a tangible threat to the general process of adoption, and thereby to the general economic prospects for 'the country'. To consume these products, then, is also to accept or endorse the place of this technology within our society, and

indirectly, the ideas of competition and market values, as well as science, providing technologism with its authority (Gofton and Haimes, 1999: 3.11).

The riskification of GM food leads us to produce more risk knowledge but not to consider how the risk is defined. But the definition of risk in fact indicates how we should evaluate our lives. Therefore, before we produce risk knowledge about GM food, we should consider why we problematise GM food in such way because the way we problematise it indicates particular values which we might not agree with.

The riskification of GM food tends to impose its values by naturalising the knowledge which it produces. For example, scientific risk knowledge about GM food often refutes other ways of problematising GM food by claiming its own rationality and credibility. But if different ways of problematising GM food embody different values, it becomes problematic to legitimate a particular form of problematisation without addressing conflicting values. Riskification leads us to be concerned only with the physical risk of GM food and to think that science can produce correct risk knowledge, but at the same time it deflects our attention from the fact that riskification itself is also a way of problematising GM food. Perhaps the reason why the controversy of GM food is intractable is not because we have not found the correct risk knowledge about GM food but because the risk knowledge is irrelevant to the question which should be asked. Wilkinson points out that 'our preference for one interpretation as superior to the other cannot be defended on the basis of an appeal to the undisputed "facts" about the risks we face but, rather, this implies a political point of view on the possible futures which await us and the kinds of lifestyle we would lead' (2001: 111). Perhaps the solution to the problem of GM food is not the fact which can settle the controversy but the value which decides what kind of life we want to live with GM food products. Riskification leads us to try to determine the effect of GM food but not to consider what kind of future we want to live in.

As I have discussed above, the political potential of riskification is restricted by its

risk discourse. It appears that riskification is a way of challenging technological development. However, the challenge posed by riskification is restrictive because it leads us to consider how we can manage the risk of GM food and to accept its inevitability as a form of technological progress. Riskification leads us to produce more scientific risk knowledge, and it deflects our attention from the technology itself to the effects of the technology. Riskification makes us think about whether GM food is safe, but it also suggests that risk is the only reason to reject GM food products. What GM food brings us is that 'for the first time we have a market in which processed, balanced foods, whose ingredients are chosen in accordance with nutritional or health criteria, can be presented as an alternative superior to nature' (Rabinow, 1996: 105). But it is a technological option and not a necessity, and we need to consider what kind of processed and balanced food we want, why we want it and how we can bring it into existence. Riskification does not lead us to take a more active role in shaping technological development but it does lead us to accept the technology unless we can find its risk. Riskification might remind us of the uncertainty of the technology, but it makes us forget to ask a more important question: why do we need the technology? Stemerding and Jelsma argue that 'it is now generally conceived as a sheer *necessity* to innovate and, in this light, new scientific or technological ventures often appear as something inevitable' (1996: 345). But why is innovation necessary and what are the benefits which a particular innovation, such as GM food products, can bring us? When riskification fails to lead us to consider these questions, it also fails to challenge but rather reproduces the value of technological development as inevitable progress.

Therefore, riskification is problematic because it leads us to debate the facts about the risks of GM food but not the values of the technology. We produce risk knowledge in order to manage the identified risk, but in the case of GM food, first we need to consider why we bring the risk into existence. The riskification of GM food leads us to think that the risk of GM food is a determinable property inherent in the GM food product but it does not lead us to think that the risk is a property which

the product is developed to have. If the development of genetic engineering is not an inevitable sign of technological progress, it ought to be more important to consider why we develop the technology and how we might develop it than to consider what its risks are and how we can determine and manage them.

Conclusion

Riskification is the process of identifying a risk object and producing risk knowledge about it. It also indicates the appropriate way of determining and managing the identified risk. In the news stories about GM tomato puree and American GM maize, the risk of the GM food product is considered to be an object whose existence can be verified or falsified by scientific practice. The riskification of GM food in news stories establishes a fundamental argument that if there is no proven risk, there is no other reason to reject GM food products which is a form of technological progress. Riskification not only confines the GM debate to the issue of risk, but it also reproduces the myth that technological progress is desirable and inevitable. Riskification leads us to be concerned more with the effect of the technology than the technology itself. In news stories, the GM debate is represented as a debate in which debaters dispute what is the 'true' effect of GM food and how to determine it. But riskification is only one way of problematising GM food, and it is ideological in as far as our concern is channelled away from the value of the technology to the fact about the risk of the technology. We need to have a different way of problematising GM food which can lead us to consider why we develop the technology and to discuss how we should develop it.

However, the riskification of GM food has become the legitimate way of problematising GM food. When the problem of GM food is often defined as its risk to human health and the environment in news stories, we, as the readers of the stories, tend to learn that the risk is the only significant problem which we should be concerned about. But when the GM debate is confined to the issue of risk, the debate becomes unproductive and apolitical. I discuss three problems caused by the

riskification of GM food in following chapters. Firstly, riskification often leads to the production of more risk knowledge, but when different risk knowledges conflict with each other, how can we decide which one to trust? We tend to decide which risk knowledge is credible and rational by determining which knowledge is scientific. We think that scientific risk knowledge is always credible without examining the relevance of the knowledge to the problem of GM food. I explore this issue in the next chapter. Secondly, in the process of riskification GM food is considered to be a well-defined and ready-made product whose risk can be determined. We tend to identify ourselves as the consumers of GM food products and therefore we are concerned primarily with their safety. But the identity of a consumer is not the only identity we can have and it is more problematic than we think. I explore the problem of the identity of the consumer in chapter 5. Finally, riskification leads us to debate the facts of GM food rather than the values of the technology. We tend to expect science to reveal the facts about the risk of GM food so that we can settle the controversy about it. But scientific facts, which are produced in an experimental setting, can not provide the answer because science is not as universal and objective as it seems to be. I explore the limitations of scientific facts in chapter 6.

4. Good Science, Bad Science: Boundary-work in the Debate

In this chapter I use the concept of boundary-work which I have discussed in chapter 2 to explore how conflicting arguments contest for credibility by demonstrating their scientific-ness. The boundary between science/non-science or good/bad science is a rhetorical and political construction which various arguments contest in order to establish their own credibility and to discredit oppositional arguments. Boundary-work therefore becomes a way of empowerment: an argument can achieve the power of being rational and objective when it successfully defines itself as a scientific argument. When there are conflicting arguments all claimed to be scientific, boundary-work functions to distinguish the real/good scientific argument from others. Boundary-work is often performed by referring to the norms of science. Therefore, boundary-work can function to distinguish good arguments from bad ones because people accept two taken-for-granted assumptions. One is that science is always and everywhere good; the other is that the norms of science are well-established and clearly-defined. The first assumption is grounded on the 'universality ideal' of modern science (Harding, 2000) and it leads people to think that science is good only because it is scientific. The second assumption is paradoxical because boundary-work can only function when the norms are open to be redefined. The definitions of the norms of science are ambiguous and often change in different situations. Because the norms are open to be constructed and defined, people can often (re)construct and (re)define the norms in order to claim that a particular argument is scientific and thus credible. Therefore, the reason why boundary-work can be done is because the norms of science are ill-defined and thus open to be redefined, not because they are well-defined. Boundary-work, in leading people to consider whether a particular argument is scientific but not whether it is relevant to the present issue, is problematic because it encourages people to look for a scientific answer but not a relevant answer to the question they ask.

In the following sections, I analyse the news stories about Dr Pusztai and Lord

Sainsbury to explore how the boundary-work of good science functions to make particular arguments credible. I focus on one particular norm of science, 'disinterestedness', and explore how it is constructed and defined in news stories to authorise particular scientific arguments and to discredit others. The boundary-work of disinterested science can function in such a way because people think that disinterested science is also good science. And the boundary-work of disinterested science leads people to be concerned more with the disinterestedness of the scientist than with the content of the argument which he/she makes. In other words, boundary-work moralises the debate about particular scientific arguments. But the boundary-work of disinterested science is problematic because it leads people to consider which scientific answer is good without considering if science can answer the question. In the case of GM food, the question is one that is not well-defined and thus is not a question which can be answered by science alone. The last chapter argues that there are various ways of defining the problem of GM food. Even though we agree that risk is the only significant problem of GM food, we still need to consider whether science can verify or falsify the risk as it is expected to do. And more importantly, if the question which we ask about GM food is actually a political but not a scientific question, the endeavour to define the good scientific argument turns out to be unproductive. Therefore, before we start to find the good scientific answer, we need to consider what kind of question we are asking and what question we should ask.

Disinterestedness in dispute: an introductory case

In this section, I explore how 'disinterestedness' can be redefined by the scientists who are in danger of losing their credibility. I try to demonstrate that the norms of science, such as disinterestedness, are not well-defined but open to be reconstructed for particular purposes. Merton defines disinterestedness as 'a distinctive pattern of institutional control of a wide range of motives which characterizes the behavior of scientists' (1973: 276). The translation of the norm of disinterestedness into practice is supported by the accountability of scientists to their compeers (276). Merton

further argues:

To the extent that the scientist-layman relation does become paramount, there develop incentives for evading the mores of science. The abuse of expert authority and the creation of pseudo-sciences are called into play when the structure of control exercised by qualified compeers is rendered ineffectual (Merton, 1973: 277).

Therefore, Merton argues that it is necessary to establish the impartiality and authority of science in terms of the self-control of the scientific community and the distinction between scientists and laymen. However, Merton's definition of disinterestedness seems to be unpractical in the contemporary situation. When scientists begin to work with laymen, the authority of science is in danger of being abused and its impartiality becomes questionable. Therefore, for scientists who work for government or with industries, it becomes necessary to redefine the norm of disinterestedness in order to protect their authority from questions but at the same time to be able to do their science practically. In other words, by redefining the norm of disinterestedness, the scientists attempt to avoid the contradiction between the disinterestedness and utility of science.

Scientists demonstrated their attempt to redefine the norm of disinterestedness in a public letter which they wrote to the prime minister. After the results from the field trials of growing GM crops were announced (see chapter 6), 114 scientists wrote a letter 'complaining about the way the debate on GM crops was handled' ('Scientists complain GM debate was mishandled', 1/11/2003, *The Guardian*, [245]). In the letter¹, the scientists argued that the trials 'did not assess the effects of genetically modifying the crops, but rather the impact of different types of weed control', and thus the results from the trials 'had little to do with genetic modification, its process or potential'. They claimed that the results were 'misleadingly' reported across the media as 'the end of GM in the UK', and that there were two negative consequences. Firstly, many scientists 'are thoroughly demoralized by hostility to the work they do,

¹ The full text of this letter was not showed in the paper version of the Guardian, but can be found on the website of the Guardian: <http://education.guardian.co.uk/higher/sciences/story/0,,1075119,00.html> (last visit: 21/06/2005).

which is continually misrepresented and even sabotaged'. Secondly, 'work on the basic science of genetic engineering and its applications to plants is being scaled down', and it will 'inhibit our ability to contribute to scientific knowledge internationally, and to meet challenges like yield improvement, drought tolerance and reduced reliance on pesticides'. They concluded that 'genetic engineering of plants has been reduced to a matter of consumer preference; the public has been misinformed; and the efforts of scientists to communicate about genetic engineering have been misused'.

I examine the scientists' argument from two perspectives. Firstly, their argument is founded on 'the culturally-dominant view of the popularization of science' (Hilgartner, 1990). This culturally-dominant view is 'rooted in the idealized notion of pure, genuine scientific knowledge against which popularized knowledge is contrasted' (519). Therefore, any differences between genuine and popularized science must be caused by 'distortion' or 'degradation' of the original truths (519). This view authorises scientists to determine which popularization of science is appropriate and which is distorted, and it also 'sets aside genuine scientific knowledge as belonging to a realm that cannot be accessed by the public but is the exclusive preserve of scientists' (530). In other words, this view provides scientists with a repertoire of conceptual and rhetorical tools, which they can not only use to distinguish real from popularized science, but also to buttress their epistemic authority against challenges of laymen. In their public letter, the scientists do not question the results from the field trials, but they criticise the 'misleading reports' about the results. They suggest that there is nothing wrong in the results, but rather the problem is that the results are misinterpreted and misused by the media. The scientists insist on their authority to interpret the results and to dismiss other non-scientific interpretation. Their authority is grounded in the modern culture which 'lays down the conditions for a radical distinction between those professionally concerned with the explication of secular nature and the general public with their moral concern' (Shapin, 1990: 1005). In this culture, the public is considered to 'have

no business with the framing of scientific representations and with the conceptual contest of scientists' work' (1005). Therefore, the scientists do not only demarcate their scientific interpretation from the misleading interpretation in the media, but also reproduce the power gap between scientists and the public and try to deprive the public of the opportunity to introduce its moral concerns into the discussion about growing GM crops.

Secondly, in order to establish their epistemic authority, scientists have to distinguish themselves from the public and demonstrate that their argument is purely scientific. Recently, inspired by 'the story of the new economy' which has been constructed around 'totemic sites' such as Silicon Valley (Armstrong, 2001; 525), science is expected to work with industry to create new commodities or businesses. But because of this closer relation between science and industry, the credibility of science has been questioned. In order to respond to this question, the scientists tried to argue in their letter that they can be politically and economically close to nonscientists, but still be epistemically independent of or superior to them. Perhaps the reason why scientists feel 'demoralised' is because the distinction which they try to establish is questioned by nonscientists. One scientist says in the news story:

I think of myself as a servant of society. I am paid by the taxpayer. We have been encouraged by successive governments to become involved in industry. We are now told that if we work with industry we are not allowed to comment or be involved in advice which forms the basis of political decisions – which is stupid. The best scientists will work with industry ('Scientists complain GM debate was mishandled', 1/11/2003, *The Guardian*, [245]).

This scientist tries to redraw the boundary which Merton considers to be the necessary condition for establishing the authority of science. He argues that even if scientists work with industry, they can still be disinterested to produce impartial scientific knowledge. This scientist implicitly identifies 'working with industry' with 'working as a servant for society'. For him, scientists can be similar to lay people in the sense that they work with industry, but they are still different from lay people in the authority of their knowledge. Longino argues that 'scientists sometimes become

defensive when asked to comment on the relation between science and values because they think their moral integrity is being challenged' (1990: 5). Scientists often claim that the 'constitutive values' of science, which are 'the rules determining what constitutes acceptable scientific practice or scientific method', can be separated from the 'contextual values', which are 'the personal, social, and cultural values' belonging to 'the social and cultural environment in which science is done' (4). What the scientist tries to argue in the news story is that the constitutive values of scientific practice done with industry can still remain uninfluenced by the contextual values of the industry.

Therefore, in order to protect their epistemic authority from nonscientific challenge, the scientists redefine disinterested science in their letter by redrawing the boundary between science and industry. They redefine the norm of disinterestedness in order to argue that the values of developing the technology of genetic engineering are the constitutive values but not the contextual values of science. They argue that the development of genetic engineering is desirable and progressive because it is scientific progress. One scientist claims in the news story that 'because of scientific research, life expectancy, quality of life, and the safety of food and medicines had improved astronomically' ('Scientists complain GM debate was mishandled', 1/11/2003, *The Guardian*, [245]). But even if these benefits of science are true, it does not mean that the development of genetic engineering necessarily brings us such benefits or that we need to accept it simply because it is scientific progress. Szerszynski argues that 'scientific knowing shifts from "making" to "acting" as its practical template' in contemporary society (2003: 214). He argues that 'in acting into nature, what would have been "data" in the context of the classical, laboratory experiment, becomes instead real-world "risk events", emergencies, in which nature responds to our actions and to which in turn we have to respond' (215). If the technology of genetic engineering is an action to manipulate nature for particular human values, it is problematic to ask people to accept it as scientific progress but not to consider its values. Therefore, the scientists' argument is questionable because

it tries to protect the values of genetic engineering from the challenge of nonscientists by emphasising the constitutive values of science. It is, however, unproductive to dispute whether the values of the technology are the constitutive values or the contextual values of science. It is more important to discuss the values openly and democratically so that we can decide whether we should act into nature in the way which the technology is developed and used.

In other words, the question which the scientists' argument attempts to answer is whether the science working with industry can still be disinterested. But it is more productive to ask how science and technology can make our life better and why it is better. On the one hand, the scientists reduce the public concern about GM crops to the anxiety about their risks. On the other hand, they claim that they are disinterested in the question about the risks of GM crops even though they work with the industry. However, their argument is problematic because what should be questioned is not only their impartiality but also the question they ask. Nowotny argues that the issues which scientists have to respond to are never only techno-scientific, and that 'scientific and technical expertise is always open to contestation in circumstances never controlled by the experts alone' (2000: 17). Therefore, scientific and technical expertise is 'transgressive' and thus vulnerable to contestation. Nowotny argues that the recurrent but futile attempts to tighten the boundaries of scientific and technical expertise are not expected to prevent this 'transgressiveness of expertise' (2003: 152). On the contrary, the complexities of the social and political world demand a widening of the expertise and the ability to 'transgress the boundaries between specialised knowledge and its multiple, many-layered (and often unforeseeable) context of implication' (152). Therefore, if the problem of GM food is not a techno-scientific one, the scientists' attempt to redraw the boundary of disinterested science turns out to be unproductive because what we need is not the credible scientific answer but a public debate in which the value of the technology can be discussed more democratically.

However, as demonstrated in the scientists' letter, the debaters in the GM debate tend

to do more boundary-works of good science in order to find the credible science than to discuss the value of the technology. The debate is thus confined to the issues about the credibility of particular scientific arguments and the trustworthiness of the scientists who make the arguments. Gieryn argues that boundary-works are 'brought on by disputes over credibility' when there are questions about 'how epistemic authority is to be allocated among a variety of claims makers' (1999: 340). Science is 'a culture with a strong interest in protecting its borders, both from those who would invade from the outside and from those inside who deviate from condoned behavior and thought' (Sullivan, 1994: 286). And scientific knowledge is often represented to lay people with the effort to reinforce and sustain the social and epistemic status of science (Mellor, 2003: 521). Therefore, when scientists are in danger of losing their authority and credibility, they often try to draw sharp contrasts between themselves and nonscientists to 'enhance their intellectual status and authority vis-à-vis the "out-groups"' (Prelli, 1997: 91). But when the contestation for credibility occurs between conflicting scientific arguments, the contesters start to draw the boundary between their good science and other bad ones in order to establish their authority. In the following sections, I analyse the news stories about Dr Pusztai to demonstrate how the credibility of Pusztai's findings is established on the disinterestedness of his science. The news stories draw the boundary between Pusztai's good science and the governmental biased one. Finally, the GM debate represented in news stories becomes a debate about who can we trust.

While scientists wrote their letter to defend their epistemic authority, the news stories about Pusztai demonstrate the attempt of newspapers to distinguish the credible scientific practices from biased ones. News stories portray Pusztai as a scientist who defends his scientific findings against politico-economic powers and portray another character, Lord Sainsbury, as the villain who is suspected of abusing his power to influence governmental science for his own interest. Both portraits reflect the expectation that the constitutive values of science can and should be separated from its contextual values. However, when news stories focus on describing Pusztai as a

good scientist and suggest that his findings are credible, they marginalise the issues about the relevance of his findings to the problem which we are concerned about GM food. Finally, no matter which science the news stories describe to be credible, science still has its authority to decide how we can consider the problem of GM food. We, as the readers, can still only reject GM food products when science tells us that they are risky.

Set the Stage: Individual Scientist vs. Non-Scientific Power

Dr Arpad Pusztai talked about his government-funded research on ITV's programme *World in Action* in August 1998, and claimed that his research 'had shown that rats which ate the modified potatoes had suffered damage to their immune systems' ('Scientists back critic of gene modified potatoes', 12/2/1999, *The Times*, [248]). After his speech on TV, he was suspended by the Rowett Research Institute in Aberdeen and ordered to retire. The institute said that 'Dr Pusztai had released "misleading information" and that he had been talking about the wrong potatoes' ('Scientists back critic of gene modified potatoes', 12/2/1999, *The Times*, [248]). However, twenty international scientists had examined Dr Pusztai's findings and argued that they could find nothing wrong with his conclusion. Therefore, the government was urged to re-examine the claims 'made by a scientist who was publicly discredited' ('Scientists back critic of gene modified potatoes', 12/2/1999, *The Times*, [248]).

At first, the news stories about Pusztai's findings focus mainly on the disagreements in the scientific community on the findings and initially demonstrate the 'strategic ritual of objectivity' (Tuchman, 1972) by presenting opinions from two sides, the Rowett Research Institute and the scientists who support Pusztai. However, by making the contrast between a nonhuman institute and individual scientists, they actually suggest that the opinion from one side is more credible than the other. For example, the two scientists who speak for Dr Pusztai are fully identified in the story in *The Times* by their positions and specialities: one is a toxipathologist from

Liverpool University and another is a pathologist from Aberdeen University ('Scientists back critic of gene modified potatoes', 12/2/1999, *The Times*, [248]). By contrast, the person who speaks on behalf of the institute is not clearly identified, and the institute is presented impersonally as an organisation. The impersonality highlights the power of the institute as an administrative body but marginalises its function as a research institute where scientists work. The news story represents the controversy about Pusztai's findings as a disagreement between an impersonal organisation, which executes its power over Dr. Pusztai, and two individual scientists, who make their statement on the basis of their expertise. The story also represents another contrast. On the one hand, the Cabinet Office minister is quoted as saying that 'any new data would be "thoroughly and quickly" examined by government scientists but expressed doubt that Dr Pusztai's claims would be backed' ('Scientists back critic of gene modified potatoes', 12/2/1999, *The Times*, [248]). On the other hand, the Liberal Democrats' food spokesman is reported to say that 'he would ask the Commons Agriculture Select Committee to investigate the affair'. Both contrasts suggest that the disagreement on Pusztai's findings is a disagreement between power, government and the institute, and oppositional individuals, scientists and opposition politicians. In other words, the story implicitly represents the event as a conflict between non-scientific power and individual scientists. And those oppositional individuals seem to be more trustworthy, because their opinions are made on the basis of their expertise but not their power.

If the news story in *The Times* represents the event as a conflict between power and oppositional individuals, the story in *The Guardian* takes a stronger stance by interpreting the whole event as a 'scandal' in which science is 'suppressed' by non-scientific power:

The Guardian can also reveal that the rat's brain size decreased. Dr. Pusztai did not refer to this at the time because he felt the political repercussions would be too severe. A more recent piece of research on the same rats by the senior pathologist Stanley Ewen, of Aberdeen University Medical School, is understood to validate Dr. Pusztai's preliminary findings ('Food

scandal exposed', 12/2/1999, *The Guardian*, [249]).

This episode implicitly defends Pusztai against the criticism from the institute. Firstly, although the Rowett Research Institute criticizes Pusztai for announcing his results in the media without being subject to peer review, the story claims that Pusztai is actually cautious with the impact of his findings, and decides to conceal some results which would have 'severe political repercussions'. Secondly, although Pusztai's findings are not subject to peer review officially, the findings are still scientific and factual because they can be replicated and validated by another scientist. This episode implicitly discredits the criticism from the institute by portraying Pusztai as a responsible scientist and showing that his findings are sound. Although peer review is considered to be an effectual and trustworthy method to avoid fraud in the scientific community, in some cases² other efficacious methods can be used to settle the controversy which can not be settled by peer review, such as 'the verification of the stability of experimental data through replication' (Gross, 1995: 55). The criticism from the institute is implicitly discredited in the story because Pusztai's experimental findings can be replicated by other scientists and therefore would be able to pass peer review. Also one scientist is quoted as saying that 'we found that his data are sound. We think it would pass peer review and be published and we are at a loss really to explain why the Rowett Institute came to the conclusion it did' ('Food scandal exposed', 12/2/1999, *The Guardian*, [249]). The story implicitly suggests that if the findings could be supported by other scientists, it becomes questionable why the Rowett Institute would dismiss them just for the reason that they have not gone through peer review. In other words, the story suggests that the decision of the institute to dismiss Pusztai's findings is not purely scientific. The action that the institute takes against Pusztai is represented in the story as the political repercussion

² For example, Gross argues that 'the evidence in the cold fusion controversy supports a verdict that peer review remains a trusted and trustworthy resource for determining worth within scientific communities' (1995: 53). However, he further argues that because 'peer review cannot free itself from allegations of bias', and because there is 'a rivalry between two different discourse communities, the chemists and the physicists', 'a vehicle of consensus more efficacious than peer review was called for' (54). And finally, he demonstrates that the consensus about cold fusion is 'achieved through a resource shared by both communities': the 'scientific method' which is founded on 'the verification of the stability of experimental data through replication' (55).

of his findings but not as a scientific judgment from a research institute.

Moreover, the story in *The Guardian* also refers to the impact of Pusztai's research on the biotech industry. It recites quantitative data that, for example, 'last year there were approximately 7.7 million hectares of these crops, such as maize, worldwide', and 'the so-called cauliflower mosaic promoter is used in most GM foods available in the UK, such as soya, present in an estimated 60 per cent of processed foodstuffs' ('Food scandal exposed', 12/2/1999, *The Guardian*, [249]). Based on this data, the story argues that 'it was these far-reaching implications for one of the world's most aggressively expanding industries that had put Dr. Pusztai in the eye of the storm since last August when he spoke out on ITV's *World In Action*'. The story also quotes one scientist indirectly that 'the implications (of the findings) for the biotech industry, already suffering from a public backlash against GM foods, could be severe'. In this story Pusztai's findings are discussed more in terms of their impact rather than their content. The story suggests that the reason why Pusztai's research was suspended is because of 'political repercussions' and its 'implications for the biotech industry' but not because of its scientific quality. However, the biotech industry is represented in the story as one collective and impersonal character without a voice. This story establishes a contrast between an individual scientist, Pusztai, and an impersonal 'industry'. And again this contrast reinforces the representation that the controversy of Pusztai's findings is a conflict between an individual scientist and non-scientific power.

The story in *The Guardian* even indicates that the controversy of Pusztai's findings is not a scientific one but a political-economic one. According to the story, 'some of the scientists who have viewed the evidence believe the circumstances surrounding Dr Pusztai's removal and the closing down of his research team cannot be understood outside political and commercial parameters' ('Food scandal exposed', 12/2/1999, *The Guardian*, [249]). The story removes the event from its original stage which is set up inside the Rowett Institute to a broader political-economic context in which political power and industrial interests try to suppress 'dangerous' scientific findings.

The story suggests that the event should not simply be interpreted as the Rowett Institute's disapproval of Dr Pusztai's behaviour. But the 'political and commercial parameters' are not clearly described in the story. The controversy is represented as a conflict between science (individual scientists) and non-science (impersonal power). However, the story represents mostly the opinions of individual scientists and suggests that there are political-economic interests threatened by Pusztai's findings without any further clarification. Therefore, the new stage for the story of Dr. Pusztai is set up: it is a story about a scientist who struggles against non-scientific power to tell his scientific facts to the public.

Finally, the Rowett Institute is described in the story in *The Guardian* as an administrative body but not as a research institute. The story says that the institute 'was unhappy with his having made public the results of preliminary research which had not been subject to peer review' ('Food scandal exposed', 12/2/1999, *The Guardian*, [249]). The institute is personified, and the reason why it forced Pusztai to retire is because it was emotionally unhappy with Pusztai's behaviour, but not because it has any rational question about his research. The story therefore highlights the administrative power but not the scientific function of the institute, and the action of the institute is described as an action on the basis of subjective and non-scientific judgment. The institute is concerned only with the procedure of releasing scientific knowledge but not with the quality of the knowledge. In the story, the institute's decision is not represented as a decision which is grounded on scientific examination of Pusztai's findings, but on the contrary, the international scientists support Pusztai because they reviewed his data and found nothing wrong. As a result, the scientific function of the institute is marginalised, but its administrative function is foregrounded. In other words, the institute's decision is de-scientised and politicised. The institute is thus considered in the story to be part of the 'political and commercial parameters'.

The news stories in *The Times* and *The Guardian* represent the controversy of Pusztai's findings as a conflict between independent and individual scientists and

impersonal and non-scientific power. One analysis of the news stories about passive smoking points out that news stories often reproduce a 'moral narrative' which represents a conflict 'between the tobacco industry (TI) and non-TI-funded scientists doing research on the health effects of passive smoking' (Malone et al, 2000: 717). The overriding theme in this narrative is 'the individual scientist struggling against powerful, well-funded and well-connected interests' (718). There is a specific rhetorical device³ used by the stories to convey this theme: the stories often describe the non-TI scientists as scientific protagonists who are personalised and portrayed as humane individuals. Both news stories which I examine here use the rhetorical device of personalisation: Pusztai and the scientists who support him are portrayed as the protagonists whose personal details – professions, specialities and positions – are clearly identified in the stories. By contrast, the other side of the controversy is represented as an impersonal character (the institute and the biotech industry). Both stories produce a moral narrative to frame the controversy of Pusztai's findings as a story in which a scientist struggles against non-scientific power to tell his scientific truth and he is supported by other scientists. In other words, both stories represent the controversy as a conflict between science and non-science, individual and the institute (or political-economic power), as well as expert and non-expert. As a result, although both stories represent the arguments from both sides, the moral narrative which they produce suggests that Pusztai's findings are scientific but the institute is non-scientific, and therefore Pusztai is credible but the institute is questionable.

The moral narrative does not only represent the event as a conflict between science and non-science, but also as a conflict between the constitutive values and contextual values of science. The narrative suggests that science always tries to tell the truth, as long as it is not suppressed or influenced by non-scientific power or interests.

³ In fact, the analysis identifies four rhetorical devices in their analysis: 1) science is portrayed as supporting commonsense understandings of the negative experience of secondhand smoke; 2) the scientific protagonists are personalized and portrayed as human and humane individuals; 3) scientific claims are juxtaposed with tobacco industry counterclaims in ways that give implicit support to tobacco control positions; and 4) the tobacco control position is normalized (Malone et al, 2000). Because other three devices are more relevant to the case study of passive smoking, here I only focus on the second one which is significantly related to my discussion.

However, this narrative suggests that we can trust Pusztai's findings about the GM potatoes but does not really tell us why we need his findings. The narrative describes that an individual scientist attempts to tell us the facts about the risk of GM food, but he is suppressed by non-scientific power and interests which are threatened by these facts. We, as readers of the narrative, can only appreciate his effort to tell us the facts. But this narrative seems to assume that the findings are relevant to the problem of GM food which we are concerned with, and that the question which the findings aim to answer is also the question which we should ask. In other words, the narrative diverts our concern from the relevance of Pusztai's findings to their political repercussions. It assumes that Pusztai's findings are factual because he is supported by other scientists. It suggests that science is only questionable when the fence between science and non-science collapses. In the case of Pusztai, the reason why science cannot tell the truth is because the contextual values of science try to take over the constitutive values to decide what science should reveal to the public. But the authority of science to determine which fact is relevant to the public discussion about GM food remains unchallenged. The narrative suggests that what we need to do is to find good science which is not influenced by its contextual values and can therefore reveal the facts, but not to consider whether the problem of GM food can really be solved by science alone.

Therefore, news stories represent the controversy of Pusztai's findings as a conflict between science and non-science, and they describe how Pusztai's scientific risk knowledge about GM food is suppressed by non-scientific power. These news stories seem to assume that disinterested scientific knowledge, which is not influenced by the contextual values of science, should be also relevant knowledge. However, when the relevance of particular scientific knowledge is determined by its disinterestedness, the debate about the knowledge is moralised. We then start to consider whether the knowledge is produced by disinterested scientists but not what the knowledge can do for us or why we need it. In the case of Pusztai's findings, in order to legitimate the moral narrative which they construct, news stories also start to enhance the

credibility of Pusztai's findings by showing that he is a responsible and disinterested scientist. News stories do the boundary-work of good science by making a contrast between a good scientist, who is concerned only with the truth, and a bad scientist, who succumbs to non-scientific power or works for non-scientific interests. In the next section, I explore how news stories represent Dr Pusztai as a good scientist in order to enhance the credibility of his experimental findings.

Good Scientist: Pusztai as Prometheus

In the moral narrative Pusztai is characterised as the protagonist who struggles with non-scientific power. In order to make the narrative credible, it is necessary for news stories to portray Pusztai as a good scientist and to discredit the action taken against him. News stories use two strategies to make the narrative persuasive to the readers. One strategy is to highlight the political and economic implications of the findings in order to explain the reason why non-scientific power tries to suppress it. Another strategy is to suggest that Pusztai's findings are credible because Pusztai is a disinterested scientist who resists being influenced by non-scientific power and interests. In order to make a contrast to highlight Pusztai's disinterestedness, they also portray Professor James, director of the Rowett Institute at the time, as an interested scientist who tries hard to achieve political (non-scientific) power. Through their efforts to establish the credibility of Pusztai's findings, news stories lead us to consider whether science can tell us the truth about GM food in this political and economic context but not whether science can really tell us the truth which we need.

News stories suggest that Pusztai was 'punished' by non-scientific power because he revealed the facts about GM food to the public. They assume that Pusztai's findings are the scientific facts relevant to the public discussion about GM food. They focus on the significant impact of the findings in order to demonstrate why the findings were not accepted by non-scientific power. They dwell on the conflict between Pusztai's findings and the interests of the biotech industry but not on the findings per

se. For example, the news story in *The Sun* describes the fallout after Pusztai's findings were supported by other scientists:

Thousands of fearful shoppers jammed supermarket hotlines yesterday as a cancer storm erupted over genetically-modified food...And the backlash by customers forced other High Street stores to slash the number of products on shelves. The uproar was triggered when 20 world-renowned scientists backed a colleague who said genetically-modified spuds damaged immune systems in rats and shrank their brains. The experts hit out over the sacking of government scientist, Dr. Arpad Pusztai, who made the discovery. His findings had been rubbished by his bosses in Aberdeen ('Supermarkets rush to ditch mutant food', 13/2/1999, *The Sun*, [261]).

When the story describes Pusztai as a colleague supported by 20 world-renowned scientists, it leads its readers to regard Pusztai as a scientist. The story says that Pusztai made a discovery but not an argument. If Pusztai was a scientist whose discovery could be supported by other scientists, the readers are led by the story to be curious why Pusztai's findings have been rubbished by his boss (his boss but not another scientist). The story focuses more on the political-economic impact of the findings than on the findings itself and claims that the findings led consumers to be anxious about GM food products. Even if the story does not clarify the reason why Pusztai's findings were rubbished by his bosses, it suggests that this reason must be non-scientific because the findings are supported by other scientists. Moreover, in this story Pusztai is described as a prophet who makes a discovery that can not be tolerated or appreciated by his bosses. But his discovery turns out to be influential and significant. Therefore, although the story does not clarify the reason why the findings are rubbished, it leads its readers to take sides with Pusztai more easily than with his bosses.

Moreover, in the moral narrative about a scientist struggling with non-scientific power, the protagonist has to embody the socio-culturally ideal image of a scientist in order to make the narrative more persuasive. Pusztai is depicted as a good scientist in news stories because the depiction can enhance both the credibility of the moral narrative which the stories produce and of Pusztai's findings themselves. The stories

attempt to persuade readers that Pusztai's findings are more scientific and factual simply by portraying him as a good scientist. This goodness both embodies and appeals to what this society regards as the appropriate way of doing science. In these news stories, the credibility of Pusztai's findings is built upon the trustworthiness of Pusztai as a good scientist rather than on the superiority of the findings to other scientific arguments. And his goodness is the necessary condition for his moral narrative to be accepted by the readers. But a good scientist doing science in an appropriate way should not lead to the conclusion that his findings are relevant to the question which we are concerned with, if the criteria to determine the relevance are not agreed and the question itself is not clearly-defined. When news stories represent that Pusztai's findings are good and relevant to the public discussion about GM food because Pusztai is a good scientist, they lead the readers to also accept the question which Pusztai's research aims to answer and his way of problematising GM food. The issue which we should consider is not whether Pusztai is a good scientist or whether his findings are scientific and credible, but whether the question which he asks is the question which we should ask. Pusztai's findings as scientific risk knowledge, no matter how correct they are, lead us to accept riskification as the legitimate way of defining the problem of GM food. The boundary-work of good science makes the GM debate unproductive because it deflects our attention away from the ways of problematising toward the ways of producing risk knowledge.

Pusztai is portrayed as an impartial scientist in news stories. One news story illustrates the reason why Pusztai's research project has been commissioned: a 'former senior Scottish Office official' says that the reason to commission this project was to redress an 'imbalance', because there was 'little regard' at the time 'for research into the human nutritional and environmental consequences of GM foods' ('ousted scientist and the damning research into food safety', 12/2/1999, *The Guardian*, [252]). However, in spite of this commitment to the project, Pusztai, who 'beat off 28 other tenders to co-ordinate the project', is described in the story that he 'has always kept an open mind about GM foods and conditionally supported their

release as long as there were rigorous and independent trials'. The story suggests that Pusztai does not have any presupposition on the risk of GM food and tries only to find the facts. He is qualified for this project because he 'beat off 28 tenders' and because he has no bias against GM food. In other words, the story portrays Pusztai as an open-minded and unbiased scientist who can only accept scientifically-proved facts. His findings are credible because he has no bias and only accepts the results from 'rigorous and independent trials'.

The story also indicates the difference between Pusztai and other scientists:

The other members of the project were the Dundee-based Scottish Crop Research Institute (SCRI) and Durham University biology department who grew the GM potato used in the feeding trials. All three bodies (including the Rowett Institute) had links with the biotech industry through the pursuit of commercial research contracts. There was no reason to believe that the research project would produce the controversial findings that could threaten the scientific foundations of the biotech industry they sought to embrace ('Ousted scientist and the damning research into food safety', 12/2/1999, *The Guardian*, [252]).

Again the story makes a contrast between Pusztai as an individual scientist and the impersonal institutions. The story suggests that the institutions are interested because they rely on the funding from the biotech industry. Therefore, compared to the scientists who work in the institutions and seek to embrace funding by the industry, Pusztai is a 'Promethean' scientist because he struggles against the interests of the institute to tell the truth to the public. The story also illustrates how other members of the project obstructed Pusztai's research: 'Rows had broken out after preliminary findings emerged from Dr Pusztai's team and the SCRI and Durham University's biology department showed growing discomfort about the validity of some of his methodology and the implication of the results'. The story continues:

With so many unanswered questions, far more public money would be needed, Dr Pusztai concluded. But *The Guardian* understands that the Scottish Office and the Rowett Institute declined his funding requests. For Dr Pusztai, the funding crisis and the prospect of his unexpected results not being published led him to reconsider his attitude to the media ('Ousted scientist and the damning research into food safety', 12/2/1999, *The*

Guardian, [252]).

The story provides the reason why Pusztai chooses to speak to the media. This episode, on the one hand, demonstrates that Pusztai insists that he should find the truth. On the other hand, it makes the distinction between Pusztai as a disinterested scientist and the interested institutions which try to suppress Pusztai's truth. By portraying Pusztai as a 'Promethean' scientist, the story draws the boundary between Pusztai's good science and the interested science of the institutions which Pusztai works with.

Moreover, Pusztai is depicted in the story as a responsible and reflective person. The story provides an episode to illustrate how he took his responsibility seriously:

In December 1996, Dr Pusztai suddenly became aware of the inadequate level of existing scientific trials on GM maize when a member of the Government's Advisory Committee on Novel Food Production (ACNFP) asked him to assess the validity of a licensing application from one of the industry's leading companies. He faxed his two-page assessment to the Ministry of Agriculture warning that tests into nutritional performance, toxicology or allergenicity were insufficient and inadequate. In his final paragraph he asked for 'proper experiment' with the GM plants and added: 'Do not leave it to chance'. There was no legal requirement for further tests to be carried out and approval for licensing was granted ('Ousted scientist and the damning research into food safety', 12/2/1999, *The Guardian*, [252]).

Pusztai is depicted as a responsible advisor: he would not make his assessment only on the basis of presently available but insufficient evidence, but he is scrupulous in that he requires more data to make his judgment. This episode suggests that Pusztai is not only a qualified and disinterested scientist, but also a responsible and scrupulous person who is earnest in his work. Therefore, this story establishes the credibility of Pusztai's findings on his trustworthiness both as a disinterested scientist and a responsible person. In other words, the story makes both the moral narrative and Pusztai's findings credible by showing that Pusztai is a good scientist. However, the story simply assumes that a good scientist does good science. It does not consider why and how the science is good for us. It does not consider if the scientific

knowledge produced by Pusztai is the knowledge which we need. More importantly, it does not consider whether the research question which Pusztai asks is the question relevant to the public discussion about GM food.

Another news story focuses more on the ‘unfairness’ of the whole event. The story describes how Pusztai, as ‘the 68-year-old academic’, was kicked out of his job ‘after a lifetime of valuable, though little recognised, endeavour’ (‘A doctor destroyed for being in the right’, 13/2/1999, *The Daily Mail*, [258]). The story says that ‘it was astonishing that such a well-organised scientist could have got it so wrong’, but ‘he did not get it wrong, as the evidence of 22 distinguished scientists from around the world testified’:

To be vindicated so completely must be a relief to Professor Pusztai but the trauma of seeing a professional reputation earned so painstakingly over 40 years so swiftly destroyed has proved desperately hurtful. ‘He has been depressed and down,’ said one former colleague. ‘Clearly the way he was treated has had a deep impact on him personally. They can’t really re-instate him, too much has happened, but they must restore his reputation’ (‘A doctor destroyed for being in the right’, 13/2/1999, *The Daily Mail*, [258]).

This story says that Pusztai had ‘a professional reputation’ which was swiftly destroyed simply because he warned the world that tests were ‘needed to establish the impact on human health of eating GM foods’. The story highlights the unfairness of the event: Pusztai lost his job and his professional reputation only because he argued that GM food is not safe. The unfairness is grounded on but also reinforces the contrast between Pusztai’s good science and the problematic action of the institute. When readers are persuaded by the story and thus take sides with Pusztai, they also accept the goodness of Pusztai as a scientist and the credibility of Pusztai’s findings.

I am not arguing that Pusztai’s findings are not credible or that he is not a good scientist. Rather, I am arguing that we should consider why news stories can establish the credibility of Pusztai’s findings on his goodness and what the impact is when news stories do so. News stories construct the moral narrative to frame the

controversy of Pusztai's findings in order to make it graspable for their readers. And this moral narrative leads the readers to distinguish Pusztai's credible science from the biased one of the Rowett Institute. News stories draw the boundary of good science on the basis of the norm of disinterestedness. And they reproduce the ideal image of a scientist which refers to a person who is only concerned with scientific facts and who fences his/her science from the influence of the contextual values. News stories suggest that we should trust the facts produced by a disinterested scientist. However, what if the facts produced by good science can not settle the controversy of GM food as they are expected to do? What if the controversy of GM food can only be settled by an open and democratic discussion about the value of the technology but cannot be settled by the facts about GM food products? News stories attempt to draw the boundary of good science, but they fail to address these questions. In other words, the impact of the moral narrative which news stories produce is that it leads the readers to find the facts but not to consider how the problem of GM food should be defined and how it can be solved.

For example, before we accept Pusztai's findings as facts, perhaps we need to consider whether the reality represented in Pusztai's experiment is the reality which we should accept. In Pusztai's experiment there are rats fed with GM tomatoes in order to know 'the human nutritional consequences of GM foods' ('Ousted scientist and the damning research into food safety', 12/2/1999, *The Guardian*, [252]). The reality which Pusztai's experiment tries to imitate is the reality of eating GM food. However successful his imitation is, Pusztai's experiment is set up to understand what would happen if people eat GM food as his rats do. In other words, Pusztai defines the problem of GM food as the effect of eating GM food frequently. But there are different ways of problematising GM food, and the reality in which GM food is situated cannot be simplified as Pusztai does in his experiment. We can represent a different reality in which there is someone developing the technology of genetic engineering into its present format for particular purposes and in favour of particular interests. In this different reality the problem of GM food is not simply defined as the

risk of eating it and we are therefore led to consider why the technology was developed and used in such a way. No matter how scientific Pusztai's findings are, they are irrelevant to the public discussion about GM food because they represent a reality in which the present form of the technology is taken for granted and in which we are deprived of the opportunity to participate in the process of shaping the technology. In other words, Pusztai's findings represent a reality different from the reality which GM food should be situated in and which we should be concerned with.

But news stories lead their readers to consider whose science is credible through the boundary-work of good science. They not only depict Pusztai as a good scientist but also find a bad one to be compared with. Professor Philip James, the director of the Rowett Institute at the time, is characterised as the bad scientist in the moral narrative. The story in *The Guardian* claims that Professor James 'had personally cleared the interview with Granada and put his name to official press releases supporting the programme' ('Ousted scientist and the damning research into food safety', 12/2/1999, *The Guardian*, [252]). It suggests that Professor James is irresponsible. Another story indicates that Professor James is a scientist who is ambitious for power. The story says that Philip James 'is no simple scientist chained to a laboratory bench' and 'whenever a dispute arises in the area of nutrition, it is a safe bet that Professor James will be involved' ('Professor who champions healthy eating', 13/2/1999, *The Times*, [265]). The story goes on to say:

The irony is that the institute he heads is not even involved in human nutrition. The Rowett's main purpose is animal nutrition but Professor James has never allowed that to stand in his way. He has championed the cause of healthy eating, acting as a powerful figurehead for pressure groups seeking to change the British diet. His supporters saw him as the obvious candidate to lead the food standards agency when it is finally set up – he wrote the blueprint for the agency at the request of Tony Blair – but age and a couple of high-profile controversies have probably put paid to that ambition ('Professor who champions healthy eating', 13/2/1999, *The Times*, [265]).

The story portrays Professor James as a scientist who is eager to be influential and suggests that he attempts to use his science for achieving fame and power. It

implicitly says that what he expects from his science is not knowledge but mundane interests. By portraying Professor James in this way, news stories not only discredit his action against Pusztai, but also complete the boundary-work of good science to distinguish Pusztai's disinterested science from Professor James' interested one.

The reason why the boundary-work of good science is problematic is not because the boundary drawn by news stories is 'inappropriate' but because the boundary-work leads people to pay too much attention to drawing the boundary. Perhaps Pusztai is really a disinterested scientist, and Professor James is a bad scientist who is ambitious for non-scientific power. But even so, the boundary drawn by news stories to enhance the credibility of Pusztai's findings can only lead their readers to consider who can be the good scientist to determine the risk of GM food. No matter whether Pusztai is the good scientist who can reveal the facts about GM food, he does not consider why there is a need to modify potato genetically when he feeds his rats with GM potatoes. Instead he just accepts GM potato as a ready-made product which is available in the market. If we, as readers, follow the moral narrative to accept Pusztai's findings as facts, we also accept Pusztai's way of positioning GM food products in our lives. We identify ourselves with Pusztai's rats which can only be 'fed' with GM potatoes but not with citizens who can consider what a potato is genetically modified for. The boundary-work of good science leads us to rely on scientific knowledge and to consider which science is good to determine the effect of eating GM food. But the problem of GM food is not only its impact on human health but also its history in which it has been developed in one way rather than another. The boundary-work leads us to expect that good science, if we could find it, can settle the controversy of GM food without thinking whether the controversy can really be settled by science alone.

Moreover, the boundary-work of good science transforms the discussion about scientific knowledge into a moral debate about the trustworthiness of the scientist who makes the knowledge. When we use the norm of disinterestedness as the criteria to decide which science is credible, we focus on examining whether the scientist

does his/her research without being influenced by the contextual values of science. The goodness of Pusztai as a scientist embodies our expectation that scientists should be concerned only with scientific facts. News stories try to persuade us that Pusztai's findings are credible by portraying Pusztai as an ideal scientist. This portrait of an ideal scientist both embodies and appeals to what the society 'deems the best and most noble of its sentiments and prejudices' (Waddell, 1997: 141). But the boundary-work leads us to consider if the knowledge is produced by a disinterested scientist but not the values which the knowledge embodies. Pusztai might be a good scientist, and he conditionally supports the release of GM food as long as there are 'rigorous and independent trials' ('Ousted scientist and the damning research into food safety', 12/2/1999, *The Guardian*, [252]). His research reflects his value judgment that the risk of GM food is the only significant issue to be considered. Therefore, the boundary-work of good science in news stories leads us to consider science morally but not politically. We are led to consider who does science in the 'right' way but not how science suggests that we should define the problem of GM food in a specific way.

Perhaps we should consider why the credibility of particular risk knowledge is represented in news stories as a significant issue in the GM debate. One reason is because of the 'public distrust' in scientific governance in the UK after the BSE crisis. Healey points out that the GM debate is 'framed in part by the crisis in public trust in scientific governance occasioned in the UK by the BSE crisis' (2004: 4). When Pusztai's findings indicate different facts from the governmental ones, it becomes necessary for news stories to do more boundary-work in order to determine which one is good science. When news stories about the controversy of Pusztai's findings refer to the BSE crisis, they lead their readers to consider whether governmental science can be trusted this time. In this respect, the reference to the BSE crisis brings the controversy to its next stage. News stories try to explain why governmental science is 'problematic' and they find a good reason, which is Lord Sainsbury who blurs the necessary boundaries between politics, industry and science. Before I

explore how Lord Sainsbury is characterised as the villain in news stories, I explore how the reference to the BSE crisis functions to implicitly discredit governmental science.

Mad Cow Disease and the Beefburger: A Good Example for Distrust

News stories construct the moral narrative about Pusztai in order to establish the credibility of the risk knowledge produced by Pusztai about GM food. News stories not only lead their readers to consider the issue of credibility, but also link the credibility of particular knowledge to the trustworthiness of the people who produce the knowledge. However, why is it so important for the GM debate to find disinterested and credible science? In this section, by examining the reference to the BSE crisis in the news stories about Pusztai, I argue that the attempt to find disinterested science has its root in the public distrust of governmental science, which is seen as being too close to political power and thus in danger of being abused. The BSE crisis, especially the visual image in which the former agriculture minister John Gummer feeds his daughter a beefburger, is frequently used as a 'good example' to demonstrate the incredibility of governmental statements on the issue of food safety. When news stories implicitly suggest that the controversy about Pusztai is a recurrence of the BSE crisis, they also divert our attention to the credibility of governmental assertions on the safety of GM food. News stories focus on the issue of trust and lead the readers to wonder why the government can still claim the safety of GM food on the basis of its own scientific evidence after Pusztai discovers the facts about GM potatoes. By referring to the BSE crisis, news stories move the controversy about Pusztai to its next stage on which a new character, Lord Sainsbury, can be presented. However, news stories lead their readers to consider whose science can be trusted and why, but not why they should only trust in science. The failure of governmental science, both in the BSE crisis and the controversy about Pusztai, is not due to the politicisation of science but due to the scientisation of politics. The governmental science fails because it is expected to settle a controversy which it can not settle but not because it is abused or polluted by political power.

After Pusztai was supported by other scientists, the government was under pressure 'to explain why the Government had been quick to stop the sale of beef on the bone in the "mad cow" disease scare while taking a seemingly far more relaxed attitude to GM food' ('Blair resists calls for ban', 13/2/1999, *The Times*, [262]). The story says that the prime minister 'insisted that there was yet no scientific justification for a moratorium on GM foods'. And the Cabinet Office minister is also quoted in the story as explaining the difference between the case of GM food and the BSE crisis: 'in respect of the beef-on-the-bone ban, the Government had clear advice from its advisory bodies to act; there was no similar advice in respect to GM food'. This story takes Pusztai's findings as scientific evidence to question the governmental policy on GM food. The story founds its question on a comparison between the mad cow disease scare and the public anxiety about GM food. The two cases are comparable because they both relate to the issue of food safety and because the government claims that its decision is made on the basis of scientific advice. But this comparison is a construction which frames the controversy of Pusztai's findings as a problem concerning food safety and the credibility of the government. Through comparisons with the BSE crisis, news stories remove the event from its original context where Pusztai is punished for revealing the facts about GM food to the public, to a broader political context in which the government needs to defend its credibility and accountability.

Because the government claims that its decision is founded on its own science, news stories need to explain why there can be two conflicting scientific arguments. Since the credibility of Pusztai's findings is established in news stories, the government is required to justify its own inaction to GM food. For example, in the news story in *The Guardian*, Ronald Finn, who is the 'former president of the British Society of Allergy and Environmental Medicine' and 'one of a group of scientists' calling for 'a five-year freeze on new GM foods', is quoted as saying:

We in the UK have just had a very narrow escape following the epidemic of mad cow disease. I think we probably got away with it. We have been

warned once, we have had an escape and we should be extremely careful to monitor any further major change in food technology ('Blair rules out block on new genetically modified crops', 13/2/1999, *The Guardian*, [266]).

The story also carries the reply of the prime minister:

There is no GM food that can be sold in this country without going through a very long regulatory process. Let's proceed on the basis of genuine scientific analysis and inquiry, proceed with very great care and caution and not get the facts mixed up ('Blair rules out block on new genetically modified crops', 13/2/1999, *The Guardian*, [266]).

Both Ronald Finn and the prime minister argue that GM food should be examined carefully, although they have different evaluations of the present situation and come to different conclusions. However, when Finn refers to mad cow disease, he enhances the power of his argument because he demonstrates that his argument is grounded on a previous case from which we should learn a lesson. On the contrary, under the shadow of the mistake which it has made in the BSE crisis, the government becomes vulnerable because it needs to defend its decision against the question that the present event can become a recurrence of the BSE crisis. When the credibility of Pusztai's findings is established by the moral narrative about Pusztai and the reference to the BSE crisis puts the government on the defensive, it is necessary for the government to prove that its science is also credible. But the government finally fails to do it because news stories find the reason why governmental science cannot be trusted. The government cannot be trusted because the science minister, Lord Sainsbury, transgresses the necessary boundaries between politics, industry and science.

The reference to the BSE crisis can be sensational when news stories use the visual image of John Gummer eating beefburger with his daughter. For example, two news stories in tabloids, 'Tony Blair does a John Gummer' (16/2/1999, *The Sun*, [270]) and 'Will Blair be made to eat his word?' (16/2/1999, *The Daily Mail*, [268]), use the photo of John Gummer and his daughter to remind their readers that the government has made a mistake before. On the basis of the implications of the photo, the stories

suggest that the prime minister cannot be trusted either. The story in *The Sun* says that ‘he [Tony Blair] abandoned his usual caution and insisted he would feed genetically modified food to his family’, and that ‘the statement revives stark memories of former agriculture minister John Gummer who fed beefburgers to his daughter Cordelia at the height of the Mad Cow crisis’ (‘Tony Blair does a John Gummer’, 16/2/1999, *The Sun*, [270]). The story in *The Daily Mail* also says that ‘when John Gummer and his daughter tucked into beefburgers during the BSE crisis, the agriculture minister’s subsequent attack of indigestion lasted for years’, and that ‘Mr. Blair will be hoping that his actions yesterday will not have a similar disastrous effect’ (‘Will Blair be made to eat his word?’, 16/2/1999, *The Daily Mail*, [268]). Both stories compare Blair’s statement on the safety of GM food with John Gummer’s ‘imprudent act’, and they lead the readers to consider whether the government can be trusted this time.

Therefore, the references to the BSE crisis in news stories help to change the scene of the event. In the new scene, the spotlight is cast at the credibility of the government and Pusztai’s findings are moved to the background. The comparison to the BSE crisis not only justifies the distrust in governmental assertions on the safety of GM food, but also raises question about the credibility of governmental science. But the reference to the BSE crisis also helps to define the problem of GM food as a problem of food safety and to confine the discussion about this problem to the issue of trust. When news stories suggest that the controversy of Pusztai’s findings can be a recurrence of the BSE crisis, they lead their readers to ask such a question: when governmental science has a different opinion from Pusztai’s science on the safety of GM food, which one should we trust? However, this question is unproductive even though news stories finally find an answer to it by demonstrating how untrustworthy governmental science is. It is unproductive because it naturalises riskification as the legitimate way of problematising GM food (see chapter 3), and because it leads people to think that science can reveal the facts about the risks of GM food products (see chapter 6). The reason why we need to do the boundary-work of good science is

because we define the problem of GM food as a scientific one and because we think that the problem can be solve by good science. However, the problem of GM food can be defined differently and the boundary-work leads to a narrow definition of the problem. The reference to the BSE crisis not only confines the discussion to the issue of food safety, but also forces us to 'take sides': we can only decide whose science we can trust in order to decide whether to accept GM food products. When news stories characterise Lord Sainsbury as the villain who pollutes governmental science with his own political and commercial interests, the government loses its credibility and the boundary-work of good science is finally completed.

Jasanoff argues that 'public confidence in governmental advisers is secured through testing the reliability of persons rather than (primarily) the rationality of their views' in the British regulatory process (1997: 228). She argues that this public confidence requires a set of background conditions, including 'a widely shared and unambiguous problem definition, relative certainty about the relevant "objective facts", clearly identifiable expert knowledge about these facts, a reasonable convergence of societal values, and a more or less bounded space for the articulation of views and conduct of deliberations' (229). And when all these conditions come into existence, 'a discreet, well-insulated process, founded on expert judgment, may be quite capable of producing decisions that are balanced, persuasive, efficient and, most important of all, *right*' (229). However, when these conditions simply do not exist, the presumed distance between citizens and experts is greatly reduced, and it leads to the situation of 'civic dislocation', in which a mismatch happens between what governmental institutions are supposed to do for the public and what they do in reality (223). News stories refer to the BSE crisis in order to raise questions about the credibility of politicians and the experts working for the government in the controversy of Pusztai's findings. The reference leads us to think that the reason why governmental science finally fails to support a right political decision on GM food is because politicians and experts cannot be trusted. But the 'failure' of governmental science in the case of GM food is, in fact, due to the nonexistence of the conditions which

Jasanoff identifies. Jasanoff argues that an important lesson which should be learned from the BSE crisis, is that 'earlier engagement between citizens and experts might have led to more comprehensive and better characterization of risks, as well as well diversified and realistic policy responses' (230). However, the reference to the BSE crisis in news stories does not lead us to learn this lesson but to discredit politicians and the experts working for the government. News stories do not lead us to think that the definition of risk in the case of GM food is actually ambiguous and problematic, and that we can have different ways of solving the problem of GM food. Perhaps what we need is not the credible experts to tell us what to do, but a more democratic process in which we, as citizens, can decide what to do together with experts.

Therefore, when references to the BSE crisis in news stories confine the discussion about Pusztai's findings to the issue of trust, news stories need to decide whose science can be trusted because there can be only one 'good' science revealing the facts about GM food. When news stories establish the credibility of Pusztai's science by constructing the moral narrative about Pusztai, they need to find a reason to explain why governmental science has a different conclusion about the risk of GM food from Pusztai. However, when stories begin to do more boundary-work of good science by showing how Lord Sainsbury pollutes governmental science with his own interests, they lead their readers to think that the constitute values of science can and should be fenced from the contextual values. They suggest that the reason why governmental science fails to produce credible knowledge is because the necessary fences between politics, industry and science are broken down, but not because the question is not defined clearly enough to be answered by science.

Bad Scientist: Lord Sainsbury as a Chameleon

The conflict between Pusztai's science and the government's approach is in fact a construction which news stories produce on the basis of the expectation that there can be only one scientific fact about the risk of GM food. News stories construct the moral narrative about Pusztai and refer to the BSE crisis in order to justify their

questions about the governmental confidence in the safety of GM food. But their questions reflect that science is expected to provide an uncontroversial and universal answer to the question about the risk of GM food. Therefore, when governmental science cannot reach the same conclusion as Pusztai's science, there must be a reason why governmental science fails to do its job. For example, the news story in *The Times* says that 'Mr. Blair's personal opinion was released in an attempt to counter negative publicity about the foods', and that 'ministers are worried by polls suggesting that the public is alarmed about genetically modified food and by suggestions that the Government is too close to the industry' ('Blair eats "healthy" genetic food', 16/2/1999, *The Times*, [272]). The story suggests that the government's assertion about the safety of GM food is an attempt to counter the public hostility to GM food. However, the story also leads its readers to wonder why the government needs to 'take sides' with GM food and the biotech industry. Because of the credibility of Pusztai's science and the reference to the BSE crisis, it seems that the reason why the government supports GM food is not only because its science says that GM food is safe to eat. Therefore, when Lord Sainsbury's interest in the biotech industry is revealed in news stories, the public distrust in the government can also be justified. News stories can challenge governmental science without questioning the authority of science, because the problem is that the authority of science is abused by an interested politician/businessman but not science itself.

The revelation of Lord Sainsbury's interest in the biotech industry is important because it helps to complete the boundary-work of good science. The authority of science to produce facts about GM food can only be legitimated when one of the conflicting scientific arguments is proved to be credible and others are proved to be not scientific. In other words, governmental science has to be demonstrated to be interested in order to solve the conflict between different scientific arguments. The boundary-work of good science needs to be completed by denying the authority of other contesting arguments. Gieryn argues:

Cultural cartography happens when there is something valued on the line:

material resources, prestige, the truth of a cherished claim, and power... the stakes for all sides become part of the cartography: interests are attached (to others) or denied (on our side) in order to legitimate our map as an accurate rendition, rather than some self-interested distortion, of a 'real' culturescape (Gieryn, 1999: 356).

By attaching Sainsbury's interest to governmental science, news stories complete their boundary-work of good science and legitimate the map which they draw as an accurate rendition. But if cultural cartography happens when there is something valued on the line, perhaps we should consider what is valued on the boundary which news stories try hard to draw. What is valued on the boundary of good science is the power to determine what the facts about GM food are. This power is valued because the controversy of GM food is expected to be settled by the facts. But why should we ground our decision about GM food on the facts which are produced in the name of science? Why should we feel anxious when we cannot have the uncontroversial facts about GM food? Why should we try hard to find the credible science in order to legitimate particular scientific knowledge as an accurate description about the world? News stories fail to address these questions, and they lead us to expect that good science can finally produce the uncontroversial facts about the risk of GM food.

The news story in *The Times* says that the Science minister, Lord Sainsbury, is revealed to own a firm called Diatech Ltd which has the patent to the 'cauliflower mosaic virus promoter':

Lord Sainsbury's interest in the gene was placed out of reach in a blind trust when he joined the Government and the Department of Trade and Industry said that Diatech had nothing to do with his ministerial work. But the disclosure of another of his extensive links to the GM food industry is certain to prompt Tory demands for his resignation ("Blair eats 'healthy' genetic food", 16/2/1999, *The Times*, [272]).

The 'cauliflower mosaic virus promoter' is 'at the centre of the controversy', because it 'has been said to damage the vital organs and immune system of laboratory rats' in Pusztai's findings:

He [Pusztai] and his colleagues believe the harm, including shrinkage of the brain and thickening of the stomach wall, could have been caused by

the cauliflower mosaic virus promoter, a conclusion which threatens the multi-billion pound GM industry. It is the cauliflower mosaic promoter which is owned by Lord Sainsbury's private company. The promoter is vital because it acts as an "on/off switch" to boost the growth of the GM product ('Revealed: Lord Sainsbury's interest in key gene patent', 16/2/1999, *The Guardian*, [274]).

Therefore, although there is no direct evidence proving that Lord Sainsbury has suppressed Pusztai's research or has influenced governmental science, it seems to be reasonable to suggest that Sainsbury's interests, the governmental assertion on the safety of GM food and Pusztai's tragedy are possibly related. This suggestion is not only founded on the fact that Sainsbury owns the patent to the gene which Pusztai identifies to be harmful to rats' brains, but also the fact that he switched the holding of the patent 'into a blind trust' three days after he joined the government. Because of both facts, news stories can discredit governmental science only by demonstrating how untrustworthy Lord Sainsbury is.

But when news stories complete the boundary-work of good science by revealing Sainsbury's interests, they reflect the expectation that the constitutional values of science can and should be fenced from the contextual values. The news stories about Sainsbury try to demonstrate how he might abuse the authority of governmental science for his own interests. The question which news stories aim to explore is whether an interested politician has corrupted governmental science but not why governmental science has failed to do its job. News stories assume that science can go 'wrong' only when it is abused by politicians or it is not purely good science. For example, the story in *The Times* says that 'Lord Sainsbury of Turville, the Science Minister, was accused of being a "lame duck" last night after announcing that he would leave government meetings whenever genetically modified food policy was raised' ('Sainsbury opts to stay out of GM decisions', 17/2/1999, *The Times*, [277]). In the story, on the one hand, the prime minister says that Sainsbury 'was being "hounded" over disclosures that he owned a patent connected to biotechnology', but on the other hand, the Tories say that 'it was "ridiculous" that a Science Minister had to absent himself from scientific discussions'. But no matter why Sainsbury decides

to leave meetings concerning GM food policy, he responds to the questions about his interests by showing that he would not use his power to influence the policy-making on GM food. In another story in *The Sun*, the shadow trade secretary says that 'it would be best if he [Sainsbury] resigned so we could start to restore public confidence' ('Sainsbury boss a "lame duck" in gene storm', 17/2/1999, *The Sun*, [279]). But the prime minister accuses 'the Tories of a witch-hunt' and insists that 'there is no conflict of interest whatsoever'. Both stories represent the controversy of Lord Sainsbury as a doubt about his conflict of interest. Both stories lead the readers to wonder if Sainsbury misleads the government and its science for his own interests. However, are Sainsbury's interests the only problem of policy-making on GM food? Can the government really make an impartial policy on GM food, which is grounded on disinterested scientific evidence, after Sainsbury leaves all the meetings? And the most importantly, can the problem of GM food really be solved by disinterested policy or disinterested science when we do not have an agreed and clear definition of the problem? News stories fail to address these questions.

In order to complete the boundary-work of good science, news stories try to show the untrustworthiness of Lord Sainsbury without presenting any proof that he has 'misled' the government and its science. If the portrait of Pusztai in news stories embodies the ideal image of a good scientist, Sainsbury is portrayed in news stories as a bad scientist/businessman/politician because he blurs the necessary boundaries between these three roles. Firstly, news stories describe that Sainsbury changed his subject from history to psychology when he studied at Cambridge, because of 'the excitement generated by the scientists Crick and Watson who had made ground-breaking discoveries about DNA' ('The man who spurned rock and roll for science', 16/2/1999, *The Guardian*, [280]). This story describes Sainsbury as a man who 'turned his back on his arts friends and transformed himself into a scientist':

Since then Lord Sainsbury has immersed himself in the world of science and likes nothing better than to curl up in bed at night with the latest tome on cognitive neuroscience or plant biology. When asked his ambition in life, he reportedly said he dreamed of his fairy godmother turning him into

a Nobel Prize winner in plant genetics ('The man who spurned rock and roll for science', 16/2/1999, *The Guardian*, [280]).

The reason why Sainsbury changed his mind to study psychology is because he was 'bored with churning out history essays' and found his 'true interests' in science. But his interests are less in science itself than in achieving remarkable success, such as winning the Nobel Prize. The story suggests that the reason why Sainsbury is interested in science is not because he wants to change the world through scientific practice, but because he dreams of the achievements which a successful scientist can have. The story suggests that for Sainsbury, science is a tool to achieve fame and power; in other words, his science is interested from the very beginning.

Secondly, news stories describe Sainsbury as passionate and romantic. In the news story in *The Times*, it is said that 'on leaving university he did not pursue a scientific career' but 'instead he entered the family firm and followed his other great passion, politics' ('Sainsbury opts to stay out of GM decisions', 17/2/1999, *The Times*, [277]). The story in *The Guardian* states that 'when the call came from Downing Street last year summoning him to join the Government as science minister, Lord Sainsbury hoped he would be able to indulge his two lifelong passions of science and politics' ('The man who spurned rock and roll for science', 16/2/1999, *The Guardian*, [280]).

Moreover, according to *The Daily Mail*:

Lord Sainsbury has always been a man torn by a private, all-consuming passion. Friends say the shy, diffident, cerebral billionaire shows more enthusiasm for the genetically-modified food innovations funded by his personal charitable trust than for his family's mundane grocery business ('Lord Sainsbury, the GM evangelist', 17/2/1999, *The Daily Mail*, [282]).

All the news stories claim that Sainsbury has a passion for several things. He has various identities, for example, the billionaire who is in charge of his family business, an enthusiast for GM innovations, and a politician. He has many interests and can easily cross the boundaries which are supposed to be set up between science, business and politics. News stories portray Sainsbury as a passionate and romantic person who uses all his resources to pursue his goals, like a rich playboy who fancies

his lovely toys. For example, the story in *The Guardian* describes how ‘in recent years Lord Sainsbury has poured in to the study of genetically modified organisms through the Gatsby Charitable Foundation which he set up in 1987’ (‘The man who spurned rock and roll for science’, 16/2/1999, *The Guardian*, [280]). This foundation ‘was named after F. Scott Fitzgerald’s 1920 playboy’. Sainsbury explains why he has named ‘such a worthy foundation after such an extravagant playboy’: ‘it’s a great romantic book and I am a very romantic person’, and ‘romantic to me means having a vision of something you pursue that is way behind what is reasonable’. News stories portray Sainsbury as a romantic but playful person. They suggest that Sainsbury always pursues something which he has passion for, and he can be so ‘romantic’ because he has the power to wander in the different worlds of science, politics and business. In this respect, news stories implicitly argue that Sainsbury is too romantic and powerful to be trusted, and that his passion for GM food is just not serious enough.

Finally, news stories suggest that Sainsbury’s participation in different worlds leads to his conflict of interest, and that the reason why he advocates GM food products is because he can make profits from it. Sainsbury is dangerous because he breaks the walls between different worlds. His science is polluted by his interests in politics and business. For example, according to *The Guardian*:

During six years as chairman of Sainsbury’s, the Labour peer [Sainsbury] was a powerful advocate for GM food which, he believes, could dramatically reduce supermarket bills. Tories claim his interest is inspired by more than intellectual curiosity because Lord Sainsbury owns a £1 billion shareholding in the family supermarket chain whose profits are set to soar if GM food is allowed to reach its potential (‘The man who spurned rock and roll for science’, 16/2/1999, *The Guardian*, [280]).

The story also claims that Sainsbury ‘was one of a handful of multi-millionaire business leaders who supported Mr. Blair after he became the Labour leader in 1994’, and that ‘he was listed among donors as giving Labour more than £5,000 in 1997, although the true figure is believed to be closer to £3 millions’. Another story in *The Daily Mail* argues that:

In fact, Lord Sainsbury is a unique figure in Britain – standing at the heart of the whirlpool of genetically modified trouble swirling around the Government. He has fingers in all three GM food pies. Firstly, he is the Government Minister in charge of gene policy. Secondly, he has millions invested in companies and laboratories developing mutant crops. Thirdly, as the head of his family firm for three years, he pioneered the sale of Frankenstein food to the public which still continues. Significantly, he was never at ease as Sainsbury chairman. His real passions lay outside supermarkets, in hobbies such as plant biology ('Lord Sainsbury, the GM evangelist', 17/2/1999, *The Daily Mail*, [282]).

Both stories illustrate how Sainsbury wanders in different worlds: he supports the Labour party financially in order to achieve his political power, he invests in the research of genetic engineering, and he promotes GM food products because his business can make profits from them. His investment in developing GM food products and his participation in the government are both related to his interests in business. Therefore, news stories suggest that he cannot be trusted because his science, politics and business are all related to his own interests.

By all these episodes, news stories implicitly indicate that Sainsbury is concerned less with science than with his own political and economic interests, and thus it is hard to imagine that he has not used his power from his position in the government to press for his interests. Stories represent Sainsbury's untrustworthiness in order to justify their questions about the credibility of the government when it asserts the safety of GM food. Because of Sainsbury's conflict of interest, even though the government claims that there is no scientific justification for the moratorium on GM food, news stories lead their readers to wonder if the government makes its decision only because of the absence of scientific justification. In this respect, Lord Sainsbury becomes the embodiment of the incredibility of governmental science because he is a good example that science can be abused for non-scientific interests. News stories provoke public distrust in governmental science by showing Sainsbury's untrustworthiness and conflict of interest. This provoked distrust reflects the expectation that the disinterested science can reveal the facts about GM food. New stories lead their readers to consider whether the government and its science can be

trusted and to expect that the good science can finally solve the problem of GM food. But above all, news stories do not explore why we need to face the problem of GM food and what exactly the problem is. News stories assume that the only problem of GM food is its risk and only good science can solve it by producing credible and correct risk knowledge.

It is difficult to define Lord Sainsbury as a politician, a businessman or even a scientist; however, this difficulty in defining is exactly the problem which makes Sainsbury untrustworthy. The difficulty in defining means that it is difficult to put Sainsbury into a socio-political order in which the worlds of science, politics and business should be unambiguously separated. Sainsbury is too flexible and ambiguous. He is a 'chameleon' whose identity is difficult to be determined, and therefore he is dangerous and unreliable. Sainsbury's unreliability reflects the expectation that the worlds of science, politics and business should be fenced off from each other. The boundary-work of good science can be more successful when the boundary is drawn on the map of 'the already constructed social world' (Kinchy and Kleinman, 2003: 870). The boundary between Pusztai's science and Sainsbury's science (or governmental science) is drawn on the socio-culturally constructed map on which the worlds of science, politics and industry are clearly demarcated. Pusztai's science is credible because it struggles with non-scientific power and can thus be separated from non-science. By contrast, Sainsbury's science is interested because it is too close to politics and industry so that it cannot be distinguished from them. Sainsbury's credibility can hardly be established because he violates the political and cultural order which we naturalise and learn our cultural meanings from. Sainsbury blurs the lines which should be clearly drawn in the order. He can not be trusted because he makes us confused; his science, politics and business are not as clearly-distinguished as we expect. In other words, Sainsbury can only be a competent politician, a successful supermarket billionaire or a good scientist who is interested in the technology of genetic engineering, but he can never be all of them at the same time. He can only be trustworthy when we can define him unambiguously.

Sainsbury's problem is not only his conflict of interest, but also his confusing identities. His confusing identities disorder the order which we naturalise politically and culturally.

Therefore, news stories suggest that the boundary of good science is the boundary which can separate science from non-science. The boundary-work of good science completed by news stories reflects the expectation that our life world should be ordered and that science should be clearly differentiated from politics and business. When science can be differentiated from politics and business, it can be objective and can produce the knowledge which we need. In the case of GM food, the reason why we need good science is because we think that we need objective risk knowledge about GM food. However, as discussed in the last chapter, the riskification of GM food is itself a value-laden way of problematising GM food. No matter how credible and disinterested scientific risk knowledge can be, it is value-laden because it leads us to define the problem of GM food and to solve the problem in a particular way. The boundary-work of good science in news stories reproduces the expectation that the authority of science can only be established on the separation between science and society. But when we are concerned only with the boundary which can separate science from non-science, we forget to consider how science defines the problem of GM food and whether we should accept its definition of the problem.

Perhaps we should not be concerned only with the disinterestedness of science in order to find the credible scientific knowledge. We should be also concerned with the relevance of science to the problem which we face. Before we consider whether scientific knowledge is relevant to our problem, we should at first consider how we should define the problem. The boundary-work of good science leads us to consider how to differentiate science from non-science but not to consider what science can really do for us. Science can only produce risk knowledge about a risk object which it can define and identify. In the case of GM food, what we need to settle the controversy is not risk knowledge but a more democratic and productive way of defining the problem. When GM food is developed by someone for some purposes,

we should not easily accept it as a ready-made object which can be defined by science in order to produce risk knowledge about it. Instead we should consider why and how GM food is developed into its present format.

Contesting for the Right Boundary of Good Science

The boundary-work of good science in news stories reflects our expectation to find the existence of credible science. And the boundary which news stories draw for good science is a boundary which tries to distinguish disinterested science from biased science. It is a boundary which reflects the expectation that science should be fenced from politics and business in order to protect its objectivity and value-neutrality. However, this boundary is not the only boundary of good science which is often drawn in the GM debate. As discussed in my analysis of the scientists' letter to the prime minister, the boundary between disinterested and biased science is not fixed and another boundary of good science which is often drawn is the boundary between pure and distorted science. The scientists who work with the biotech industry resist the cultural map on which the worlds of science, politics and industry are clearly demarcated, and they draw another boundary to claim their science but not science in the media is credible.

In the following section, I illustrate how different boundary-works of good science contest for the right boundary by analysing two news stories. Different ways of drawing boundaries embody different values, but they all claim that science, at least the good one, has the authority to determine which facts are relevant to the discussion about GM food. Those opposed to GM food try to enhance the credibility of their arguments by demonstrating the disinterestedness of their science, but the scientists working with the industry try to defend their pure science against irrational and political criticisms. They both seek to stabilise their preferred boundary of good science in order to claim their own credibility and to discredit the other. But they both fail to stabilise the boundary because they think that the boundary is a factual one and not a constructed one which is drawn on the basis of particular values.

Therefore, no matter how the boundary is drawn, the boundary-work of good science just leads the public discussion about GM food to a stalemate in which we can only choose our own preferred boundary.

One news story in *The Guardian*, which describes the situation of GM food product in America, is an example of the boundary-work of disinterested science. The story illustrates how science working on the technology of genetic engineering is used by the industry to make profits. The story argues that ‘compared to Europe, there is little public debate on the issue of genetically modified (GM) foods’ in America, and says that the American agriculture ‘has undergone an extraordinary revolution with none of the sound and fury that has accompanied parallel changes in computer science and telecommunications’ (‘Why Americans are happy’, 20/2/1999, *The Guardian*, [285]). Both comparisons, one with the situation in Europe and one with other technologies, suggest that the public acceptance of GM food product in America is unnatural and unusual. Mark Hertzgaard, the author of the book *Earth Odyssey*, is quoted in the story as saying that ‘the principal cause of this resounding silence is political’ and that ‘corporations have a greater control of the debate here’. The story says that ‘the links between the GM industry and the [American] government have been carefully cultivated’. It provides examples to demonstrate the links: for example, ‘when Monsanto brought a group of Irish journalists to the US recently to combat a spate of bad publicity, the visit included a tour of the White House’. It even quotes an analyst to say that ‘where Monsanto seeks to sow, the US government clears the ground’. Therefore, the story suggests that the public acceptance of GM food in America is the consequence of political and industrial support.

This story implicitly argues that the science working on the technology of genetic engineering in America is interested because it works for the industry. Scientists develop the technology of genetic engineering to create profitable food products for the industry, and therefore they do not reveal the truth to the public. Science works too closely with industry in America and finally it becomes one part of the industry. The story suggests that science, industry and politics work together to make the

American public accept GM food products without any resistance. Again, this story reflects the expectation that science, politics and industry should be fenced off from each other. Science can only be disinterested when it can be clearly differentiated from industry and politics.

However, one news story in *The Times* takes an opposite stance. The story aims to defend science working on the technology of genetic engineering and to argue that the public resistance to GM food products in the UK is an irrational panic provoked by the media. The subhead of the story says that ‘our fears over genetically modified foods have been fuelled by a media frenzy and inaccurate reporting’ (‘Do we care about the truth?’, 19/2/1999, *The Times*, [288]). The story criticises the first news story about Pusztai’s findings in *The Guardian*:

The GM-food frenzy was triggered by a two-page spread in *The Guardian* on February 12, claiming that tests on GM potatoes had damaged rats which had eaten them. Curiously, an almost identical article which had appeared in *The Mail on Sunday* at the end of January had passed unnoticed. *The Guardian* article, despite its length, did not address two key issues: that the GM potatoes tested were not intended as human food, and would never have passed muster as such; and that the gene inserted into them was for a toxin. Small wonder, perhaps, that they might have had damaging effects on the rats, though whether they actually did is still in dispute. By all normal journalistic standards, the story was holed below the waterline (‘Do we care about the truth?’, 19/2/1999, *The Times*, [288]).

The story also argues for the safety of GM food:

As it happens, GM foods have been better monitored and controlled in Britain than anywhere else in the world. Small trial plots are all that have been planted. No ill-effects to health have been observed, nor are they likely. Possible environmental effects are being carefully monitored (‘Do we care about the truth?’, 19/2/1999, *The Times*, [288]).

Finally, the story concludes:

Newspapers that join in a feeding frenzy put their reputations at risk and earn the contempt of readers who know about the subject. Worse, they help to create an atmosphere of fear which could threaten the forces which have made life less risky in the past century (‘Do we care about the truth?’, 19/2/1999, *The Times*, [288]).

The story assumes that people only question GM food products in terms of their risks. The story claims that the risk of GM food is never observed and thus proved. Therefore, the public fear of the risk is irrational because it is provoked by 'mistaken' media coverage. When this story asks the question 'do we care about the truth?' in its headline, the truth which the story refers to is the truth which can only be founded on observable and scientifically provable facts. The story also suggests that if GM food products could not be proved to have ill-effects on health and the environment, then we have no other reason to reject them as progress brought to us by 'the forces which have made life less risky in the past century'. It argues that if there was no evidence for their risks or that their effects could be monitored and managed, the opposition to GM food products is just an 'irrational panic' or 'the media feeding frenzy'.

Moreover, the story not only claims that the truth about GM food is distorted by the media, but also suggests that we can and should distinguish the truth from the distortion, the rational knowledge from the irrational emotion, and the pure science from distorted science. The story argues that the news story in *The Guardian* distorts Pusztai's findings and misleads the public to be anxious about GM food. This story does not claim that Pusztai's science is wrong but that the media make his science wrong. It draws the boundary of good science as the boundary between the good science which is interpreted correctly by scientists and bad science which is distorted by the media in order to publish sensational stories. It argues that in the GM debates we should be concerned only with the effect of GM food which can be observed and proved by scientific practice. Therefore, this story suggests that science has the authority to determine which facts are relevant to the GM debate; however, it argues that the science which can have the authority is the undistorted science, but not the disinterested science.

However, the story in *The Times* adopts the 'deficit model' of public understanding of science, which 'reflects an expectation that members of the public are relatively ignorant of science' (Lock, 2002: 87). The deficit model argues that the science represented in the media is 'characterized by inaccuracy, unwarranted certainty, and

oversimplification' (Gross, 1994: 6). Therefore, it claims that the task of public understanding of science is to avoid all the demerits of the coverage of science in the media. However, according to Gross, this model is problematic because of its 'mistake to locate the problem of public understanding in public ignorance' (7). He points out three defects of this deficit model. Firstly, 'it embodies a mistaken view of science': it tries to draw a firm boundary between science and its popularization, but simply no firm boundary exists (7). Secondly, the model 'isolates science from contexts that give it public significance' (8). Finally, the model deflects attention 'from the ethical and political issues science raises, or ought to raise' (9). It is obvious that the story in *The Times* also tries to draw the firm boundary between the real scientific knowledge and the distorted representation in the media. The story implicitly argues that the conflict in the GM debate is a conflict between rational knowledge produced by real science and irrational fear provoked by the distorted representation of science. The story suggests that science is always good if it is not misinterpreted or misrepresented. Both the boundary-work of pure science and the boundary-work of disinterested science attempt to legitimate the authority of science in the GM debate. The reason why different boundary-works lead to different conclusions is because they determine the good science on the basis of different values, but not because one boundary is more correct or appropriate than another.

The GM debate is 'far from being a debate for or against science', but is a debate between the science of pressure groups and the science of the government and the biotech industry (Reed, 2002: 500). Therefore, the boundary-work of good science seems to be so important in the GM debate because we think that we need to decide whose science is credible. But when we do not consider why to draw the boundary but only consider how to draw, we find that there are different boundaries and none of them can be stabilised as they are expected to be. The GM debate becomes a debate between our good science and their bad science, and the boundary can only be accepted by the people who draw it. But I am not arguing that we should try to find the correct boundary, because the boundary is not a factual but a constructed line

which can only be accepted when the value which it embodies is accepted. It can only be possible for us to decide which science is good when we know what kind of science we need. But more importantly, if what we need is not at all credible scientific knowledge, no science can be good because science is just irrelevant to our present problem. In the case of GM food, what we need is a more open and democratic discussion about the development of genetic engineering. In this discussion we can consider how to define the problem of GM food properly before we consider what of scientific knowledge we need for solving the problem.

Therefore, perhaps what we need is to open the black box in which the history of GM food is hidden. The reason why we make so many efforts to draw the 'right' boundary of good science is because we think that the good science can reveal us the facts about GM food. But we should recognise that the properties of GM food are something which GM food is developed to have but not something inherent in it. Science can only produce risk knowledge about GM food in an artificial and well-controlled experimental setting. In this setting, GM food is an object without history. If science finally identifies the properties which a particular GM food product was developed to have, we should consider who decides to develop the product in such a way and why before we try to find the credible science to identify the properties. When we start to consider why and how GM food was developed in such a way, we also start to see the limitations of science and to know that science cannot answer the question which we should ask about GM food.

Conclusion

The news stories about the controversy of Pusztai's findings try to find the credible science which we can trust by the boundary-work of good/disinterested science. News stories also try to establish the credibility of particular scientific arguments based on the trustworthiness of the scientists who make them. The boundary-work of good science in news stories reflects the expectation that science can and should be clearly differentiated from politics and industry. In order to enhance the credibility of

Pusztai's science, news stories produce the moral narrative to describe Pusztai as a scientist who struggles with non-scientific power to reveal the truth to the public. When news stories suggest that government's assertion about the safety of GM food can be a recurrence of the BSE crisis, they not only confine the public discussion about GM food to the issue of food safety, but also lead the readers to consider whether the government and its science can be trusted. And the revelation of Lord Sainsbury's conflict of interest in news stories provides the readers a good reason to distrust the government and its science. The confusing identities of Sainsbury disrupt the way in which science, politics and business should be fenced from each other. Pusztai's science is good because it is separated from politics and industry, but Sainsbury's science (or governmental science) is bad because it works too closely with politics and industry. The boundary-work of good science in news stories reflects the expectation that science can provide us the uncontroversial and universal facts which can settle the controversy of GM food.

However, the boundary of good science can be drawn in different ways on the basis of different values. The boundary is not a factual but a constructed line. The issue of credibility is centralised in the GM debate because science, if it is the good and credible one, is expected to solve the problem of GM food. But the problem of GM food is not as well-defined as it seems to be. Science can only produce risk knowledge about a risk object which it can define and identify. Therefore, when science produces risk knowledge about GM food, it also objectifies GM food as an object whose properties can be discovered but not discussed. The boundary-work of good science in news stories leads the readers to consider the credibility of particular scientific arguments but not to examine their ways of defining the problem of GM food. The boundary-work leads to a narrow definition of the problem because scientific risk knowledge about GM food can only be produced when GM food is defined as a ready-made object and the present form of the technology is taken for granted. But what if the problem is in the present form of the technology? We need to discuss how to define the problem before we decide what kind of science we need for

solving the problem.

The boundary-work of good science cannot produce a fixed and agreed boundary. Because different boundary-works can only produce different boundaries but none of them can be stabilised, we are required to choose our preferred boundaries. But why do we need to make efforts to draw the boundary of good science? Perhaps we should consider why we need to draw the boundary before we consider how to draw it. We are not only the consumers who can only choose to accept or reject GM food products on the basis of scientific facts, but we can also be the citizens who can participate in the process of shaping the technology of genetic engineering. When we start to identify ourselves as citizens rather than consumers, we also start to recognise that we do not need to find the credible scientific arguments among conflicting ones but we should consider why we develop GM food in one way rather than another.

5. Labelling GM Food and the Identity of the Consumer

As discussed in last chapter, the boundary-work of good science reflects the expectation that good science can produce the facts about GM food on which our decisions can be grounded. But different scientific practices produce conflicting facts, and contesting boundary-works of good science lead to a situation in which no single fact can be accepted by everyone. In such a situation, we cannot find the uncontroversial and universal facts about GM food on which our political decisions can be grounded. The government is thus required to fulfill its obligation to settle the controversy of GM food without visibly taking sides with any camp in the GM debates. This could be one of the reasons why, in 1999, the government introduced regulations concerning the labelling GM food products. The labelling of GM products reduces the problem of GM food to a technical one, which is to consider how to define GM food products and what information should be provided on the label. It also shifts the responsibility of decision-making to the consumer, who is assumed to be rational and calculated to make his/her decision on GM food when sufficient information is available to him/her. The labelling of GM food products is founded on the argument of 'consumer sovereignty' which considers the free market to be the most efficient means to satisfy people's wishes (Keat, 1991: 217). The argument of consumer sovereignty suggests that the satisfaction of people's wishes is intrinsically desirable, whatever the content or character of these wishes may happen to be. Therefore, by enforcing the regulation of labelling GM products, the government can not only retreat from engaging directly in the 'intractable policy controversy' (Schon and Rein, 1994) of GM food, but also legitimately require the public to take the responsibility of decision-making in the name of the authority of the consumer.

In this chapter I develop my discussion about the identity of the consumer by analysing news stories about regulations which require food manufacturers, shops and supermarkets in the UK to label their food products with GM ingredients. The

news stories about these rules mainly focus on their impact and practicability. They represent both the voices from the government and from people who are supposed to be influenced directly by the rules, such as the owners of restaurants and shops. The controversy about the labelling of GM food products is represented as a disagreement on the practicability of regulation, and people in news stories are in dispute mainly over the appropriate definition of a GM food product. However, the practice of defining GM food products is also the practice of making them visible in a specific way. Through the practice of differentiating GM from other natural or normal food, an artificial category of GM food products is created and thus GM food can be objectified and made visible. The regulation of labelling not only provides information to the public but also creates a particular way of defining and categorising GM food. In this respect, regulation is an ordering practice which tries to transform the ambiguous concept of GM food into a graspable and governable label. However, the difficulty of defining GM food products and of enforcing the regulation, which is discussed in news stories, indicates that an ordering practice is always incomplete and thus in danger of being resisted and challenged. Moreover, regulation reduces the information which is necessary for making an informed choice to the information about the nature of the food product. It suggests that when a food product can be defined clearly as GM or non-GM food, the consumer can make his/her own decision rationally and freely. As a result, regulation requires the prudential consumer to learn by him/herself the necessary knowledge in order to make the decision. But at the worst it can lead to a situation in which 'de-skilled' individuals depend more and more on the expert knowledge to search for the socially approved solutions to their own discomforts and anxieties (Bauman, 1992: 88).

When news stories mainly focus on the impracticability of regulation, they also marginalise the criticisms which indicate the problems of the argument of consumer sovereignty on which such regulation is founded. First of all, regulation regards the consumer as a 'separative self' (England, 1993). It assumes that consumer is autonomous and self-interested to make his/her choice in the market, and his/her

preference is impervious to social influences. Secondly, regulation adopts the economic model of choice which regards the consumer's choice as a comparison between available options in front of him/her on the basis of his/her calculation of want-satisfaction. Therefore, for the economic model of choice, it is significant only to consider how to choose but not the reason for choosing. In the case of labelling GM products, the model suggests that if a food product in the market could be well categorised and clearly labelled, it is not necessary to consider why the consumer makes such a choice rather than another, because the consumer's reason for choosing is the outcome of his/her rational calculation on the basis of his/her personal preference. Finally, when regulation adopts the economic model of choice which deflects our attention from available options to consumer's choice, it depoliticises the consumption of GM products and takes for granted the existence of GM products in the market. The consumer's choice is removed from the socio-cultural context where the choice is made. The consumer's preference is privatised and thus depoliticised, and the responsibility of solving the problem of GM food is further individualised. And we, as readers of news stories and consumers, can choose only to accept or reject GM food products whose existence cannot be questioned. We are deprived of the opportunity to take part in the process of shaping the technology. When the regulation of labelling GM products is mainly discussed in terms of its practicability, then criticisms are marginalised. In other words, news stories reproduce the ideology of individualism and neo-liberalism, and lead us to a situation in which we have no opportunity to participate in a more public and democratic discussion about the development of a new technology.

Labelling as classifying: an incomplete ordering practice

On March 18th 1999 the UK government announced tougher regulation concerning the labelling of GM food products, which requires food manufacturers, supermarkets and shops to label their food products with GM ingredients. They would face fines of up to £5,000 for failing to do it. Six months after the announcement, 125,000 caterers in the whole country must also know the GM contents of the foods which

they provide. Although caterers do not need to list every GM ingredient on their menus, they have to assure their consumers that consumers can know about the GM content of foods if they ask, and staff have to be trained to be able to provide the information. The regulations were announced nearly one month after the controversy of Pusztai's findings. As one news story in *The Guardian* suggests, the government announced 'tougher labelling controls which will also be extended to restaurants and cafes' in order to make 'a fresh attempt to allay fears over genetically modified foods' ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291]). Although we have no evidence to claim that there is a direct relation between the controversy of Pusztai's findings and the regulation of labelling GM products, we may consider the regulation to be a strategy adopted by the government to react to the public anxiety about the risk of GM food.

In news stories, regulation was mainly discussed by two groups of people. One side of the discussion was the government spokesman who explained the reason why regulation was introduced and defended its practicability. The other side was the people who were supposed to be directly influenced by the regulation, for example, the owners of restaurants who complained of the difficulty of putting it into practice. The food safety minister, who spoke for the government, explained that the purpose of the regulation was to protect the consumer's right to know: 'what we are asking restaurants to do is to be in a position so that if a customer asks if there are GM ingredients to know, not to say "I will check and find out next week"' ('Caterers given respite over GM labelling', 19/3/1999, *The Times*, [293]). He emphasised that the information should be provided to consumer with great precision:

Forget 'may contain'. We are not in the business of 'may contain'. It's got to say genetically modified or genetic modification. The EU directive states 'does contain' ('Caterers given respite over GM labelling', 19/3/1999, *The Times*, [293]).

The minister seems here to assume that the clear and precise information about the GM content of food product is the only information which the consumer needs for decision-making. The information which the regulation requires restaurants to

provide is the information about the nature of food products. The regulation only requires the restaurant staff to be able to define the GM content of the food which they serve. By contrast, people on the other side of the discussion criticised the new regulation of labelling as unworkable and unpractical. For example, according to Michael Gottlieb, director of the Restaurants Association:

Our members have spent a lot of money designing and printing menus and these may have to be changed to accommodate the new rules. Also, most of our suppliers don't have a clue whether or not their products contain GMs so how can they tell restaurateurs in the first place? ('Caterers given respite over GM labelling', 19/3/1999, *The Times*, [293])

Gottlieb also charged the government for avoiding its responsibility to address directly the safety of GM food products: 'if they are not [safe] they should not be produced and if they are then the Government should stick to its guns and not bow to idiotic pressure'. As a result, two oppositional opinions about the new regulation emerged in news stories, which mainly disagreed with each other on the issue about the practicability of regulation. However, neither opinion questioned the identity of the consumer who is addressed in the regulation. Both opinions further accepted the existence of GM food products in the market as something inevitable. In other words, news stories confined the discussion about regulation to issues about its technical details. The focus of the discussion in news stories was on technical questions, such as how a GM food product should be defined and how the information can be provided clearly. News stories led the readers to wonder how difficult it would be to enforce the regulation. But both sides of the discussion seemed to agree that if the appropriate and precise information could be provided to the consumer, he/she would make his/her own decision on GM food product, even if both sides had different opinions about the content of the appropriate information. News stories led their readers to consider how the information could be provided to consumer but not why the consumer needs the information.

Therefore, in news stories, the regulation of the labelling of GM food seemed to be problematic only in terms of its technical details. News stories mainly point out three

difficulties to put the regulation into practice. First of all, the restaurateurs are quoted in news stories as complaining that they can not bear their legal liability without imposing the same responsibility to their suppliers:

David Smith, chief executive of the Federation of Master Bakers said: ‘The vast majority of the food industry has no desire to mislead people. I am sure everyone wants to label accurately. But we are going to have difficulty knowing because there is no legal obligation for our suppliers to tell us (‘Restaurants face fines if they deny GM food on menu’, 19/3/1999, *The Guardian*, [291]).

Secondly, the necessity of this stricter regulation is challenged, because some supermarkets have already promised to withdraw their own-brand GM food products or to label them: ‘the failure of the new rules is demonstrated by the fact that they [GM food products] have already been left behind by the country’s major supermarkets’ (‘Modify your menus’, 19/3/1999, *The Daily Mail*, [297]). Finally, and more importantly, the definition of a GM food product which was adopted by regulation is criticised and challenged. For example, one story in *The Times* says:

The new laws will not apply to ingredients such as the emulsifier lecithin and cooking oils. Although these products are derived from the GM process they contain no GM protein and so any meal cooked in GM soya oil or a chocolate biscuit can be labelled GM-free (‘Caterers given respite over GM labelling’, 19/3/1999, *The Times*, [293]).

Another story in *The Times* quotes the environmental group Friends of the Earth who:

criticised the regulations for excluding foods that are derived from GM crops but which no longer contain any evidence of it. Examples include oils prepared from soya beans, which contain no proteins, and lecithins (emulsifiers made from soya) (‘Enforcement is likely to be costly and slow’, 19/3/1999, *The Times*, [294]).

However, we should recognise that these difficulties to put the regulation into practice are not due to the faulty design of the regulation but the incompleteness of regulation as an ordering practice. The practice of labelling GM food products is also the practice of defining, classifying and objectifying GM food products. Therefore, regulation is in fact an attempt to create an order in which GM food products can be

differentiated from other natural or normal food products. But unfortunately, the order which regulation attempts to impose on the world can never be stabilised. Instead, the imposition of order is often challenged and resisted.

The term GM food, as a noun, seems to refer to an object which exists out-there and thus can be defined clearly. However, when we try to label GM food products, we soon recognise that we need to draw a clear-cut but artificial distinction between GM and non-GM food by legitimating one particular way of defining GM food. But there are different ways of defining GM food, and none of them can differentiate GM from non-GM food without facing ambiguity or difficulty. There are at least two reasons why GM food cannot be defined simply and clearly. Firstly, food production is a process of mixture and combination. A food product is often a hybrid from various ingredients. In news stories at the time, restaurateurs argued that they could not fully know about their food products simply because they are at the end of the process of food production. Moreover, it is also problematic to define the food product which is a mixture with GM and non-GM ingredients. The solution to this problem of definition is to adopt a quantitative but arbitrary threshold to define the food product with certain percentage of GM ingredient as GM food product. In one story in *The Times*, a supermarket spokesman replies to a consumer's inquiry and says: 'while I have every sympathy with the position you have decided to take, i.e. avoiding eating any genetically modified ingredients or foods, I regret to say that in the near future you will starve' ('Eat up or starve, shopper is told', 19/3/1999, *The Times*, [296]). The spokesman explains that 'the fact is that soya and maize have been co-mingled, making it almost impossible to guarantee GM-free status', and that 'rival supermarkets' claims of a ban on GM foods were based on the fact that they allowed a tolerance, or threshold, of 1 per cent'. And in another story, one public analyst questions the quantitative threshold for GM-free food:

We can test for GM ingredients and say whether they are there or not but it is difficult to say how much is there. In any case, people who want to avoid GM foods will want to ensure that there is none there, not that it falls below an arbitrary threshold ('Enforcement is likely to be costly and slow',

19/3/1999, *The Times*, [294]).

The quantitative threshold of GM-free food is an artificial and arbitrary line. It is a line which is drawn by political or institutionalised power, and it has the effect of creating the category of GM food. This artificial line can only be stabilised by the support of power, and it is often challenged by critics who attempt to redraw the line. Bowker and Star argue that the 'enforcement of categories and standards involves negotiation or force', and that 'classifications, however dry and formal on the surfaces, are suffused with traces of political and social work' (1999: 49). The food product, which is a hybrid from GM and non-GM ingredients, can only be classified by a quantitative but artificial line. And this artificial line reflects the arbitrary and political nature of classification.

Secondly and more importantly, the problem of defining GM food is not only a technical problem. It is also a problem concerning the socio-cultural meaning which is embodied in a particular way of defining GM food. For example, when people criticise the regulation of labelling GM food, they not only question the technical details of the regulation, but also the order which the regulation attempts to impose on the world. When the food safety minister is required to explain why the regulation does not cover the ingredient refined to the point where its GM status is undetectable, he answers that 'if people have an ethical or environmental objection to the manufacturing process, I cannot police it' ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291]). To define a GM food product by the percentage of GM ingredient in the product is not only a way of objectifying GM food, but also a political action to make GM food visible to the public in a specific way. The regulation defines GM food as the food with certain amount of detectable GM ingredient so that it suggests that GM food should be examined as an object or a product but not a technology or a process of food production. Regulation attempts to create an order in which GM food can be artificially differentiated from GM-free food, but in the same order people can only accept GM food and its technology as something inevitable. What the minister does not explain is the reason why

regulation marginalises the issues about the manufacturing process of GM food. The definition of GM food in the rules leads the public to see GM food as an object but not a process in which GM food has been brought into existence.

In his discussion about the EU's eco-labelling scheme, Simmons argues that 'the eco-labelling mechanism is, and will continue to be, vulnerable to challenge because of the contestable nature of its embedded assumptions' (1997: 236). He argues that 'the social and cultural dimensions of environmental issues introduce ambiguities and tensions which frequently go unrecognised or unacknowledged by policy makers due to the realist framework within which they operate' (236). The practice of labelling GM food reduces a range of issues concerning the introduction of a new technology into our everyday life to the issue about the appropriate definition of GM food. GM food can have different meanings in our lives, but many of them are unrecognised in the regulation of labelling. As one member of Friends of the Earth argues:

Many people don't want GM ingredients at all and don't want to support GM technology. This [regulation] does not allow them to avoid supporting it. ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291])

The practice of labelling GM food is problematic not because of its technical fault but because it tries to reduce the problem of GM food into a technical problem. In this situation, when news stories focus on the practicability of regulation, they marginalise the criticisms about the 'realist framework' adopted by the government.

Therefore, the regulation of labelling is an ordering practice which aims to create an order in which GM food can be differentiated from other foods. But the order which it aims to impose can only be sustained by political or institutionalised power. Labelling GM food products is to make GM food visible. But the difference between GM and GM-free food products is a construction which is accelerated by regulation, and we should consider the impact when regulation differentiates GM from GM-free food in one way rather than another.

Factual information and the powerless consumer

When the food safety minister was questioned about the impracticability of regulation, he insisted that 'we think it's highly practical for claims to be checked out and consumers to be properly informed. It is possible to enforce these regulations' ('Modify your menus', 19/3/1999, *The Daily Mail*, [297]). In another story, the minister declared that 'this is not an issue of food safety. We are determined consumers should be able to choose whether or not to eat genetically modified foods' ('GM food to be labelled in all cafes', 19/3/1999, *The Sun*, [300]). The minister defends and justifies the regulation by referring to the consumer's right to know and right to choose. However, he does not consider whether the information which regulation requires food producers or suppliers to provide is enough for consumers to choose. The rules attempt to define the minimum, value-neutral and factual information which the consumer should know from food suppliers in order to make an informed choice. It assumes that consumer can make the choice on the basis of his/her personal preference if the factual information is provided. However, when regulation determines what information is factual and necessary for consumers, it makes a value-laden judgment. The rules not only protect the consumer's right to know, but also decide what the consumer can and should know.

The regulation of labelling suggests that the difference between GM food and other foods can be separated from people's evaluation of it. The regulations require food suppliers to provide the factual information about the GM content of their food products and aims to visualise the difference between GM and GM-free food. The difference is regarded as a fact which can be clearly determined and identified. Regulation assumes that consumers can interpret the difference on the basis of his/her own value when the difference is visible to him/her. In other words, regulation assumes that consumer has his/her own value about GM food and knows how to interpret the difference *before* the difference is made visible. However, labelling GM food is not only to visualise the difference but also to make consumers conscious of the difference in one way rather than another. The consumer is required

to interpret and evaluate the difference in order to make a choice when he/she learns the difference from the information on the label. But the difference makes little sense to the consumer if he/she does not know why GM food should be differentiated from GM-free food and how to interpret the difference. And the consumer's choice is made available by the information so that he/she can only choose from the options which are differentiated by the information. In this situation, regulation draws a line between fact and value, and requires the consumer to take the responsibility of forming his/her own value about GM food when the factual information is available to him/her.

However, the line between fact and value which regulation draws is in fact artificial and questionable. The line between fact and value is not given and fixed; it is often contested and challenged. For Example, Michael Gottlieb, the director of the Restaurants Association, is quoted in one news story as saying:

I don't think people want to face life or death decisions when they go out. Either GM food is safe, and the Government should not be kowtowing to certain groups, or if it is not safe, it should be banned ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291]).

He questions that the factual information which the regulation require to provide is not enough for consumers to make an informed choice. Consumer needs more facts. And he considers the risk of GM food to be part of the facts which the government should tell the public. Although the risk of GM food is not really a fact can be revealed or determined (see chapter 6), Gottlieb is correct to protest that the regulation should not consider the issue of risk to be the personal preference of the individual consumer. The line between fact and value which is drawn by labelling regulation is also a line which distinguishes governmental from individual responsibility. When the risk of GM food is regarded as a personal preference, the responsibility to manage and control the risk is also privatised and individualised. What Gottlieb highlights is that regulation exempts the government from the responsibility to make political decisions on GM food, and transfers this responsibility to consumers in the name of consumers' autonomy. But if the factual

information provided to consumer is only about the GM content of food product, consumers need to learn other necessary knowledge about GM food by themselves in order to be able to bear the responsibility for making the choice.

Therefore, the line between fact and value drawn in the regulation distributes more responsibilities to the consumer who is required to learn the knowledge about GM food in order to manage its uncertainty by him/herself. Keat argues:

What *is* required of consumers, though, is that they should know *what* their preferences are, and *whether* they have been satisfied by a particular purchase. But such knowledge... is something of which every consumer is capable. After all, it consists essentially in people's knowledge of their desires, beliefs, etc., that is in the kind of knowledge for which everyone has indisputable 'authority' in his or her own case. (Keat, 1994: 29)

However, it is problematic that regulation assumes that consumer is able to know his/her personal preference on GM food. Firstly, the line between fact and value drawn in the regulation excludes a range of facts from public discussion. Regulation aims to visualise the difference between GM and GM-free food but it also makes other issues about GM food invisible. Not only the issues about the risk, but also the issues about the history of technological development, are both excluded from public discussion. These issues are depoliticised in the realms of personal knowledge or personal preference. They are privatised to be the issues which should be considered by individual consumers. Secondly, the regulation asks consumers to develop knowledge about GM food but pays no attention to the process of producing knowledge. Regulation restricts the action which the consumer can take to his/her decision-making in the market. Perhaps the consumer is diligent to learn the knowledge about GM food and prudential to make the choice. But when the consumer has no opportunity to participate actively in the process of producing knowledge but can only passively learn the knowledge which is available to him/her, consumer cannot be as autonomous as he/she is expected to be. The information provided to consumers is only about the GM content of particular food product, but consumers are required to handle the uncertainty resulting from introducing a new

technology into their lives. And what the consumer is allowed to do is to decide whether to buy GM food product. Therefore, the regulation of labelling does not only exclude a range of issues about GM food from public discussion, but also deprives the consumer of the opportunity to take alternative actions about GM food. In other words, the regulation does not only require the consumer to bear the responsibility which he/she can not really bear, but also eliminates the ground for a public and democratic discussion about GM food by privatising and individualising the responsibility of problem-solving.

Perhaps in contemporary society, to be an individual suggests 'a *duty*, a set of responsibilities, rather than a series of rights' (Sulkunen, 1997: 262). The regulation of labelling characterises the consumer as an individual who can and should take the responsibility to solve the problem of GM food, no matter how the problem is defined by him/her. Bauman defines individualisation as a situation in which 'troubles are supposed to be suffered and coped with alone and are singularly unfit for cumulation into a community of interests which seeks collective solutions to individual trouble' (2001: 86). Regulation suggests that individualisation is the best way to settle the controversy of GM food: the individual consumer knows best about what he/she prefers and can thus make the informed choice when the factual information is provided. However, regulation seems to assume that the public can act as only consumers when they face the problem of GM food and ignores other alternative identities which the public can have, for example, as citizens who can participate in the process of shaping the technology or producing the knowledge which they consider to be useful. And when the public can only act as consumers, they might be too powerless to bear the responsibility for coping with the problem of GM food individually. Consumers can only choose from the available options, but have no power to change the available options or to create new options.

Therefore, news stories focus much on the practicability of the regulation of labelling but do not question that the regulation requires the individual consumer to take the responsibility which he/she might be too powerless to take. When an individual

consumer is required to find the solution to the problem of GM food by him/herself, he/she might in turn be dependent on the socio-cultural authority which is considered to be able to provide this solution. Cruikshank argues:

The condition of democratic equality and individual isolation led to contradictory propensity of democratic citizens, on the one hand, to become ungovernable in their independence, and on the other hand, to wholly submit in powerlessness to any authority powerful enough to command them (Cruikshank, 1996: 243).

When an individual is required to take the responsibility of problem-solving which he/she can not take, he/she can not be as independent and autonomous as he/she is expected to be. He/she can only rely on the established authority in order to know how to solve the problem. Even if the consumer can know about the GM content of a particular food product, he/she still needs to know how to interpret the difference between GM and GM-free food. If the consumer has no power to participate in the process of producing knowledge, he/she can find no way to be independent and has rely on the established authority to provide him/her with the necessary knowledge. Jensen and Kjærnes argue that:

If expertise is removed from civil culture and isolated in bureaucratic and professional institutions, its influence easily becomes undemocratic and its aim of serving the citizen shrouded...People are then manipulated according to an unclear balance of values negotiated by the equally unclear elite or 'new class' of politicians, bureaucrats and experts, which have each other as clients. On the other hand, if experts have their legitimation based in living civic culture and political mobilisation, and their organisational setting gives them a firm platform independent from other parts of public policy, their acceptability is higher and the risk of manipulation against the interests of ordinary people is smaller (Jensen and Kjærnes, 1997: 231).

If an individual consumer could take a strong role in cooperating with an expert to produce knowledge, perhaps he/she could be more influential in handling the uncertainty of GM food. However, it happens more often than not that the consumer can only passively learn knowledge from an expert. Individual consumers depend on the authority of science to tell him/her if GM food is safe to eat. When science is cast as 'the collective manager of the source of uncertainty', a classic pattern of power

and dependency is reproduced (Bauman, 1992: 98). The individual in society must be rational enough to make choices, but he/she 'cannot be rational without being guided by the verdicts of science and without being offered algorithmic, or at least heuristic prescription for action that carry approval of the experts' (99). In this respect, we should consider how to empower consumers to be autonomous particularly as the regulation of labelling seems to take the autonomy of the consumer for granted. It ignores the fact that the consumer might be de-skilled and powerless when he/she faces uncertainty which cannot be handled in individual level.

The line which regulation draws between fact and value is problematic not only because it distributes the unbearable responsibility to individual consumers, but also because it aims to create an artificial division between fact and value. The regulation assumes that the consumer knows how to choose on the basis of his/her value so that the rules simply need to provide the consumer with the factual information about GM food products. News stories express the criticisms about the appropriateness of the line, but they do not question the line itself. They accept the character of the consumer which is embedded in the regulation, but ignore the fact that this 'character' is problematic, as now I go on to explain.

The economic model of choice and the capable consumer

The regulation of labelling aims to protect the consumer's right to know. For example, this regulation does not cover GM tomato puree which has been approved for sale from 1996, but the food safety minister says in a news story that 'there would be a "moral obligation" to tell consumers about it' ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291]). In another story, the minister says that 'restaurants will not be able to get away with "defensive labelling" saying that food "may contain" GM products' ('Caterers given respite over GM labelling', 19/3/1999, *The Times*, [293]). The aim of the regulation is to provide clear and precise information about the GM content of food products, and therefore

restaurants can not be allowed to use ambiguous expressions. It is not only a legal liability but also a moral obligation. The regulation emphasises the consumer's right to know because it tries to separate the consumer's knowing from his/her choosing. The regulation not only marginalises the discussions about what-to-know and how-to-know, as I discuss above, but also suggests that the consumer's personal preference should not be challenged because the consumer can and should choose by him/herself. All that regulation requires is that the consumer is informed about the available options in the market. It is assumed that the consumer's value or preference is a matter of personal business and his/her consumption is a calculating and self-satisfying choice between available options in the market.

However, can the consumer's knowing be really separated from his/her choosing? Regulation is an ordering practice which makes GM food visible; it constructs the difference between GM and GM-free food so that the consumer can have different options to choose. But this order is not objective or given, and it attaches particular socio-cultural meaning to GM food because it adopts particular way of defining GM food. The difference which regulation constructs is between GM and GM-free food; therefore, the options which are created by this difference for consumer are food products with a certain amount of detectable GM ingredients and food products without. But the difference is not factual but artificial, and it suggests that the consumer should consider GM food in one way rather than another. People can choose because they know that they have options; people cannot choose the option which remains unknown to them. In this respect, knowing cannot be separated from choosing. The consumer cannot have his/her preference before the difference is made visible to him/her, and can only decide what to choose when he/she knows what is the difference between available options for him/her. Preference and difference are thus mutually constructing. The difference requires the consumer to think about his/her preference, but at the same time the preference reproduces the difference by interpreting it in a socio-culturally meaningful way. In other words, the information which regulation calls for not only differentiates GM from GM-free food, but also

requires the consumer to consider what GM or GM-free food means to him/her.

Moreover, regulation not only tries to separate the consumer's knowing from choosing, but also characterises the consumer as the capable consumer, who has a constant and well-defined interest or desire before he/she enters the market to find the satisfaction. As I mention above, some critical news stories argue that the information provided because of regulation is insufficient or improper for the consumer to make an informed choice. But they seem to agree with the regulation that the consumer can and should choose whatever he/she wants. For example, Robin Maynard, a member of Friends of the Earth, is quoted in one news story as saying:

This hardly gives the sophisticated consumer any choice. Many people don't want GM ingredients at all and don't want to support GM technology. This does not allow them to avoid supporting it ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291]).

Although Maynard is correct to argue that regulation naturalises the existence of GM products in the market, which I will discuss in next section, he still considers the sophisticated consumer's preference is inherent in the consumer and extraneous to his/her consumption. He seems to agree with regulation that the consumer has already known what to choose before he/she enters the market, and therefore what we should do is to make sure that the consumer can find whatever he/she wants in the market. The consumer's preference is constant and would not change in different contexts. More importantly, the preference is personal so that it should not be intervened by any power or be examined publicly. Regulation aims to help the consumer to know what he/she can choose, but it avoids considering what the consumer chooses and why the consumer chooses in a specific way. It assumes that the consumer has pre-existing and clear opinion about GM food before he/she faces GM food products in the market.

However, the consumer might not be so rational and independent as he/she is expected to be. Consumption is an action which is situated within 'a limited condition that bears the burden of histories of social category formation in terms of

class, gender and other parameters, the normative adjudication of families and peers, and the pressure of business attempts to ensure their particular profitability' (Miller, 1995: 36). The consumer interprets the difference between available options in order to choose from them; but his/her interpretation of the difference has socio-cultural and political implications which should not be fully privatised. Labelling regulation does not consider how the consumer forms his/her preference and how his/her preference changes in different contexts. The regulation does not consider how the consumer's freedom is influenced and restricted by the contexts in which he/she is situated. The regulation does not consider what the political impact is when the consumer interprets the difference in one way rather than another. Because the regulation privatises and individualises the consumer's preference, it depoliticises the preference and excludes all the questions above from public examination and discussion.

The regulation of labelling adopts the economic model of choice to consider consumption. The regulation removes consumption from its socio-cultural context and considers it to be a rational choice between available options on the basis of the consumer's constant and well-defined preference. Therefore, consumption is considered to be an economic behaviour of calculation and comparison. The consumer, with his/her preference, enters the market to compare available options and calculate which one can bring him/her the maximum satisfaction with the minimum cost. Consumption is thus deprived of its socio-cultural and political meanings. The regulation assumes that the consumer has his/her opinion about GM food before he/she enters the market to choose food, and assumes that the capable consumer, with his/her opinion about GM food, can make a rational choice when the factual information is provided. The economic model of choice considers only the behaviour of choosing but not the reason for choosing or the consequence of choosing. The economic model considers the consumer to be a rational being who calculates and compares, but it does not consider what he/she calculates for and how he/she compares.

The concept of the capable consumer produces a 'separative model of human nature' which assumes that 'humans are autonomous, impervious to social influences, and lack sufficient emotional connection to each other to make empathy possible' (England, 1993: 37). The capable consumer is a human being without life history and social position so that his/her consumption is only a rational choice without social and political meaning. The capable consumer's preference is established and fixed before he/she enters the market, and therefore it would not change even if the consumer interacts with others in the market. Therefore, the formation of consumer preference, as a process of socio-cultural learning, is separated from the consumer's rational choice in the market. Because his/her preference is inherent in the individual consumer, it turns out to be impossible to compare a particular preference with others. The preference is purely individual, subjective and private. It can only be demonstrated to others when consumer makes his/her choice in the market.

Moreover, when the capable consumer is required to solve a social or political problem through his/her consumption, his/her 'problem-solving' is often considered in terms of 'instrumental rationality' (Halkier, 2001: 206). The assumption appears to be that if the consumer could obtain sufficient relevant and correct information, he/she can solve the problem by choosing what is good for him/her rationally and autonomously (206). The capable consumer knows how to define the problem in terms of his/her own interest or preference so that he/she can find the best solution from available options in the market. However, the definition of relevant and correct information is ambiguous and questionable, as I discuss above. Not every problem can be solved at an individual level and not every solution can be found in the market. More importantly, the definition of problem is not uncontroversial and well-defined for every consumer to seek solution in the market. Without considering these issues, the capable consumer might finally be required to solve a problem, such as the problem of GM food, but does not have the necessary social and political resources to solve it.

However, the everyday practice of consumption can be more complicated than it is

represented in the economic model of choice. The economic model of choice and the concept of the capable consumer which are adopted by the regulations are problematic because they simplify the practice of consumption and exaggerate its efficiency as a way of problem-solving. Regulation expects consumers to define the problem of GM food individually and to find the appropriate solution by making the choice to buy or not to buy. Regulation not only avoids handling the problem directly but also reduces the diversity of food consumption. It ignores the fact that people consider and react to the problem of GM food in different ways even if they are conscious of the problem. For example, Halkier uses the concept of 'ambivalence', which he defines as a social dynamic that 'can play different roles in people's everyday lives', to explore how the consumer handles environmentally related risks differently in his/her practice of food consumption (2001: 209). He recites four types of ambivalence experience. Firstly, ambivalence is considered by the consumer to be a tension which produces anxiety or irritation. Secondly, ambivalence is regarded as a legitimate or acceptable aspect of risk-handling because it is a basic condition of being a food consumer in modern society. Thirdly, ambivalence is normalised so that the consumer incorporates it into daily food consumption in ways that neither produce tension nor need legitimation. Finally, ambivalence is avoided by the consumer who routinises his/her risk-handling practices. Halkier further argues that individual consumers in fact use and refer to several types of ambivalence in 'their individual narratives and in their social negotiations with each other', and therefore different types of ambivalence experience 'are not mutually exclusive but cut across different contexts and social relations' (211-2). People might be aware of the uncertainty of GM food, but they are not always rational and know how to choose as the concept of the capable consumer suggests. Instead, they are 'ambivalent' and use different strategies to cope with their 'ambivalence'. The individual consumer does not solve the problem of GM food through his/her practice of food consumption but develops a strategy to cope with it.

And what if the individual consumer is not aware of the problem of GM food? What

if he/she just defines the problem in a 'politically incorrect' way? Labelling regulation seems to consider that it is the consumer's freedom to choose whether to take the problem of GM food seriously. The regulation does not try to solve the problem but aims to make it invisible in the public sphere. However, the problem should be discussed publicly and democratically, because it is not only a choice to buy or not buy but also a decision to develop the technology in one way rather than another. Because the regulation adopts the economic model of choice to consider consumption, it does not consider how and why the consumer considers the problem of GM food and performs a daily practice of food consumption. But the consumer's freedom to choose should not be exaggerated to mean that his or her choice is unquestionable. For example, scientific knowledge can not only be used instrumentally but also consumed 'for pleasure' or in order to express 'self-identity, group membership, and political affiliation' (Michael, 1998: 323-4). In this situation, the reasons why people choose to trust particular scientific knowledge in order to make decisions on GM food have socio-cultural and political implications which should not be made invisible in public discussion by the economic model of choice. The way of defining the problem and searching for the solution reflects how the consumer positions himself/herself in the socio-cultural and political context. Therefore, the regulations are problematic because they lead people to consider nothing about the socio-cultural and political impacts of consumer choice.

Labelling regulation reproduces a myth concerning the freedom and autonomy of the consumer. Because it removes the practice of consumption from its socio-cultural context, it hardly pays any attention to the political and material constraints which are imposed on the individual consumer when he/she makes choice in the market. The constraints include the availability of the consumer's preferred options in the market, the unequal distribution of politico-economic resources and the socio-cultural taboos reproduced in daily practices of consumption. As Warde argues:

The very notion of the individual consumer prevents us from appreciating the constraints people face in their consumption practices, as embodied

persons rather than ghostly abstractions of economics. That which is sociologically interesting happens in the space between responsibility for one's own choices and the classification procedures of social groups. The social world is differentiated by the groups to which a person belongs and has on-going interaction. The use of the term 'the consumer' signifies an undersocialised actor; it exaggerates the scope and capacity for individual action (Warde, 1994a: 231).

In news stories, the arguments both defending and questioning regulation assume that consumer can be autonomous if sufficient information about GM food is provided to him/her. What both arguments disagree on are the technical details of the regulation, such as its practicability and the content of the information which it requires to provide. But even if the consumer knows how to choose, it does not mean that the consumer can choose what he/she prefers. The consumer's freedom is restricted by the supply in the market, his/her political-economic status and socio-cultural background. Consumption is a practice situated in the socio-cultural and political-economic context so that it should not be simplified as an economic choice between available options. As Holmwood argues:

The 'new consumer society' poses us with a challenge. If we accept that it is grounded in heterogeneity, the incommensurability of ends and the primacy of choice, we seem to favour the market as its institutional expression. But, wherever the scope of the market is expanded against the state as an expression of collective requirements, we find that inequality and poverty also grow. The challenge is to identify the basis for defending welfare services and social citizenship (Holmwood, 1997: 75).

The economic model of choice is problematic because it leads people to be concerned only with consumer's choice between available options but not with the consumer's power to choose. The consumer might not be able to choose the option which he/she prefers. Moreover, the option which the consumer prefers might not be available at all in the market. In both cases, the consumer is not as autonomous and free as the model assumes.

Wickham argues that 'consumption has no essence for the social sciences, it is only a term given to a series of processes identified and seen to have features in common by attempts to govern them' (1997: 283). Labelling regulation characterises the public as

consumers and frames the problem of GM food as a problem of food consumption. It leads people to consider the problem in terms of consumer autonomy and choice. The criticisms presented in news stories question the practicability of the regulation, but they more or less agree with the regulation that the problem of GM food should be considered to be a problem of consumption. However, it is problematic to expect that the problem of GM food can be solved by the practice of consumption. This expectation leads people to neglect the issues about consumer powerlessness and the socio-political constraints on the practice of consumption. Warde argues that ‘we should be wary of perpetuating a politico-ideological sense of the consumption process which imputes freedom to an activity that is not in any important sense free’ (1994b: 897). The regulation assumes that the consumer has the freedom which he/she might not actually have, and news stories largely fail to question this assumption.

Economic amoralism and the inevitability of GM food products

The regulation of labelling is problematic not only because it exaggerates the consumer’s power to solve the problem of GM food, but also because it leads to a narrow definition of the problem as a problem of food consumption which can thus be solved by the individual consumer. The regulation aims to help the consumer make his/her choice autonomously and freely, but it does not consider the social and political impacts of consumer autonomy which it tries to protect. When problem-solving is individualised and privatised, the consumer’s solution is regarded as his/her personal business which should not be examined or interfered with by others. Different personal preferences are considered to be incomparable in the economic model of choice. The regulation seems to suggest that if we could not make the political decision on GM food – perhaps because we could not have the uncontroversial facts about GM food (see chapter 4) – we should allow everyone, as individual consumers, to decide how he/she wants to define and solve the problem of GM food. Therefore, the solution which regulation proposes does not solve the problem, but only shifts the responsibility of problem-solving to individual

consumers.

There are different preferences or opinions about GM food, but this does not mean that we should only tolerate all of them and cannot compare or evaluate them. The regulation of labelling not only individualises the responsibility of solving the problem of GM food, but also sustains the status quo because any attempt to make radical change is impeded in the name of heterogeneity and consumer autonomy. We, as autonomous consumers, can only choose from available options in the market. We can not take a more active role to suggest any change to the available options because someone else might want to choose them. Regulation emphasises the individual consumer's right to know and right to choose, but ignores the fact that consumer also has a right to participate in the process to bring the option which he/she really wants into existence. In other words, we have not only the right to choose as consumers, but also the right to decide what should be produced or innovated as citizens. Regulation defines the problem of GM food as a problem of consumption but not a problem of production.

The consumer's right to choose is partly justified by the 'subjectivist theory of values' which argues that 'questions of a moral, aesthetic or political nature have no objective or authoritative answers' (Keat, 1991: 227). Keat argues:

Consumers may be ascribed sovereignty not only in the sense that it is they who should 'rule' over producers, and hence that the success or failure of rival producers is to be determined by their ability to satisfy consumer preferences; but also in the additional sense that they are the sole and unchallengeable arbiters of value – that there are no further, objective or authoritative criteria by reference to which their own opinions and preferences can be assessed (Keat, 1991: 228).

Subjectivist theory assumes that consumer's preference is incomparable. Value is considered to be not only subjective but also inherent in individual. However, value is subjective but not necessarily incomparable and individual. Regulation considers the consumer's choice to be a value judgment but fails to recognise that producing GM food is also a value judgment. The value of GM food is decided when it is

produced, and it is a value against which the individual consumer has no power to protest. Producing GM food is a value judgment which has significant impacts on consumers, not only because it create a choice, but also because it changes the practices of agriculture and food production in a particular way. The value of GM food cannot be individualised simply because it is a value which should be decided *before* but not *after* GM food is produced. People have different opinions about GM food, and these opinions reflect conflicting values about the future of the technology. These opinions should be discussed and examined in the public discussion about the technology of genetic engineering and should not be individualised and privatised to be a choice in the practice of food consumption. The conflicting values about the technology should be debated and examined publicly and democratically in order to decide how the technology should be developed and used. Labelling regulation is problematic because it suggests that individualising value judgment about GM food can settle the conflict between different values about the future of the technology. However, labelling regulation only makes the conflict invisible in the public sphere and does not settle it. The conflict can only be settled in a public and democratic discussion about it.

Perhaps regulation seems to be acceptable because it proposes an ‘ideal liberal relation between individual and society’: in this relation, consumers ‘are private individuals rationally pursuing their self-defined interests through a mechanism (the market) that socially coordinates individuals’ actions without compromising the autonomy of their choices’ (Slater, 1997: 42). Regulation aims to make the problem of GM food governable by defining it as a problem of consumption rather than of production. Regulation not only isolates the individual consumer from his/her social position and cultural background, but also makes it impossible to examine how the consumer thinks about GM food in his/her everyday life. Regulation refrains from making any judgments about the consumer’s evaluation of GM food. Regulation, therefore, reproduces the ideology of ‘economic amoralism’:

It does not matter whether individuals are expressing a preference for

heroin, nail varnish or opera tickets, for more hospitals or more nuclear warheads: the analysis will have the same logical structure. The form that should be taken by the material wealth of modern society is dictated not by overriding social goals and judgments as to what makes for a good life (for example, more hospitals, less heroin) but by the privately formed preferences of individuals, which cannot and should not themselves be judged. The consumer must be sovereign because the individual is sovereign. The beauty of the market is that it refrains from moral judgment: everything has its price if individuals express a demand for it (Slater, 1997: 46).

However, Slater points out that the commitment to economic amoralism never stops 'liberal regimes from making substantial and moralistic interventions; it just makes them self-contradictory' (46). Economic amoralism embodies a value judgment that the mechanism of the market is the best way of problem-solving. But why should we consider the mechanism of the market to be the best solution to a range of social and political problems? In the case of GM food, why should we define the problem of GM food as a problem of consumption but not a problem of production? Economic amoralism can only make itself self-contradictory because it is a substantial moral judgment which it tries to avoid. When regulation emphasises the consumer's right to choose, it actually obscures 'a different type of choice altogether, a more difficult type of choosing, one that involves dilemmas and morality rather than tastes and whim or a desire for difference' (Gabriel and Lang, 1995: 45). Regulation makes a value judgment to individualise the responsibility of solving the problem of GM food. It is not only a judgment which needs to be justified, but it also deprives the consumer of the opportunity to choose to solve the problem in an alternative way rather than through his/her practice of food consumption. When regulation defines the problem of GM food as a problem of consumption, it aims to make the problem technical and governable but it actually makes the problem apolitical and insolvable. The problem of GM food is not a problem of consumption but a problem about the value of the technology. It can only be solved when people start to discuss its value, publicly and democratically, in order to decide how the technology should be used and developed.

Therefore, when the regulation of labelling defines the problem of GM food as a problem of consumption, it confines people's action on GM food to the choice between GM and GM-free food. When regulation individualises the responsibility of problem-solving, it deprives people of the opportunity to suggest a radical change at a collective and social level. It forces people to accept the status quo in which GM food products have been brought into existence. It naturalises the existence of GM food, and suggests that GM food is the result of inevitable technological progress. In this respect, the consumer is actually too powerless to resist the power of producer because he/she can only choose to buy or not but cannot decide whether to produce GM food products in the first place. For example, in one news story in *The Times*, a supermarket spokesman says that 'although the company had every sympathy with her determination not to eat GM foods, the reality was that it was difficult to avoid such foods' ('Eat up or starve, shopper is told', 19/3/1999, *The Times*, [296]). Ironically, when the regulation aims to empower the consumer by providing the factual information about GM food, it actually makes the consumer powerless because he/she can only accept the existence of GM food. Gabriel and Lang argue that the emphasis on consumer choice is used as 'a smoke-screen for shedding responsibility or for deception', because 'if one is seen as actively choosing a particular option, one is expected not to complain when it goes wrong' (1995: 27). A choice between limited available options cannot be considered to be a real choice. Regulation does not empower consumers to be able to create new options but only forces them to accept the options which have already existed in the market.

As said by one member of Friends of the Earth in a news story, the available options in the market does not include the option to avoid supporting the technology of genetic engineering ('Restaurants face fines if they deny GM food on menu', 19/3/1999, *The Guardian*, [291]). Regulation not only requires consumers to take the responsibility of solving the problem of GM food, but also deprives them of the opportunity to act as citizens who actively participate in the process of shaping the technology of genetic engineering. The consumer can only demonstrate his/her

preference in the practice of consumption. People can only act as consumers who encounter the technology in the market when the technology has been developed into its present form. For the consumer, GM food products are inevitable. GM food has no history and is not an innovation which created by someone for some reasons. In other words, the individual consumer has no right to take part in the process of shaping the technology, although he/she has a right to know and a right to choose. The consumer can only choose the products produced by a new technology but cannot reject the technology or change the direction of technological development.

News stories focus on the practicability of regulation and thus fail to raise all the questions about regulation which I discuss above. Criticisms of regulation which are represented in news stories in fact agree that consumers should have a right to know and a right to choose. We should not abstain from making political decisions on GM food because we cannot find the uncontroversial facts about GM food which might legitimate the decisions on GM food. Instead we should try to make the decisions without such facts. Labelling regulation aims to solve the problem of GM food by individualising and privatising the responsibility of problem-solving. It emphasises the consumer's right to know and right to choose, and it defines the problem of GM food as a problem of consumption. It makes the conflict between different values about the technology invisible and forces the public to accept GM food as the result of inevitable technological progress. In this respect, regulation makes it difficult to have a public and democratic discussion about the value of the technology and the reason for developing it. Regulation does not solve the problem of GM food but only makes it invisible in the public sphere. Regulation characterises the consumer as someone who can choose anything but not to be a consumer:

It individualizes the idea of citizenship, as if becoming a citizen is a matter of individual choice alone. In this way, citizenship becomes a life-style, however praiseworthy and necessary, which can easily degenerate into tokenism and is hardly likely to alter the politics of consumption (Gabriel and Lang, 1995: 182).

Regulation is problematic not only because of its impracticability but also because of

its assumption about the consumer's power to solve the problem of GM food individually. News stories, however, fail to point this out.

Conclusion

Labelling GM food products is an ordering practice which aims to make GM food visible to the public. However, an ordering practice can never fully succeed because the order which it aims to impose on the world is artificial and often in danger of being contested and challenged. News stories about the regulation of labelling mainly focus on the technical details of the regulation and present the questions about its practicability. But news stories fail to recognise that the difficulty to enforce the regulation is not due to the imperfect design of the regulation but due to the fact that any ordering practice can only be partly successful. Moreover, labelling regulation aims to objectify and visualise the difference between GM and GM-free food. It considers the difference to be the factual information which food suppliers should provide to consumer in order to help him/her to make the informed choice. Regulation draws an artificial and constructed line between fact and value, and assumes that the capable consumer can make his/her choice in the market on the basis of the factual information which is provided to him/her. Although the criticisms in news stories disagree with the regulation on the line which it draws between fact and value, they do not challenge the separability between fact and value.

The line which regulation draws between fact and value is also a line which distinguishes governmental responsibility from individual responsibility. The regulations adopt the concept of the capable consumer to assume that the consumer has a constant and well-defined opinion about GM food before he/she enters the market to perform his/her daily practice of food consumption. Regulation requires the individual consumer to make a decision on GM food on the basis of his/her preference, and thus the government needs only to make sure that the factual information is correctly and clearly provided. However, the concept of the capable consumer pays no attention to the process of socio-cultural learning in which the

consumer learns the necessary skills and knowledge to cope with the problem. Regulation aims to empower the individual consumer by providing factual information about GM food, but ironically it makes the consumer more powerless because it requires him/her to solve the problem without considering whether he/she has the necessary skills and knowledge to solve it. The consumer can only make his/her choice in the market, and is deprived of the opportunity to take part in the process of shaping the technology and producing the knowledge about it. Consumers can only rely on the authority of science to tell them what to do, but it seems that science can not really provide an uncontroversial answer to consumer inquiries.

Regulation defines the problem of GM food as a problem of consumption, and it makes it less possible to have a more public and democratic discussion about GM food. Regulation adopts the subjective theory of values and refrains from making any judgment on consumer evaluation of GM food. But value is subjective and not necessarily incomparable and individual. There are different and conflicting values about GM food. Privatising and individualising the different values about GM food cannot solve the problem of GM food but only makes the conflict between different values invisible in the public sphere. Moreover, regulation individualises the responsibility of solving the problem of GM food, and confines people's action to the choice between GM and GM-free food in the market. It requires the consumer to make his/her value judgment on GM food after but not before GM has been produced. It requires consumer to accept the existence of GM food and the present form of the technology of genetic engineering. People can only act as consumers to choose 'freely' between GM and GM-free food in the market, but cannot act as citizens to take part in the process of shaping the technology.

News stories focus on the practicability and the technical details of regulation of labelling, but fail to point out these problems. The difficulty to find a solution to the problem of GM food publicly and collectively should not be a reason for individualising and privatising the responsibility of problem-solving. Instead we should try to understand why it is difficult and how to overcome the difficulty. News

stories may lead their readers to think that the regulation of labelling is impracticable, but they do not lead the readers to recognise that the regulation leads to a narrow definition of the problem of GM food. It cannot solve the problem but only makes it invisible to the public.

6. From Science to Politics: the ‘Malleable’ Fact and GM Crops

In October 2003, the result from a three-year, government-funded farm trial of growing GM crops alongside conventional crops was announced. The result was mainly interpreted in news stories as scientific evidence that growing GM crops can be harmful to the environment. The evidence revealed by the trial was that there were fewer weed seeds in GM rape and beet fields than in conventional crop fields, and that this shortage of seed could pose a threat to animals which rely on the seeds for survival. However, in their letter to the prime minister, a group of scientists warned that this interpretation in news stories would mislead the public, because the trial did not ‘assess the effects of genetically modifying the crops, but rather the impact of different types of weed control’, and therefore its result had ‘little to do with genetic modification, its process or potential’ (‘Scientists complain GM debate was mishandled’, 1/11/2003, *The Guardian*, [245])¹. These scientists were uncomfortable to see that scientific evidence distorted by political opinions which protested against the development of genetic engineering. They criticised the misleading interpretation in news stories by drawing the boundary between real science and distorted science (Hilgartner, 1990). By their boundary-work, the scientists claimed that they had the epistemic authority to decide the appropriate way of interpreting the result from the field trial (see chapter 4). In other words, they argued that the result from the trial could not provide the answer to the question which we ask about the risk of GM crops.

The different interpretations of the result from the trial, however, lead us to consider whether the question to which we are eager to find an answer is the question which science can answer. As discussed in chapter 4, the boundary-work of good science reflects our expectation that science can provide us the uncontroversial facts about GM food. We try hard to find the real and disinterested scientific fact which we think

¹ The full text of this letter is not showed in the paper version of the Guardian, but can be found on the website of the Guardian: <http://education.guardian.co.uk/higher/sciences/story/0,,1075119,00.html> (last visit: 21/06/2005)

is factual and epistemically superior. But at the same time we do not consider whether a scientific fact, no matter how factual it is, can really settle the controversy of GM food as we expect it to do. We forget to think that, perhaps, scientific fact can never answer the question which we ask about GM food. In the present case, the result which was produced in the well-ordered but artificial experimental arrangement of the trial could not be generalised as a scientific fact revealing the environmental risk of GM crops. But without any deliberation, news stories easily drew the conclusion from the result that growing GM crops had negative impacts on the environment. Perhaps we can think that scientific fact is 'distorted' by the media as the scientists said in their letter. But their criticism is also questionable because it does not recognise that our question about GM food is not a question which science can really answer. The question which we ask about GM food is actually a socio-cultural and political question. The facts produced by scientific method cannot settle the controversy of GM food as they are expected to do.

As discussed in chapter 2, scientific practice can be considered to be a practice of 'story-telling', which aims to produce factual and objective stories about the world in which we live. We often think that a story produced by scientific practice is a fact which reveals something true about our life world. But we tend to forget that a scientific fact is produced by a process of reduction and simplification so that its factual status is inevitably contextual and conditioned. A scientific fact, as a story produced by scientific practice, can be a useful representation of the world, if we are well aware of its limitation. The world represented by a scientific fact seems to be mechanical and law-ruled because the fact is produced in a theory-oriented and well-designed experimental arrangement but not because the world is really mechanical or law-ruled. The fact which science produces about the world is a modeled and simplified representation of the world but not the world itself. Strictly speaking, a scientific fact is only factual in its experimental context. The fact only refers to the reality which is simplified and modeled by its experimental arrangement. In the present case, the trial produced a fact that there were fewer weed seeds in the

fields where GM crops were grown. But this fact is only factual in the experimental context of the trial; it is a fact which is brought into existence by the experimental design of the trial. The trial was designed to objectify one property of GM crops, and reduced the agricultural practice of growing GM crops to a scientifically interpretable arrangement in which the comparison between growing GM and conventional crops could be made. When the trial produced a scientific fact which was considered to reveal the environmental risk of GM crops in news stories, the limitation of the fact was made invisible to the readers of news stories.

In this chapter, I explore how news stories represented the result from the trial as a scientific fact which had a significant impact on the GM debate. News stories simply represented the fact as scientific evidence of the risk of growing GM crops. Because of this representation, news stories did not lead their readers to consider how the result was produced in the experimental arrangement of the trial. News stories did not examine how the trial simplified and modelled the agricultural practice of growing GM crops in order to make the impact of growing GM crops visible and scientifically interpretable. Moreover, news stories focused on the impacts of the result on future policy-making as if the result revealed the truth about GM crops. The result, as a scientific fact, was 'transited' from its experimental context to a broader socio-political context in order to be used to justify and rationalise particular political actions. The result was even considered in news stories to be able to settle the controversy of GM food/crop because it proved the risk of GM crops. But news stories marginalised the issues about the limitation of the result as a scientific fact. The result was contextual and conditioned not only because it was a fact which did not refer to the real world but only to the experimental context where it was produced, but also because it confined public discussion about GM food to the issues about its objectified and physical risk. The trial aimed to produce the facts about GM crops, but it seemed to take the values of GM crops for granted. The trial was designed to explore what is the difference between growing GM and conventional crops, but it considered nothing about the reason for growing GM crops in the first place.

The trial as a story-telling practice

Scientific practice is a story-telling practice. But this argument does not suggest that we should therefore abstain from understanding and explaining the world around us by scientific investigation. Instead it suggests that we should be critical and skeptical when particular scientific knowledge is claimed to be universally true. We should examine how knowledge is produced in a well-controlled and theory-oriented context which translates our life world into a manageable and scientifically interpretable experiment. Nor does this argument suggest that the story told by scientific practice is not true or factual. On the contrary, it suggests that we should be aware of the conditions in which a scientific story can be considered to be a scientific fact. Ziman compares a scientific theory to a map:

A map has to represent a particular territory, and cannot be interpreted or used without *some* idea of its relative point... it reminds us that a scientific theory is not a pure abstraction like a mathematical theorem. It is only meaningful as a representation of a particular aspect of reality as it might appear in principle to *some* human intelligence (Ziman, 2000: 128).

Therefore, a scientific theory has to be understood as a purposeful generalisation, and 'the entities that figure in a scientific theory are selected and simplified to suit its scope and function' (130). Ziman further argues:

The fact that maps are human artifacts does not, of course, imply that they are untrue to nature... The same goes for scientific theories. It cannot be denied that they are 'constructed' to satisfy human purposes. This does not automatically imply that the knowledge they claim is untrustworthy. It only means that in evaluating a theory we have to take into account the needs and interests of its makers (Ziman, 2000: 130).

In this respect, a scientific theory is a story which is produced to make the world meaningful for some purposes. A scientific theory tends to have the surface structure of a general claim; however, it does not 'in fact make claims about the world', but gives us clues about how to manipulate the world (Cartwright, 1999: 35). Scientific knowledge is produced in a theory-oriented and simplified model which transforms the world into a scientifically interpretable and manageable representation. Scientific

knowledge cannot be universally true because it only represents a part of reality which is made meaningful in its model. Therefore, scientific knowledge is true *ceteris paribus*; it is only true in its own theory-oriented and simplified model. It is a story-telling practice because it produces a story which makes reality meaningful and understandable to human intelligence. It is a human action which aims to make reality meaningful and so produces a simplified but meaningful representation of the world, but the representation should not be confused with the world itself.

The field trial transformed the practice of growing GM crops to an experimental setting in which the consequence of growing GM crops could be quantitatively compared with the consequence of growing conventional crops. News stories took the result from the trial as a scientific fact revealing the risk of GM crops, but they did not recognise that the result was actually brought into existence by the experimental setting. However, because I analyse the news stories about the trial but not the official report of the trial, I recognise that my analysis can be accused of distortion. When I analyse news stories to explore how the trial produced facts about GM crops in its experimental arrangement, I might be questioned that I use second-hand representation which is an oversimplified illustration of the trial. I defend my analysis against criticism in two ways. Firstly, this criticism assumes that the result from the trial is a fact and the media coverage is a simplified or distorted representation of the fact. This criticism argues that the result is factual when it is not misinterpreted or misrepresented. But I want to examine how the result was produced in its experimental setting and how this setting became the condition of its factual status. Because I am concerned with the production of the fact but not the correctness of the fact, the information about the trial which was provided in news stories is sufficient to support my argument. Secondly, the trial makes a property of GM crops visible to the public, and news stories took it as a scientific fact which had its social and political implications. When I make this argument, I am not arguing that the property of GM crops is factual but that news stories misinterpreted it. Rather I am arguing that it is questionable in the first place to interpret the result from the trial as

a fact which is always and everywhere factual. News stories in these circumstances provide a good example for this interpretation. In other words, if I did not regard the result as a fact which should be interpreted correctly, I need not to justify myself that my interpretation of the result is correct but not distorting. Instead I explore how the result is produced to be a fact and how it is considered to have the power which it should not have.

News stories represented the result from the trial as scientific fact with political significance by removing it from its original experimental context and situating it in a broader socio-political context. News stories showed the result as a fact about the risk of GM crops which is factual not only in its experimental context but also in the broader socio-political context. The representation of news stories demonstrates how 'malleable' a scientific fact can be, because it can be used to indicate different phenomena in different contexts. In this case, the fact that there were fewer weed seeds in GM crop fields than in conventional crop fields was removed from the experimental context where it was produced and situated in the socio-political context to prove that growing GM crops is harmful to the environment. From a quantitative comparison produced in an experiment to a scientific proof of the risk of GM crops, the result, as a scientific fact, demonstrates its malleability to be interpreted and used in different contexts for different purposes. I am not arguing, however, that the result from the trial is misused, but that the result should not be expected to be able to answer the question which we ask about GM crops because our question is in fact a political rather than a scientific one.

News stories represented the result from the trial as scientific fact revealing a true property of GM oil-seed rape and sugar beet. They focussed more on the political significance of the result but took its factual status for granted. They seem to suggest that the result was a self-evident and objective fact because it was produced by one costly and extended scientific research, and described how big the trial was in order to enhance the credibility of the result. For example, one news story in *The Times* says:

Growing genetically modified crops can be harmful to the environment. Results from three-year, £ 5.9 million government farm trials of the new technology paint a grim picture of a landscape denuded of many farmland birds, butterflies, insects and common field plants ('Beet and rape harmful, but maize beneficial', 17/10/2003, *The Times*, [300]).

Another story in *The Guardian* takes a stronger stance to argue that the result from the trial is scientific proof of the risk of GM crops so that further political action should be taken:

Two GM varieties, oil-seed rape and sugar beet, face a Europe-wide ban after long-awaited field-scale trials showed that the crops damaged wildlife, and would have a serious long-term effect on bee, butterfly and bird populations ('Two GM crops face ban for damaging wildlife', 17/10/2003, *The Guardian*, [306]).

Both stories emphasise that growing GM crops is proved by the trial to be harmful to the environment. Both stories indicate that the result is significant because it is a scientific fact revealing the risk of GM crops. However, neither story examines whether the result is really as factual as it is assumed to be. They lead their readers to consider nothing about the limitation of the result but only to accept it as a scientific fact about GM crops. Lahsen reminds us that 'sensitivity to the limits of science and to the elusiveness of an objective standpoint is imperative' in contemporary society, and that 'purported scientific claims, as well as claims to expertise, need to be critically examined, not passively accepted' (2005: 161). We, as readers of news stories, should not follow the stories and accept the result as a scientific fact which is always and everywhere factual, but we should consider how the result is produced in the experimental context of the trial and on what condition the result can be claimed to be factual.

News stories did not explore how the abstract and ambiguous concept of risk is concretised and exemplified in the result from the trial. Cartwright argues that an abstract concept always 'piggybacks on more concrete descriptions' (1999: 45). For example, she argues that the concept of 'force' in the laws of physics is embodied in the more concrete descriptions which 'use the traditional mechanical concepts, such

as *position, extension, motion and mass*' (45). The concept of force is abstract and can only exist in particular mechanical models which constrain the scope of its application. In the case of the gravitational attraction between two masses, we learn that the smaller mass m is subject to the force GmM/r^2 in the situation where this small mass m is located in a distance r from another larger mass M . However, the force GmM/r^2 only exists in the model of a 'two-body system' (45). The description of the force GmM/r^2 is only true in the situation which can be simulated by the model of a two-body system. And in the case of the trial, the harmful effect or the risk of growing GM crops is embodied in the quantitative comparison which is made possible only by the experimental arrangement of the trial. A story in *The Times* describes the dramatic effects of growing GM crops on wildlife:

In GM rape fields there were 80 per cent fewer weed seeds and in GM beet fields about 60 per cent fewer seeds. The seeds are an important part of the diet of many animals and birds, so a shortage poses a threat to species which rely on them for survival ('Beet and rape harmful, but maize beneficial', 17/10/2003, *The Times*, [300]).

Therefore, the risk of GM crops is proved or made visible by the comparative model which the trial set up to examine the consequence of growing GM crops. Or we can say that the risk is brought into existence by the model. An abstract concept of risk is embodied in a more concrete description that there are fewer seeds in GM crop fields. But this concrete description, which is based on the quantitative comparison made by the trial, is only factual in the experimental arrangement of the trial.

Although an abstract concept can only be embodied in a more concrete description, this does not mean that an abstract concept tells us nothing more than what we can know from the concrete description (Cartwright, 1999). An abstract concept and a concrete description are, after all, different. Cartwright argues that 'the meaning of an abstract concept depends to a large extent on its relations to other equally abstract concepts and cannot be given exclusively in terms of the more concrete concepts that fit it out from occasion to occasion' (1999: 40). Therefore, although the risk of growing GM crops is embodied in the concrete description which is only factual in

the experimental arrangement of the trial, the abstract concept of risk can function differently from the concrete description in which it is embodied. It can function to justify particular political decisions about GM food. When the result from the trial was considered to be a scientific fact about the risk of growing GM crops, it could be resituated in the political context to support a political action to ban GM crops. The result was malleable because it could be transformed from a quantitative comparison produced in one particular experiment to a fact revealing the true property of GM crops for different purposes in different contexts.

As discussed in chapter 3, the result from the trial also riskifies GM crops because it defines the problem of GM crops as a problem of their environmental risk. The trial was designed to produce risk knowledge about GM crops. But no matter how factual the result is, we still need to consider why we should determine the environmental risk of GM crops in order to decide what to do with GM crops. GM crops are developed by someone for some purposes, and their properties are something which they are developed to have but not something inherent in them. We seem to be concerned more with the effect of growing GM crops than the reason for growing them. We are eager to determine the properties of GM crops but forget that we can also decide not to bring GM crops into existence in the first place. The result is problematic not only because it is only factual in its experimental context but also because it defines the problem in a restrictive way. But before I discuss more about this issue, I want to demonstrate why the result, as a scientific fact, could only be factual in its experimental context and how it was considered to have the power which it should not have.

The fact only exists in the trial

We seldom think about the conditions for a fact to be a fact when we accept it as a fact. Especially when it is a scientific fact, we tend to consider it to be objective and universal because it reveals something existing in the world around us. However, according to Pera, we should distinguish the fact talking about the world with its

'putative reference' from the fact describing (or corresponding to) the world with its 'real reference' (Pera, 1994). The fact with its putative reference is a fact which refers to an element of the world 'as established *through* certain experimental operations and *within* a given theoretical framework that interprets the results of these operations' (Pera, 1994: 158). And the fact with its real reference is a fact which refers to an element of the world in itself which is 'what it is and exists or not regardless of the state of our knowledge' (158). Pera argues that the real reference is inaccessible and inscrutable, because we can never rely only on observational and experimental situations to grasp our life world without introducing a theory to understand it, nor can we, based on one success of a given putative reference, proceed to the real reference (158). Pera suggests that we should define the concepts of object and fact in a different way. He defines an object as 'the putative reference of a concept about which there is consensus' and a fact as 'a shared state of objects' (160). Therefore, he argues that science is not objective in the sense that it 'makes assertions corresponding to' the world around us, because 'objects and facts are constructions' but 'not carbon copies, images, or icons' of the world (161). He suggests that science is objective only 'in the sense that it is intersubjective' because 'objects and facts depend on a consensus over the corresponding concepts and judgments' (161).

Therefore, a fact is accepted as a fact because its putative reference is accepted intersubjectively, but not because it has a real reference to our life world. We should therefore consider why to accept a fact as a fact and what is the consequence when we accept it as a fact. There are various reasons why one fact is preferable to another. And when we accept a fact, we also accept its way of representing and framing reality. We accept a fact not because it mirrors the world but because we decide to see the world through its representation. To decide which fact we should accept is always a political action. At best we can make this decision in a more democratic way. It is a decision which should be made in a process of reflection, deliberation and negotiation. And we also need to be sensitive to potential power domination when we

accept particular representation as reality. We should not expect that we can find a universally acceptable fact about the world but should consider the way of see the world through the representation of a particular fact. In the present case, I am not arguing that the fact produced in the trial was not factual. Rather I am arguing that we should consider why it was accepted as fact and should be aware of its limitation. It is obvious that we should not accept the result as a fact simply because it is scientific.

If we consider the reason why the result from the trial was accepted as fact, it turns out to be questionable that news stories simply considered the result from the trial to be a scientific fact revealing the nature of GM crops. When I say that the fact is produced and only factual in the experimental arrangement of the trial, I do not mean that the fact is ontologically nonexistent. Instead I mean that the fact is contextual and conditioned. An experiment is a theory-oriented arrangement which is designed to demonstrate the existence of a particular fact. An experiment simplifies the world into an artificial setting in order to make the fact determinable. Without the experimental arrangement to transform the world into a controllable and interpretable setting, the fact could not be demonstrated in such determinate way. In this sense, we should consider whether or not the way of representing the reality of growing GM crops in the trial is acceptable before we accept the result as a fact.

The fact that there are fewer weed seeds in GM crop fields than in conventional crop fields could be demonstrated in the trial because the trial was arranged to make this quantitative comparison. It was designed to demonstrate the difference between GM and conventional crops in a particular war. One news story in *The Guardian* describes how 'the trials were designed to test whether weeds and insects fared better in fields of conventional crops or crops which had been genetically altered to be resistant to a single herbicide' ('Birds and the bees: how wildlife suffered', 17/10/2003, *The Guardian*, [308]). In other words, what the trial was designed to test is not only the difference between GM crops and conventional crops, but also the difference between the crops which can resist to a single herbicide and the crops

which cannot:

In GM crops it meant that the farmer could use one application of herbicide to kill a large spread of weeds in one go without harming the crops. Conventional crops might need several applications of different herbicides at different stages in order to keep weeds under control ('Birds and the bees: how wildlife suffered', 17/10/2003, *The Guardian*, [308]).

But what if we grow both GM and non-GM crops in the same way? Farmers can use one application of herbicide to kill a large spread of weeds without harming the crops because the crops are genetically modified for this purpose. As said in one news story in *The Daily Mail*, 'the GM beet, oilseed rape and maize had all been transformed in the laboratory to have an in-built resistance to spraying with specific powerful weedkillers', and 'it was these chemicals, used with the GM crops, which destroyed flora and fauna' ('The death knell sounds for GM', 17/10/2003, *The Daily Mail*, [315]). If the GM crops tested by the trial were created for improving the efficiency of killing weeds in the fields, the result that there were fewer weed seeds in the GM crop fields turned out to be predictable or even inevitable. In other words, the fact that there were fewer weed seeds in the GM crop fields was a consequence of growing herbicide-resistant crops in the way that one single herbicide is used to kill a large spread of weeds. The difference between GM and non-GM crops demonstrated by the trial is actually a difference which the trial was designed to demonstrate.

However, the trial paid no attention to the reason why the crop has to be genetically modified to be resistant to a single herbicide. It just accepted the status of GM crops which it tested as an existent innovation. The reason behind developing the herbicide-resistant crops was because the crops could be grown in a more efficient way. In other words, the crops were created because they could make agricultural practice more intensive. However, as the story in *The Guardian* says:

The trials were held because there had already been a steady decline since the 60s in the number of weeds because of intensive agriculture. As a result, there had been a reduction in a wide range of animal species, including bumblebees, grey partridges and corn buntings. They were losing both their food sources and their habitats ('Birds and the bees: how wildlife

suffered', 17/10/2003, *The Guardian*, [308]).

If the number of weeds declined because of intensive agriculture, what can we expect when we grow crops which are genetically modified in order to make agricultural practice more intensive? We should think that the reason why GM crops are harmful to the environment is not because they are harmful but because we make them harmful. The fact that growing herbicide-resistant crops leads to the shortage of weed seeds is not a consequence of growing GM crops but rather a consequence of using the technology of genetic engineering to make agricultural practice more efficient and intensive. In other words, we should consider why we develop GM crops in such a way and who decides to do it. We should pay more attention to the history of GM crops but not only the consequence of growing GM crops (see chapter 7).

Moreover, in order to produce the result, the trial needed to make the reality of growing GM crops quantitatively measurable and comparable. *The Guardian* describes how:

Researchers measured the number of grasses and broad-leaved weeds and calculated the weight of the dried weeds. This gave a good measure of the quantity of foliage, flowers and stems that were above ground and available for animals to eat, as well as how many seeds the weeds produced. Another measure was how many seeds fell from the weeds on to the soil surface, known as "seed rain". This allows scientists to predict how many seeds would be available for insects and birds to eat. This is particularly important because some farmland birds – skylark, corn bunting and yellow hammer – which rely on weed seeds in the autumn and winter have been declining. The number of weed seeds left to provide plants for the future was also measured ('Birds and the bees: how wildlife suffered', 17/10/2003, *The Guardian*, [308]).

Different quantitative data was collected in the trial in order to estimate and then compare the numbers of weed seeds in GM and non-GM crops fields. But when researchers measured the numbers of grasses, broad-leaved weeds and seed rain, the reality of growing GM and non-GM crops was also transformed to the quantitative data which can be calculated, interpreted and compared.

The transformation to quantitative data can be considered to be a dual process of

reduction and amplification. In the process of transformation, the data loses its 'locality, particularity and continuity' but achieves the 'compatibility, calculability and standardization' (Latour, 1999: 70). The process turns the world into an aligned, transformed and constructed reality. In the experimental setting of the trial, several objects, such as grasses, broad-leaves weeds, the weight of dried weeds and seed rain, are selected to be represented in the form of numbers because they are considered to be significant by the theory on which the trial is based. And by being represented in the form of numbers, the objects become comparable and theoretically interpretable. The reality of growing GM crops is also transformed into a range of calculable and comparable data. When the real world is transformed into data, researchers can produce scientific arguments by comparing and interpreting the data. Therefore, quantification is a way of taming the world to make it graspable and interpretable.

However, the quantitative data which was collected from the fields are theoretically meaningful and interpretable representations of the world, but not the world itself or the only and true representation of it. Quantification is a 'methodological reduction', but not an 'ontological reduction' (Stenmark, 2001). Stenmark argues that the 'scientist is like a fisherman casting a net in the water', and that 'even when the net is used in an optimal way, it does not rule out that there are fish smaller than the mesh of the net or that there can exist other living things in the water' (22). The scientist's net is his/her theory; he/she selects the theoretically significant objects from the world and quantifies them in order to make them comparable and interpretable. In the present case, the number of weed seeds is significant because researchers believed that a couple of animals, insects and birds relied on the seeds for survival. And the reason why they measured the number of grasses, the weight of dried weeds and the amount of seed rain was because they believed that they could predict how many seeds would be available for insects and birds to eat on the basis of their measurement. The real world was transformed into the quantitative data for researchers to produce the answer to their research question according to their theory. However, the researchers' quantification is not the only way of representing the

reality of growing GM crops. For example, if we chose to see the reality of growing GM crops from a farmer's perspective, we might be concerned with different issues about GM crops. Several social and politico-economic issues, such as the controversy of patent and royalty, the power struggle between farmers and the biotech industry, and the value of intensive agriculture, are marginalised in the researcher's representation of reality. The trial quantifies reality in order to produce the desired fact, but it marginalises other ways of representing reality for different purposes and for answering different questions.

The fact produced in the trial is factual only in the experimental context of the trial. The fact that there are fewer weed seeds in GM crop fields was demonstrated by the trial because the trial was designed and arranged to demonstrate it as such. We can draw the conclusion that growing GM crops is harmful to the environment from the fact produced by the trial because we have a theory to interpret the fact. But can we really use the fact produced in the trial to justify and rationalise particular political decisions on GM crops? Why should we make our political decisions on GM crops on the basis of a scientific fact? News stories assumed that the result from the trial revealed the nature of GM crops and was thus universally true. News stories described the political-economic impact of the result and even implicitly argued that the result as a scientific fact could settle the controversy of GM food/crop. However, news stories failed to consider the limitation of the result. The result from the trial, no matter how factual it was, is contextual and conditioned so that it cannot be generalised as scientific evidence for the risk of GM food. And when news stories argued that the result could settle the controversy of GM food/crop, they also led their readers to understand the controversy in a restrictive way. The fact cannot settle the controversy not only because the fact is not universally true but also because the controversy is not scientific but political.

Scientific fact in the broader socio-political context

As mentioned above, the scientific fact produced in the trial is malleable because it

can be used in different contexts for different purposes. Although the fact is only factual in the experimental arrangement of the trial, it seems to have been interpreted as scientific proof of the risk of GM crops in news stories. When news stories represented the result from the trial as a scientific fact revealing the nature of GM crops, they focussed on the political and economic significance of the result but not on its limitation. However, we should consider why news stories could so easily remove the result from its original experimental context and situate it into a broader socio-political context. A scientific fact is malleable because it is thought to reveal the truth, but its malleability is based on the ambiguity of the truth which it claims to reveal. News stories represented the result as a scientific fact revealing the risk of GM crops, but they did not consider how the ambiguous concept of risk was concretised and exemplified by the result. Perhaps we can argue that the media distort the facts for political purposes. However, this criticism is problematic because it suggests that we should expect real science to determine whether GM crops are risky. But if the concept of risk is ambiguous and abstract, a concrete fact produced by scientific practice, no matter how factual it is, cannot prove the risk as it is expected to do. A scientific fact can only be regarded as a proof of a risk when we can clearly know how to define the risk, for example, the shortage of weed seeds. However, the definition of risk used by the trial seems to be too narrow to produce the fact which could support a political decision on GM crops.

A story in *The Guardian* recites different interpretations of the result ('Outright ban, caution or green light?', 17/10/2003, *The Guardian*, [312]). The different interpretations reflect that the truth which the result claims to reveal is not as self-evident as it seems to be. For example, one consumer group argues that the result confirms 'our concerns that commercialisation of GM will destroy consumer choice once for all', and one environmental group also argues that 'these trials clearly show that the alleged benefits of GM do not exist'. The National Trust, representing opinion from the countryside, urges caution and says that the result highlights 'how much more work is required before the government can draw any definitive

conclusion on the introduction of GM crops'. But on the other hand, Dr Tester from department of plant sciences in Cambridge University argues that 'to generalize and all GM is bad, or all GM is good is a crude over-simplification, and these new results provide classic evidence of the complexity of the real issues'. And the Agriculture Biotechnology Council, representing opinion of the biotech industry, argues that the trials are 'not GM on trial', because 'genetic modification is a tool which can be used in different ways with different management practices resulting in different outcomes'. These conflicting arguments reflect that the result from the trial could tell different stories about the reality of growing GM crops. It could be the evidence for the risk of GM crops, but it could also be a fallacy which does not demonstrate how the technology of genetic engineering works. In this respect, the result from the trial was not really a self-evident scientific fact as represented in news stories. The truth which the result revealed is actually ambiguous. When we try to make a political decision on GM crops on the basis of that result, we need to have a consensus on the truth which the result revealed. However, the result was too controversial to be accepted as a fact. More importantly, why we should be bothered to consider how to accept the result as a fact when the decision which we need to make on GM crops is a political not a scientific decision?

Other news stories seemed to focus mainly on the political and economic significance of the result and thus regarded it as a fact revealing the nature of GM crops. Because the result from the trial was represented as a scientific fact, news stories led their readers to pay more attention to its political repercussions. For example, a news story in *The Times* says:

Elliot Morley, the Environment Minister, last night ruled out biotechnology companies being granted any GM licences in Britain next year and said that the country was "some way" from reaching any final decision on the issue. He spoke out after government scientific tests showed that GM oilseed rape and beet harmed the environment. Mr Morley even accepted that, given the impact of these crops on wildlife, particularly on farmland birds, they may never be licensed for use here. Ministers realise that were they to allow some commercial planting they would be renegeing on their

commitment to reverse the decline in the number of farmland birds by 2020. The results of the GM field trials suggest a huge threat to birds such as the skylark and corn bunting. With public opinion overwhelmingly against the technology, ministers have seen its political dangers ('Decision on GM crops postponed until after election', 17/10/2003, *The Times*, [302]).

Because the trial revealed that growing GM crops can harm the environment, the government had to reconsider whether to allow commercial planting of GM crops in the UK. Another news story in *The Guardian* says that the result from the trial forces the government to reconsider its 'enthusiasm for GM technology':

The government is now faced with an embarrassing about-turn on its enthusiasm for GM technology. Loss of birdlife in the countryside has been put forward as a key "quality of life" indicator by the government and it is pledged to reverse the trend ('Two GM crops face ban for damaging wildlife', 17/10/2003, *The Guardian*, [306]).

According to *The Daily Mail*:

MINISTERS were preparing last night to backtrack on pushing for commercial GM crops amid overwhelming evidence of harm to the countryside. After extensive farm trials, Environment Minister Elliot Morley indicated that genetically-modified oilseed rape and beet would never be approved. He also questioned whether there would ever be a market for Britishgrown biotech food because of public opposition ('The death knell sounds for GM', 17/10/2003, *The Daily Mail*, [315]).

News stories describe how the government altered its policy on commercial planting of GM crops because the trial revealed the facts about GM crops. The result from the trial was thus generalised in news stories to indicate the properties of all GM crops but not only the properties of the crops which were genetically modified to be resistant to a single herbicide. News stories stated that the government made its political decision on GM crops because the trial proved the environmental risk of GM crops. However, the stories did not examine whether the facts produced in the trial can really justify the political decision and why the risk of GM crops was the only issue which the government needed to consider when it makes its decision.

The fact produced in the trial could not justify and rationalise the political decision as

it was expected to do simply because it was conditioned and contextual. Even though it was only GM oilseed rape and beet which were tested in the trial, the political decision to ban their commercial planting could still not be fully justified by the result. The fact that there are fewer weed seeds in GM oilseed rape and beet fields could be demonstrated because the trial was designed to produce a quantitative comparison between non-GM crops and herbicide-resistant GM crops. Therefore, the fact did not refer to a true property of GM oilseed rape and beet but only referred to a difference between herbicide-resistant crops and herbicide-resistless crops which was made visible in the experimental arrangement of the trial. On the other hand, the fact required by the government to justify its political decision is a universal and objective fact which reveals the true property of GM crops. However, this kind of fact does not exist not only because there are different kinds of GM crops but also there are different definitions of the property which should be considered. In other words, the fact which the government needs is not a fact which can be produced in the experimental arrangement of such a trial. The question which the trial could answer was more concrete and restricted than the question which the government expected the trial to answer. In other words, the question which the government was asking about GM crops is in fact a political (or socio-technical) problem which science alone cannot answer.

It is, therefore, unproductive to argue that the government distorts scientific fact for political purposes, because the scientific fact is irrelevant to the political decision which the government is required to make. Rather, it should be more productive to consider why science is expected to answer a political question which it can hardly answer and why science can pretend to be able to answer it. When a scientific fact produced in a particular experimental context is used to justify a political decision, the fact needs to be transplanted from its original experimental context to a broader socio-political context. This transplantation includes two moves: one move is 'from the particular to the universal in the domain of knowledge, ideas, and beliefs', and the other is 'from the local to the global in the domain of political action and policy

choice' (Jasanoff and Wynne, 1998: 75). In the present case, the result from the trial is transformed from the fact that there are fewer weed seeds to the fact that growing GM crops is harmful to the environment. Also the decision is transformed from one about the method of growing GM crops to the decision about commercial planting of GM crops. By being transplanted from the experimental context to the socio-political context, the fact is transformed from a scientific fact to a socio-political fact which can lead to particular political actions. But we should recognise that a scientific fact can be transformed to a socio-political fact not because it reveals the truth but because it is socio-politically accepted as a revelation of the truth. As Jasanoff and Wynne argue:

It [the social science literature on science and public policy] has also been instrumental in revealing that technical knowledge deemed suitable for public action is not exclusively a production of the scientific community, with its vigorous, but publicly invisible, forms of self-criticism. Rather, it is a sociotechnical hybrid whose authority depends on active communication and collaboration among multiple cultures or forms of life – including the bureaucratic, scientific, economic and social – each of which possesses its own distinctive resources for producing and validating knowledge (Jasanoff and Wynne, 1998: 74).

When the fact produced in the trial was used in the context of policy-making as scientific evidence for the risk of GM crops, we should be well aware of the process of transplantation in which the fact achieves its malleability to be used in different contexts for different purposes. The fact can have its authority in the socio-political context not because it is scientific but because it is accepted as a scientific fact. However, news stories fail to point out this issue but simply represent the result for the trial as a fact revealing the nature of GM crops.

Perhaps the reason why we might expect that the policy on GM crops should be grounded on a scientific fact is because we think that a scientific fact can rationalise and depoliticise political decisions. Ezrahi argues that if we did not examine the interaction between science and politics in terms of rationality and effectiveness, we could explore how the role of science and technology functions as political strategies

to legitimate actions and to hold political actors accountable in the context of public affairs (1990: 12). He argues that a political action is not only the performance of a task but also a mode of political and ideological communication (12). In this respect, science, as a rhetorical and political resource which enables an actor to construct the 'liberal-democratic' form of his/her action, is often used in the political context to depersonalise and to depoliticise the exercise of political power, or to rationalise the 'government actions as actions taken not only on behalf of but also supposedly for the sake of the people' (13). When science is considered to reveal the truth about our life world objectively and rationally, a political action which is based on scientific advice can also claim itself to be an objective and rational action. But sometimes a political action cannot be rationalised and depoliticised, and needs to be taken on the basis of a value judgment which is made in an open and democratic discussion, not a fact which is produced by scientific practice. The power of science is exaggerated when we think that science can rationalise all the political decisions which we need to make. When we consider the properties of GM crops to be something which GM crops are developed to have but not something inherent in them, we can see that a scientific fact about the property is insufficient to solve the problem of GM crops. What we need to do in order to solve the problem is to decide, politically and democratically, how we should develop and use the technology.

The quantitative comparison made by the trial was expected to tell us the effects of growing GM crops so that we could decide whether to grow it. However, when the world is transformed into quantitative data in order to calculate and compare the data as if we are calculating and comparing the world, we should not mistakenly think that quantification makes our calculation and comparison objective and rational. Quantification is a value-laden and theory-oriented action, and it highlights certain properties of the world but marginalises others. Porter argues that 'quantification is a powerful agency of standardization because it imposes order on hazy thinking, but this depends on the license it provides to ignore or reconfigure much of what is difficult or obscure' (1995: 85). Quantification can transform the world to a range of

standardised and interpretable data. But the impersonality and standardisation of quantification should not be confused with objectivity. Quantification is often thought to be a scientific method which can reduce subjectivity to a minimum and thus transform a scientific result from 'a view from somewhere' into 'a view from nowhere, at least nowhere in particular' (Porter, 1992: 646-47). But to represent reality in the form of numbers is a value-laden action: the reason for transforming the world into quantitative data is because the world can thus be calculated and compared. Quantitative data is just a simplified representation of the world but not the world itself. Quantification can create a measurable and comparable reality of our life world, but it can only be useful when we need to compare and measure the world in the form of numbers. When we need to decide whether or not we should develop and use a technology in a specific way, quantification might not be the appropriate way of representing the reality which we are concerned with.

Therefore, no matter how objective and rational the result from the trial seemed to be, it was insufficient to support a political decision on GM crops. As mentioned above, the harm of growing herbicide-resistant GM crops is the consequence of its herbicide-resistance. In such a situation, we should consider why the technology of genetic engineering is used to produce the crops which can resist a single herbicide, but not whether we should ban commercial planting of GM crops on the basis of the result. We should consider how to develop and use the technology in more acceptable ways. But these issues cannot be considered only from a scientific perspective but from a political and socio-technical perspective, because they are issues about values. We should not take technological progress for granted. Instead we should decide how a technology should be developed. It is a decision which can be only made by an open and democratic discussion about all the conflicting values about the technology. A scientific fact produced in an experimental arrangement is insufficient to help us to make this decision.

In this situation, the result from the trial was insufficient to justify a political decision on GM crops not only because it was contextual and conditioned but also because it

led people to make the decision *after* but not *before* the technology was developed. The result, as a scientific fact, was removed from its original experimental context and situated in a broader socio-political context in order to depoliticise a political decision. However, depoliticising the decision is problematic not only because the decision could not be depoliticised as such but also because the decision should not have been made after the technology had been developed to have the property which the fact revealed. The controversy of GM food/crop could not be settled by the result from the trial not only because a lot of significant issues were made invisible in the reality represented by the trial but also because the present form of the technology is taken for granted in the reality. I explore how the trial took the existence of GM crops for granted and what its implications are in the next section.

The limitation of the fact

In this section I want to examine how the trial represented the reality of growing GM crops and argue that its representation has had a negative impact on the public discussion about GM food/crop. The trial investigated the effect of growing GM crops, but did not consider why the effect should be brought into existence in the first place. The trial aimed to know the future of growing GM crops, but forgot to think that the future is shaped by the past in which GM crops have been decided to be developed in a particular way. The trial leads us to accept the reality of growing GM crops as it is but not to consider what kind of reality it can and should be.

Again, an artificial line between fact and value is drawn so that we can have a scientific fact to depoliticise the decision and avoid the difficulty of engaging in a debate about conflicting values. But we forget that the fact is actually produced by a value-laden experimental arrangement in which reality is decided to be represented in a specific way. The reality represented in the trial is a reality in which the crops have already been genetically modified to resist a single herbicide. In the reality, we, the public and readers of news stories, can only decide whether to accept GM crops or not when their properties are revealed by the trial. However, there are several

things invisible in this reality, for example, the history of technological development and the power to decide how the technology should be developed. We think that the result from the trial was an objective and value-free fact, but forget that the fact was actually produced for a particular purpose. We forget that asking a question about the risk but not the value of GM crops is itself a value judgment. The result from the trial tells us only what happens in the experimental arrangement of the trial. When we accept its result as a fact, we also accept its way of representing the reality of growing GM crops. The trial leads us to accept the status quo and pay no attention to the process in which the technology has been developed into its present format.

However, the reality of growing GM crops can be represented and considered in different ways. For example, news stories about the failure of Monsanto's wheat business in Europe can lead us to think about the reality from different perspectives. Stories suggest that Monsanto's failure is due to the public 'distrust' of GM food/crop in Europe, as a story in *The Daily Mail* indicates:

It [Monsanto] blamed the failure on the lack of a market for hybrid wheat seeds, saying the move was a 'strategic decision'. Anti-GM campaigners insist the decision was related to the anti-GM climate in Europe. Friends of the Earth spokesman Pete Riley said: 'They set up the operation in Cambridge five years ago with the clear intention of introducing GM wheat and barley into Europe. This has been a pretty abject failure' ('Critics hail retreat of seed giant', 17/10/2003, *The Daily Mail*, [317]).

Another news story in *The Times* states that 'Monsanto has lost some of the arrogance that led to the battle of words five years ago with the Prince of Wales over "Frankenstein foods" but more discrete lobbying has failed to win over European consumers' ('New seeds of doubt on GM reinforces Monsanto sale decision', 17/10/2003, *The Times*, [304]). The story goes on to say that Monsanto is 'unable to develop successful hybrids with wheat and cereal farmers who have the annoying habit of saving seed for next year, a strategy that can reduce their royalty payment'. The story concludes:

Developing countries want more and cheaper food but in Europe, food quality, not quantity, is the main concern. Monsanto's experience has been

with US consumers; they are happy to eat GM food, caring more about volume and price than origin or quality. For a people so rich, that approach seems strange, but food habits go back hundreds, if not thousands of years, and it is worth remembering that most Americans are descended from people who arrived barefoot in the land of plenty. If Monsanto learns any lesson from its retreat from Cambridge it could do worse than talk to Unilever, the vendor. Unilever's chairman, Niall FitzGerald, is a supporter of biotechnology but the firm will not use GM products if consumers don't want them. Unilever knows its business is about selling food, not technology, a distinction that escapes Monsanto ('New seeds of doubt on GM reinforces Monsanto sale decision', 17/10/2003, *The Times*, [304]).

If we could learn any lesson from the failure of Monsanto's wheat business, the lesson should be that introducing a new technology into everyday life is not only a scientific but also a socio-cultural and political-economic action. Even if Monsanto tries to promote its hybrid wheat seed which is actually not genetically modified, it still faces the difficulty of changing the farmers' habits, as argued in *The Times* story. In the case of GM crop/food, Monsanto needs to overcome the difficulties of persuading European consumers to accept a GM product not only as a new technology but also as a crop/food. The trial leads us to consider a GM crop as a new technology whose properties can be determined by science but not as a crop which we grow to feed ourselves. When we are concerned with the effect of growing GM crops and expect that a scientific fact can determine the effect, we forget that we should also consider the reasons for growing it. Like Monsanto's failure, the trial fails to recognise that a GM crop should be examined not only as a crop grown in the experimental context but also as a crop grown and consumed in the real world. The technology of genetic engineering can be examined 'morally (Is it justifiable?), economically (What does it cost?), socially (Who benefits?), politically (Who controls it?), aesthetically (Does it make food more pleasing to the sense?) and scientifically (Is it safe?)' (Cook et al., 2004: 441). And we should be aware that the trial is not the only way of defining and solving the problem of GM food/crop.

When we attempt to find a scientific fact revealing the risk of GM crops, we often find various and conflicting scientific arguments but none of them can be factual

without question (see chapter 4). We tend to define the problem of GM crop/food as the uncertain effect of using the technology, and therefore we expect that science can determine the effect. But the problem is not only the effect of using the technology but also the way of using it. For example, it is not necessary to use the technology of genetic engineering to produce herbicide-resistant crops. The present way of using the technology is a consequence of the socio-technological process in which the technology has been developed. In other words, the technology has its own history but is not just created in the laboratory by disinterested scientists. As showed by Monsanto's failure, the present way of using the technology is drastically challenged, at least in the European context, and not all the challenges are concerned only with its effect. If we do not examine the technology of genetic engineering morally, socially, economically, politically and aesthetically but only scientifically, we would not be able to cope with the problem of the technology and simply accept the present way of using the technology. However, if the properties of GM crops are something which they were developed to have, why we do need to decide whether to grow GM crops until we can prove their properties in a scientific experiment? Why do we not think more carefully before we decide to produce the crops? We can decide to use the technology in a 'better' way after we can publicly and democratically discuss what the 'better' way is. We do not need to accept the present form of technology as the trial leads us to do.

We should consider the trial, which simplifies the world to produce its result, to be a political action which depoliticises the reality of the technology and deprives us of the opportunity to change the present form of the technology. The reality of growing GM crops is transformed into quantitative data in order to produce the fact. In the experimental arrangement of the trial, GM crops are removed from their socio-cultural and political context but are represented as given and ready-made objects. The issues about the history of the technology are all made invisible in the experimental arrangement of the trial. In the trial's representation of reality, there are no biotech industry, no farmers, no scientists, no politicians, no environmentalists

and no lay people. There are only herbicide-resistant GM crops, weed seeds and wildlife. GM crops are removed by the trial from the socio-technological context where they were invented, produced and grown, and are situated in the experimental context of the trial in order to be tested. Therefore, no matter how objective and factual the result from the trial seems to be, it can never settle the controversy of GM crop/food, because the reality to which it refers is too simplified and apolitical. We need to examine the issues which are made invisible in the trial's representation of reality, if we really want to find a solution to the problem of GM crop/food.

Conclusion

In this chapter, I have explored how the trial was designed to produce a scientific fact about the effect of growing GM crops, and how the reality of growing GM crops was transformed into an experimental arrangement in which a quantitative comparison between growing GM and non-GM crops could be made. The result from the trial was interpreted in news stories as a scientific fact revealing the harm of growing GM crops to the environment. However, this fact could only be factual in the experimental context where it was produced, because it had no real reference to the world but referred only to the trial's representation of the world. When news stories represented the result as scientific proof of the risk of GM crops and described its social and political significance, they marginalised discussions about the limitation of the result as scientific fact. The trial transformed the world into quantitative data in order to make it calculable, interpretable and comparable. In such a way, the fact which it produced could never reveal the true properties of GM crops, but only the end product which the trial was designed and arranged to produce. It had the power of a scientific fact because we accepted it as a scientific fact but not because it was universally true.

When the result from the trial was used to justify and rationalise political decisions on GM crops, it was 'transplanted' from its original experimental context to a broader socio-political context. In the experimental context it is a concrete

description about the consequence of growing herbicide-resistant GM crops, but in the socio-political context, it is considered to be a scientific fact revealing the nature of all GM crops. The result, as a scientific fact, was used to depoliticise political decision-making because it made the decision 'objective' and 'rational'. It was an objective and rational decision because it was made on the basis of a fact but not a value. However, the question which the trial was designed to answer is different from the question which the government asked about GM crops. The fact produced in the trial was conditioned and contextual so that it could not settle the controversy of GM crop/food as it was expected to do. And the political decision on GM crops cannot be depoliticised by a scientific fact produced in an experiment not only because the fact can only be factual in the experiment but also because the problem of GM crops cannot be simply defined as a scientific problem. A scientific fact is insufficient to solve the problem of GM crop/food because it is irrelevant to the problem. The problem is not only the effect of growing GM crops but also the reason why the crops are modified genetically in such a way. The properties of GM crops are something which they are developed to have but not something inherent in them. Therefore, the decision should be made *before* rather than *after* the technology is developed.

The result from the trial, as a scientific fact, was limited. It was contextual and conditioned because it referred only to the simplified representation of reality constructed by the trial. But more importantly, it was a fact produced on the basis of a value judgment of representing the reality of growing GM crops in a particular way. The trial removed GM crops from the social and politico-economic context where they are invented and produced, and situated them in the experimental context where the effect of growing GM crops could be made visible in the form of quantitative comparison. The history of GM crops is thus made invisible in the trial's representation of reality. We, as the public and readers of news stories, are deprived of the opportunity to consider why and how the technology of genetic engineering is developed into its present form. In the story told by the trial, GM crops are given and

ready-made products which are brought into existence by the technological progress of genetic engineering. However, this story deflects our attention away from the socio-technological process in which the technology is developed. It leads us to examine the effect of growing GM crops but not to consider why the effect was brought into existence in the first place. When news stories represented the result from the trial as a scientific fact without question and focussed on its political significance, they failed to point out these issues. In order to find a solution to the problem of GM food/crop, we need alternative news narratives which can lead us to define the problem in different ways. In the next chapter, I will try to explore how we can propose alternative narratives about GM food/crop.

7. The Dominant Narrative and the Alternative Narratives

Based on my five case studies in previous chapters, in this chapter I explore the ideological and political implications of the dominant narrative which is constructed and reproduced in the news stories about GM food. The dominant narrative is reproduced in press coverage, and it becomes a naturalised and legitimate framework in which various events are framed and interpreted. The news stories about GM food are often criticised in that they mislead the public, as was said in the scientists' letter to the prime minister (see chapter 4 and 6). Even some newspapers are criticised for taking a campaigning stance to make the GM debate confrontational and raucous (POST, 2000: 21). But these criticisms are questionable in the sense that they try to distinguish science from politics and to marginalise all the political or non-scientific questions about GM food. The dominant narrative is problematic neither because it provokes public anxiety about GM food nor because it politicises public discussion. It is problematic because it represents the GM debate as a debate between two irreconcilable camps which use their own scientific facts to support their own arguments and to discredit the opposition. The dominant narrative confines the debate to controversial issues about the physical risk of GM food, and represents the debate as a contest between facts contesting for credibility. In the dominant narrative, we, as readers of news stories, are characterised as consumers who can only choose whether to buy GM food products or not. When the dominant narrative is reproduced in different news stories, we are led to accept the narrative as a legitimate way of representing the reality of GM food.

In the dominant narrative, the problem of GM food and crops is defined as a problem about the uncertain effects on human health and the environment. GM food is represented as an existing and ready-made object whose properties can be determined or revealed objectively and scientifically. In the narrative, the present form of the technology is taken for granted. But the present form of the technology is not something which we should accept passively. When the dominant narrative leads

its readers to pay attention only to the effects of the technology, it marginalises the questions about the reasons for developing and using the technology in such a way. The dominant narrative is problematic because it makes the GM debate unproductive. We are led to a narrow definition of the problem, and thus try to solve the problem in an unproductive and restricted way: we produce more conflicting scientific facts about GM food to make us more confused. There are important questions about the technology which remain unasked; such as how and why the technology should be developed and used.

How should we understand the power of the dominant narrative? News stories transform our life world into a social reality which we can grasp and react to (Bennett, 1982: 288). We should consider a news story neither to be a factual description about the world nor a false construction which contradicts the deep truth of the world. A news story is not separable from the reality which it represents, but is, rather, an embodiment of the reality (Bennett, 1982: 288). It makes reality visible and brings it into existence in a particular way. As a significant source of knowledge about our life world, news stories help us to know how to position ourselves in the world. Without symbolic representations, the world is inaccessible and ungraspable for us. But particular representations of the world are accepted as reality not because they are objective and factual, but because they are naturalised in a sense that we think that the reality which is represented by them is the world in which we live. Put it differently, the reality can be seen in different ways, and the reason why we see it in a particular way is because we accept this way as the only and appropriate one. When we propose different ways of representing, we also propose different ways of seeing, reacting to, and producing reality. We can not access the world without symbolic representations of it, but it does not mean that all representations are equally good (Fairclough, 2000: 155). Instead, we should compare and examine different representations reflectively and critically in order to find the ones which can help us to examine our situation and to solve our problems creatively. When the dominant narrative leads to a narrow definition of the problem of GM food and to

unproductive solutions, we should consider how to produce alternative narratives in which different problems can be seen and different solutions can be suggested. In other words, when we propose alternative narratives, we not only resist the symbolic power of the dominant narrative but also start to see the reality of GM food in different ways.

Therefore, in this chapter I begin with a discussion about the disadvantages of the dominant narrative. The dominant narrative leads us to focus on the effect of GM food and to find the facts which can determine the effect. I discuss the symbolic power of the dominant narrative and explain how it is possible to produce a different reality by representing it in a different way. In order to solve the problem of GM food, I argue that we need alternative narratives which can lead us to consider the controversy of GM food in different ways. We need alternative narratives in which the problem of GM food can be defined and solved in more productive ways. I am not arguing that we can find the best narrative about the reality of GM food. Instead, I am arguing that we should always examine our ways of representing reality and consider the consequence when we accept particular representations as reality. When the dominant narrative cannot help us to solve the problem, we need alternative narratives in which more creative and productive ways of defining and solving the problem can emerge.

The dominant narrative in news stories

In previous chapters, I explore how the risk of GM food is represented in news stories. This is the crucial issue which is central to public discussion about GM food. I also explore how science is expected to provide the facts which can either verify or falsify the risk. When science fails to produce uncontroversial facts about GM food, the GM debate becomes a contest between conflicting arguments for credibility. News stories not only confine the GM debate to the issues about the physical risk of GM food, but also polarise the debate into two irreconcilable camps. The opinions opposing GM food in news stories are often the opinions from environmental or

consumer groups, for example, Greenpeace and the Friends of the Earth. By contrast, the groups defending GM food are either the government defending its policy, or scientists claiming that there is no scientific evidence for the risk of GM food. The two groups have different interpretations about the effect of the technology. The opposition group often claims that GM food is hazardous and brings no benefit to the public. The defending group often argues that the risk of GM food cannot be proved scientifically. At first glance, news stories seem to represent the GM debate in a balanced and inclusive way. There are opposing opinions arguing against each other in the stories and therefore readers can learn how the problem of GM food is considered from different perspectives. However, through presenting opposing positions, news stories polarise the debate into pro- or anti-GM choices. They lead their readers to think that they can only take one side or the other in the debate. The dominant narrative only highlights the opinions about GM food which can be categorised into either pro- or anti-GM stances.

Therefore, the dominant narrative which is reproduced in news stories has three disadvantages. First of all, the dominant narrative represents the GM debate in a ritualised way, so that the debaters and their arguments become predictable. Some debaters repeatedly appear in news stories, and their arguments are represented in a fixed way. The stories often select the arguments from environmental and consumer groups to represent the opinions opposing GM food. These groups are characterised as being 'neutral experts' who express 'the interests of the public' in contrast with the 'narrow vested interests of business' (Furedi, 2002: 175). In order to demonstrate their objection to GM food, news stories often highlight the radical or even extreme arguments from these groups. For example, in different news stories, Friends of the Earth are repeatedly quoted as stating: 'if that type of pressure [from the American government] has occurred, as we suspect, then it helps to explain why the Government is doing all that it can to rush through these potentially very dangerous crops and foods before adequate testing has been carried out' (Charles Secrett, Friends of the Earth, 'Blair resists calls for ban', 13/2/1999, *The Times*, [262]). They

also state that: ‘many people don’t want GM ingredients at all and don’t want to support GM technology’ (Robin Maynard, Friends of the Earth, ‘Restaurants face fines if they deny GM food on menu’, 19/3/1999, *The Guardian*, [291]); and that ‘we now have confirmation that GM crops harm the environment, make no economic sense and are deeply unpopular’ (Tony Juniper, of Friends of the Earth, ‘Two GM crops face ban for damaging wildlife’, 17/10/2003, *The Guardian*, [306]). News stories make anti-GM arguments predictable for their readers by repeatedly presenting the arguments from particular groups in a ritualised way. They lead their readers to think that people who oppose GM food are mainly the people who join environmental and consumer groups.

However, when news stories only represent the radical opinions from environmental and consumer groups, they marginalise other arguments which question GM food in different ways. Furedi argues:

Environmental and consumer activists have deep-seated convictions that new products and technologies are likely to be unsafe and that they must make society aware of the multitude of dangers it faces...Encouraging people to fear, mistrust, complain and litigate is seen as a socially responsible act... However... an uncritical celebration of mistrust can only help to breed passive cynicism. Cynicism leads nowhere, certainly not to political renewal (Furedi, 2002: 185).

I do not agree with Furedi that environmental activism or consumer activism only encourages people to fear and mistrust. But I agree with him that the way the dominant narrative represents the activism leads us nowhere. In news stories, the professional activists of environmental and consumer groups speak on behalf of the public, and their arguments express only hostility to the technology, fear of its risk and mistrust of the political and industrial powers behind it. However, other more reflective and deliberative arguments which cannot be easily categorised into either pro- or anti-GM stances are marginalised in news stories. The GM debate is represented as a debate between two irreconcilable camps whose arguments are in conflict with each other. In this respect, the dominant narrative cannot encourage readers to reflect on the problem of GM food.

The second disadvantage of the dominant narrative is that it leads its readers to expect that science can reveal the facts about the risk of GM food. Since we have two irreconcilable camps disputing the risk of GM food, we expect that we can settle the controversy by a scientific fact which reveals its nature. However, science can only answer a well-defined question. The question about the risk of GM food is ambiguous and controversial since we have no clear and agreed definition of the risk. When an experiment is designed to answer this question, it has to define the risk in a particular way. In this situation, a scientific fact about the risk of GM food is often challenged not only because it is only factual in the experimental setting where it is produced, but also because its definition of the risk is not acceptable for everyone. Because of this, a scientific fact cannot settle the controversy of GM food as it is expected to do. We have conflicting scientific facts which define the risk differently. We have conflicting arguments which are based on these conflicting facts. We try to determine which argument is credible by determining which fact is purely scientific (see chapter 4), but we ignore the fact that the question which we ask is not a well-defined question which can be answered by the facts produced in experimental settings.

Therefore, the dominant narrative leads its readers to consider which fact is scientific and thus credible, but not to consider the question which the fact aims to answer. The narrative leads the readers to think that if a fact cannot answer their question it is because it is not scientific, but not because it is irrelevant to the question. Midgley argues that 'explaining things does not necessarily mean fitting them into existing scientific schemes' and explanations vary with the needs that call for them (2001: 122). She argues that scientific facts and scientific explanations are not always more fundamental than others: different kinds of questions need different kinds of answers, and the main difficulty is to identify the exact question we are asking (123). We expect that science can answer our question about GM food by providing objective and uncontroversial facts. However, we hardly consider what kind of question we are asking and what we should ask. We have to make sure that our question about GM

food is a scientific question before we find a scientific answer to it. Our question is too ambiguous and ill-defined to be answered by science.

The dominant narrative also leads its readers to accept the authority of science without considering the reason for accepting it. The dominant narrative guts 'science of content by reducing it not to a method for finding truth but to a conflict of authorities and even personalities quoted in the media' (Burnham, 1991: 40). The GM debate is polarised in news stories by juxtaposing competing authorities, and therefore what their readers can learn from the stories is that there are 'competing figures speaking on one side or the other, each trying to establish the most convincing authority and media presence' (40). Different arguments try to enhance their credibility by demonstrating their scientific-ness. No matter whether they are pro- or anti-GM, they lead us to think that scientists should get in the last word on issues of introducing the technology of genetic engineering into our lives. Scientists have already decided what kind of technology we need in their laboratories; and they should also decide what kind of questions we should ask and answers we should get in public discussions about the technology. We are deprived of the opportunity to participate in the process of shaping the technology, and can either accept the technology as an example of scientific progress or reject it when scientists tell us that it is risky.

The third and most important disadvantage of the dominant narrative is that it confines public discussion about GM food to the issue of its risk. In the dominant narrative, the problem of GM food is defined as a problem about its physical or scientifically provable risk. As discussed in chapter 3, different ways of defining the problem lead to different ways of evaluating the technology of genetic engineering, and 'riskification' is only one way of problematising GM food. In the dominant narrative, the benefits of GM food are weighed against its risks, but only its risks are examined and its benefits are taken for granted. The narrative suggests that risk is the only problem standing in the way of the public acceptance of GM food as progress. It leads its readers to consider how to determine the risk of GM food, as if GM food is

an existing and ready-made object rather than a technology which is still developing. It suggests that we as consumers can and should decide whether to buy GM food products, but it ignores the fact that this decision is not the only decision which we can and should make. The narrative seldom describes how the technology has been developed into its present form. It seems that the technology evolves in the laboratory which is remote from society. But the technology is developed by someone for particular purposes in favour of particular interests. When the dominant narrative leads us to consider only the effect of the technology, it deflects our attention away from the history of the technology and deprives us of the opportunity to question the reason for developing it. We pay much attention to the risk of GM food, but we fail to recognise that it is not a given object and that its nature could be changed if we decide to develop it in different ways. The risk of GM food which scientists reveal in their experimental settings should not be considered to be one determined property of the technology, but a consequence of using the technology in a specific way. In other words, the narrative leads us to take the present form of the technology for granted. However, we should consider why the technology should be developed in such a way before we decide to do it.

Therefore, the dominant narrative is problematic because it leads its readers to focus only on the issue about the risk of GM food. It is a matter of politics to decide which issue should be debated and how the issue should be debated. Lukes argues that the supreme and most insidious exercise of power is 'to prevent people, to whatever degree, from having grievances by shaping their perceptions, cognitions and preferences in such a way that they accept their role in the existing order of things, either because they can see or imagine no alternative to it, or because they see it as natural and unchangeable, or because they value it as divinely ordained and beneficial' (1974: 24). He suggests that we should incorporate into the analysis of power relations 'the question of the control over the agenda of politics and of the ways in which potential issues are kept out of the political process' (21). The dominant narrative has the power to confine public discussion about GM food to the

issue about its physical risk. It leads its readers to identify themselves as consumers who can only decide whether or not to accept GM food products in the market. In this respect, the dominant narrative leads its readers to accept their role in the existing order of things and to see no alternative to the present form of the technology. The dominant narrative makes the issues concerning the history of the technology invisible in the public sphere. It shapes readers' perceptions so that they accept the technology as it is without considering how it can be developed and used differently. It does not encourage readers to actively participate in the process of shaping the technology. In other words, the dominant narrative naturalises the existence of GM food products and depoliticises the history of the technology of genetic engineering.

Therefore, the dominant narrative fails to encourage its readers to participate in the process of shaping the technology, and leads them to pay attention only to the effect of the technology. Wynne argues that 'the definitive modern focus of public discourse on the theme of *risk* and insecurity alone, as if this were the universal natural meaning of the public issues involved over new sciences and technologies, is a key obstacle to any democratic impetus' (2002: 472). He argues that 'the dearth of any public epistemic debate around purposes rather than consequences, not only of technology but of scientific knowledge itself, would seem to suggest that reflexive modernization as a genuinely reflexive focus on exposing and collectively deliberating our own culture's "naturalized" and constitutive human contingencies is at best exaggerated, at worst a delusion' (473). When the dominant narrative leads its readers to focus on the risk of GM food, it makes public discussion about GM food unproductive because its readers can imagine no alternative to the technology and can only choose not to accept GM food products in the market when their risks are proven scientifically. The narrative makes the public powerless because they are fenced off from the laboratories where GM food products were developed. It not only makes what happened in the laboratories invisible to the public, but also reproduces the power gap between scientists who decide how the technology should be

developed, and the public who can only accept the results of technological progress. The public has no power to decide what kind of GM food they want or to question the reason why public resources should be invested in developing the technology of genetic engineering.

The dominant narrative, which is reproduced in news stories about GM food, has three disadvantages in creating a more inclusive, public and democratic discussion about the development of genetic engineering. The narrative represents only the radical arguments from legitimate debaters, and confines the GM debate to the issue about the risk of GM food which is expected to be either verified or falsified by scientific facts. The narrative has its power in shaping our knowledge about the world in which we live, and we naturalise its representation of the world as if it were the world itself. When we accept its representation as reality, we also accept the socio-cultural meanings reproduced in the narrative, such as the inevitability of GM food as an example of scientific progress, and the authority of scientific knowledge. News stories function as definers of social reality by representing and embodying the reality in a particular way for us. In the next section, I discuss the symbolic power of a news narrative and explore how we can see the reality in different ways by proposing alternative narratives about it.

News stories, definers of social reality and symbolic power

We often think that news stories provide us with information about the world where we live. And we often consider communication to be a process or a technology which involves the transmission of thought and the dissemination of knowledge. However, this 'transmission view of communication' (Carey, 1989: 15) leads us to understand communication in terms of an information flow between source/author and receiver/audience. It leads us to pay no attention to another important function of communication which is to establish human relationships through achieving mutual understandings and shared meanings between communicators. In order to explore how communication helps people to establish and to maintain their society, Carey

argues that we should understand communication from an alternative perspective which he calls the 'ritual view of communication':

A ritual view of communication is directed not toward the extension of messages in space but toward the maintenance of society in time; not the act of imparting information but the representation of shared beliefs. If the archetypal case of communication under a transmission view is the extension of messages across geography for the purpose of control, the archetypal case under a ritual view is the sacred ceremony that draws people together in fellowship and commonality... It [a ritual view] sees the original or highest manifestation of communication not in the transmission of intelligent information but in the construction and maintenance of an ordered, meaningful cultural world that can serve as a control and container for human action (Carey, 1989: 18).

From the transmission view, reading newspapers is considered to be a process of learning or acquiring new knowledge about the world around us. By contrast, from the ritual view, reading newspapers is considered to be like attending a religious ritual in which nothing new is learnt, but a particular view of the world is portrayed and confirmed. Under the ritual view, news is not information but drama: 'it does not describe the world but portrays an arena of dramatic force and action; it exists solely in historical time; and it invites our participation on the basis of our assuming, often vicariously, social roles within it' (Carey, 1998: 21). News stories are both representations 'of' and 'for' reality: as 'stories of', news stories represent reality, and as 'stories for', they create the very reality they represent (29). When we examine news stories from the ritual view of communication, we explore how the members of a society create, express, and convey their knowledge of and attitudes toward reality through the construction of a variety of symbol systems. In other words, we aim to understand the socio-symbolic process whereby social reality is created, shared, maintained and modified.

Therefore, news stories neither mirror nor distort reality. Under the ritual view of communication, reality does not exist a priori, and news stories are not apart from the reality which they represent. Rather, news stories are the results of our socio-symbolic practice of representing and producing our social reality. Following

Bennett's argument, I regard news stories as definers of social reality:

To suggest that the media should be viewed as 'definers of social reality' is to suggest that *what* 'events' are 'reported' by the media and the *way* in which they are signified have a bearing on the ways in which we perceive the world and thus, if action is at all related to thought, on the ways in which we act within it. It is to affirm that the media *are* agencies of mediation, that in reporting events they also propose certain frameworks for the interpretation of those events, moulding or structuring our consciousness in ways that are socially and politically consequential. Viewed in these terms, the media are not *apart from* social reality, passively reflecting and giving back to the world its self-image; they are *a part of* social reality, contributing to its contours and to the logic and direction of its development via the socially articulated way in which they shape our perceptions (Bennett, 1982: 288).

As definers of social reality, news stories transform our life world into a social reality which is perceivable, communicable and manageable for us. News stories are representations of reality through which socially shared knowledge and beliefs can be communicated, learnt and maintained by the members of a society. The socially shared knowledge and beliefs are naturalised and legitimatised when news stories repeatedly report various events in a ritualised way. We, as readers of news stories, learn how to interpret our social reality meaningfully and how to position ourselves in it from the stories. A controversy, a social problem, and a risk object such as GM food, are all made visible to the public by being framed as a controversy, a social problem and a risk object in news stories. Through being reported in the media, what happened in the world is transformed into socio-culturally interpretable events. We naturalise and objectify the social reality represented in news stories because we accept the stories as factual descriptions of our life world. We think that a social reality exists as news stories report it. The reality becomes graspable and communicable for us because it is framed by news stories in ways which are socio-culturally meaningful. The reality represented in news stories is not independent of the stories; the reality is produced by news stories in a sense that we can only perceive and grasp the reality when it is represented in the stories.

However, we should not misinterpret the argument that news stories function as

definers of social reality. On the one hand, the argument does not suggest that there is nothing outside the symbolic representations of news stories. On the other hand, news stories are not the only socio-symbolic practice of producing social reality, even though they are significant and powerful because they are an important source of our knowledge about the world in which we live. News stories constitute a significant part of our socio-symbolic practice of representing, reproducing and maintaining our social reality. But news stories can only function in a broader socio-cultural context and in cooperation with other social institutions – for example, science, literature and politics. They cannot create social reality in a vacuum. There are other social practices of defining and producing reality, for example, the scientific experiments which are designed to produce the facts about our life world. What news stories create is ‘a new kind of publicness which consists of what we may describe as *the space of the visible*: it is the non-localized, non-dialogical, open-ended space of the visible in which mediated symbolic forms can be expressed and received by a plurality of non-present others’ (Thompson, 1995: 245). News stories produce social reality in the way that they select and signify what happened in the world, transform the happening into a socio-culturally communicable event, and make this event visible to the public in a particular way. News stories produce the ‘mediated publicness’ (Thompson, 1995) from which we can learn about the experiences of others and about events which happened out there. In this sense, news stories visualise a particular version of social reality for a plurality of non-present others.

The concept of mediated publicness leads us to consider the power of news stories in a different way. Media power can be defined as a ‘symbolic power’ (Couldry, 2003: 39). Couldry argues that ‘the media’s differential symbolic power is naturalised through the media’s role in framing, ordering, and naming social reality’ (Couldry, 2000: 57). Firstly, the media function as a frame which marks off the social from the private and particular. The media provide an abstract form of togetherness ‘which operates without altering the actual segregations in society’ (44). Therefore, we

should consider the questions of which categories of social agent get to write, speak, and be seen in the frame and which do not. As discussed in the first disadvantage of the dominant narrative, news stories only represent the arguments of particular debaters. These debaters are thus more influential in the GM debate because they can be seen in the space of the visible. The reason why other debaters are invisible in news stories is not because they do not exist, but because they are framed out and thus made invisible.

Secondly, the media have the power to order social reality by establishing the divisions between different worlds. The dominant narrative functions as an ordering practice by distinguishing the world of politics, which is a world where people discuss values, from the world of science, which is a world where people discover facts. The narrative establishes that science has the authority to determine which fact about GM food is true and credible. In order to avoid the abuse of scientific authority, the world of science has to be fenced off from the world of politics. In the world of politics, people make their decisions about GM food based on their subjective values. But people can rationalise and depoliticise their decisions if their decisions are made on the basis of scientific facts. In this respect, the dominant narrative imposes an order on our life world by establishing the division between politics and science. The fact produced in the world of science is epistemically superior to the value discussed in the world of politics. The dominant narrative suggests that the decision based on facts is more objective and rational than the decision based on values. It defines the controversy of GM food as a controversy in the world of science but not in the world of politics. Therefore, it suggests that we should determine the facts about GM food but not discuss the values of GM food in order to settle the controversy. The dominant narrative puts our social reality in order by drawing an artificial line between fact and value.

Finally, news stories function as definers of social reality by providing an essential flow of information and meanings 'that enable the generation of new discursive resources at a societal level' (Couldry, 2000: 50). The dominant narrative provides its

readers with the risk discourse which they can use to define the problem of GM food. By providing a couple of facts concerning risk, news stories lead their readers to think that risk is a significant issue which they should be concerned with. But the dominant narrative does not provide us with alternative discursive resources which we can use to discuss GM food in alternative ways. It defines the controversy of GM food as a controversy about the risk, and it only provide us with the fact that the risk is debated, but not the fact that the technology of genetic engineering was developed by someone for some purposes. Bourdieu argues that 'political subversion presupposes cognitive subversion, a conversion of the vision of the world' (1991: 127). We cannot develop different ways of defining and solving the problem of GM food because we are not provided with the alternative information and meanings which can enable the generation of new discursive resources. We are deprived of political power because we do not know how to see the world in a way that empowers us to take part in the process of technological development.

In order to resist the symbolic power of news stories, we need to engage in 'the politics of the sign', which 'is not to oppose truth to falsehood, but to *take up a position* in relation to dominant systems of signification' (Bennett, 1982: 307). The politics of the sign does not aim to search for the best representation of reality. Rather, it requires us to examine our current representation reflectively and critically. Symbolic power is not a personal or physical power, and it is only embodied in the ways that reality is interpreted and represented socio-symbolically:

The emergent forms of power are apparently neutral and primarily functional in character, and one cannot readily address them as physical and as tangible entities of power, let alone personal. For this reason the problem has to be dealt simultaneously at both the cultural and the political level (Melucci, 1996: 181).

We can only resist symbolic power by trying to represent and produce reality differently. The reason why we should represent a different reality is because we think that we can define and solve our problems more productively. We propose alternative narratives in order to redefine the reality which is naturalised in the

dominant narrative. To propose an alternative narrative is a political and value-laden action. We cannot find the best narrative about the reality of GM food, but we can find alternative narratives in which the problem of GM food can be defined and solved in a more productive way. In other words, we should try to find the narratives which can help us to create a more inclusive and democratic discussion about the technology of genetic engineering.

The dominant narrative reproduces certain socio-cultural meanings about technological development, scientific knowledge and risk-control. It has three disadvantages in creating a more democratic discussion about GM food. In the next section, I review various alternative ways of considering scientific practice and technological development. These challenge the meanings reproduced in the dominant narrative and therefore provide us with alternative discursive resources with which we to represent GM food differently.

Technology, democracy and alternative narratives

We should try to tell different stories about GM food in order to consider its problem in different ways. We can begin with the stories which do not have the disadvantages of the dominant narrative which I have discussed above. Therefore, we have at least three ways of proposing alternative narratives. The first way is to include diverse and marginalised arguments into news stories and to make the conflict of values visible to the public. The second way is to highlight the contextual and question-oriented nature of scientific practice. The third way is to deflect our attention away from the risk of GM food toward its history. These three ways can lead us to see the reality of GM food in different ways. They turn the invisible into the visible. However, we should be aware that all the three ways are value-laden. They do not aim to describe the reality of GM food more correctly and objectively than the dominant narrative. Rather they aim to describe the reality differently from the dominant narrative so that a more inclusive and democratic discussion about GM food can be created.

The first way of proposing an alternative narrative is to represent the GM debate in a

more open and inclusive way. The GM debate should not be confined to particular active debaters and their radical arguments. The opinions which can be heard in the debate should not be simply categorised into either pro- or anti-GM stances. For example, farmers who decide whether to grow GM crops should be allowed to express their thought about the technology in the GM debate. Farmers might not simply take a pro- or anti-GM stance, but consider how the technology can work for them or whether the change created by the technology is desirable for them. Because the dominant narrative polarises the GM debate and only makes particular debaters visible to the public, more sophisticated arguments considering the value of the technology are marginalised and made invisible to its readers. When diverse debaters and their arguments are included into the GM debate, different ideas about how the technology of genetic engineering should be developed and used could emerge. The concept of 'post-normal science' challenges conventional science 'in which uncertainty was tamed, ignorance suppressed, and the supposedly value-free character of science proclaimed as a great value' (Ravetz and Funtowicz, 1999: 641). Ravetz and Funtowicz argue that post-normal science legitimates the introduction of a plurality of knowledge into policy debates by including 'extended facts' from 'extended peer communities' into the debates (642). O'Connor also argues that post-normal science advocates the enrichment of abstract demonstration by interpersonal dialogue and debate:

If scientific questions, which relate directly to society, were researched in a 'dialogical' manner, ways would be sought to understand the concerned individuals, populations or stakeholders. While never rejecting concern for internal coherence and rigour, science can cope better with future uncertainties, and better solve the problems of those people that make up society, by extensively utilising social dialogue (O'Connor, 1999: 671).

Therefore, the advocates of post-normal science suggest that we should create a more open and inclusive discussion about the issues concerning science and technology in order to cope better with the uncertainties resulting from the development of techno-science. The decisions about the introduction of a new technology into everyday life cannot be made only based on the scientific facts about the technology,

but should be made by discussing and considering the extended facts from extended peer communities. Therefore, in order to cope better with the future uncertainties of GM food, we need to open the GM debate to different kinds of knowledge and various arguments.

However, including diverse debaters into the GM debate does not necessarily make the debate more productive. The concept of post-normal science leads us to propose alternative narratives in which various debaters from extended peer communities with their extended facts can be heard by each other. But creating a more democratic discussion involves not only including various arguments, but also addressing the questions of the incommensurability between different arguments, and of the unequal distribution of power between different kinds of knowledge. Pellizzoni argues that the concept of post-normal science relies very much on the virtues of dialogue; therefore, it suggests that if public discussion could be conducted impartially among its participants and open to everyone's reasons, it could result in a technically preferable option among those available (1999: 107). But Pellizzoni wonders whether it is possible to determine the preferable option 'when there is great uncertainty on the essential aspects of a problem and on the possible consequences of the choices' (108). What an open dialogue between various debaters could produce is not the best solution to a problem but more sophisticated knowledge about the problem. An open dialogue can make us realise that we should deliberate how to define the problem of GM food before we solve it, because there are conflicting ways of problematising GM food. But when various arguments are irreconcilable in their ways of defining the problem, public discussion, no matter how impartially it is conducted, cannot reach a conclusion which is acceptable for all participants. We should be aware of this limitation of an open dialogue.

Moreover, Pellizzoni argues that the concept of post-normal science seems to ignore the power gap between experts and lay people: 'in case of sharp contrast between scientific and non-scientific arguments, the experts' authority and their superior strength of reasoning, deriving from their theoretical background and structured

empirical support, makes it probable that they will easily “demonstrate” they are right’ (1999: 109). It is not so simple for non-experts to question the authority of experts, because they cannot easily express themselves, because what they say has little probability of being adequately considered, and because they are inclined to accept principles, concepts and accounts coming from the scientific community (110). Without effective measures to empower non-expert participants, there cannot be a democratic discussion between expert and non-expert participants because of their unequal power. An open dialogue cannot happen if expert participants have the power to dominate the dialogue and non-expert participants have no power to resist.

Even though some measures to empower non-expert participants are adopted in public discussion, we still have to consider who can decide the topic of the discussion and how it is decided. As Kleinman argues:

If citizen involvement in the realm of science is to be successful, work must be undertaken to institutionalize mechanisms that allow participants the opportunity to acquire the broadest possible ‘knowledge base’, that promote reflection on taken-for-granted attitudes toward expertise held by participants, and that maximize the possibility of equal roles for all participants (Kleinman, 2000: 155).

The equality between all participants should be established from the beginning of the discussion, including the right to decide the agenda for discussion. Even though all participants are allowed the opportunity to be impartially heard and considered, we should be aware that some participants could still be more powerful because they can decide the agenda. The fact that agenda-setting is also a kind of power is often ignored. When public discussion between different participants is set up, the choice of the topic can determine what kind of conclusion will finally emerge. Although it is necessary to include diverse and conflicting opinions into public discussion about GM food, including different opinions alone cannot democratise the discussion if the discussion is confined to the issue about the risk of GM food. We have to incorporate the first way of proposing alternative narratives with the second and the third in order to make public discussion about GM food more democratic and productive.

The second way of proposing an alternative narrative is to highlight the contextual nature of scientific practice and to advocate doing science in a context-sensitive way. When we realise that science can only answer well-defined questions, we start to consider what kind of question we should expect science to answer and how we can use science to find answers to our questions. If the facts produced in experimental settings are not the appropriate answers to our questions about GM food (see chapter 6), we should consider how to produce the answers which we need. We need to produce knowledge which is sensitive to its context, not only the context in which it was produced, but also the context in which it will be applied. We also have to avoid assuming that we can find the universal and objective facts about GM food. We have to accept that the knowledge which we produce is always contextual and conditional. In other words, we have to redefine our concept of good science. Science is good not because it can produce universal and objective knowledge, but because it can produce practical and useful knowledge. For example, the advocates of ‘socially robust knowledge’ suggest that the more strongly contextualised a scientific field is, the more socially robust is the knowledge it is likely to produce:

Many of the most powerful scientific techniques – reductionism, normalization, sampling methods, control groups – are based on this presumption of containment or insulation ... Good science has been constantly at risk of being contaminated, even overwhelmed, by a surfeit of contexts. Our argument is that this has now been turned on its head. Those scientific fields which have continued to restrict the range of external factors which they take into account, to preserve a ‘sterile space’, and which we have characterized as weakly contextualized, are tending to become less creative and productive. Those which embrace, willingly or otherwise, a diversity of external factors, and which we have described as strongly contextualized, are not only more ‘relevant’, but may also be more successful in terms of both the quantity and the quality of the knowledge they produce (Nowotny et al., 2001: 167-8).

Knowledge can only be socially robust when it is produced in a context-sensitive way. In this sense, the social robustness of knowledge is neither a relativistic nor an absolute idea; it is a relational idea because it can only be judged in a specific context.

However, although the concept of socially robust knowledge suggests that scientific knowledge should be produced in a context-sensitive and practical way, it seems to assume that the context in which the knowledge is produced is pre-existing and given. It focuses on the contextualisation of knowledge but it ignores the fact that the context changes in conjunction with the production of knowledge. The concept of socially robust knowledge suggests that we should appreciate the open-endedness and context-sensitive nature of contemporary science as strengths rather than weaknesses, but Strathern asks: 'if science must be socially robust in order to survive, what makes "socially" a legitimating epithet?' (2003: 266). Strathern argues that the concept of socially robust knowledge suggests that society is just there in the background, and that it does not consider how to produce an adequate or acceptable account of social conditions (266). The judgment of the social robustness of particular scientific knowledge can only be made in the contexts in which it is produced and used; however, these contexts are not concrete or given because the contexts are produced and shaped when the knowledge is produced and used. We have to consider how to define the contexts in which we are situated when we try to produce practical and useful knowledge in them. The concept of socially robust knowledge suggests that knowledge should be produced in a context-sensitive way, but it ignores the fact that the context is sometimes more ill-defined or problematic than we think.

Therefore, when we propose alternative narratives by proposing alternative ways of producing scientific knowledge in order to answer our question, we should consider not only how to produce knowledge but also how to ask questions. The second way of proposing alternative narratives leads us to consider how to produce practical and useful knowledge but not why the knowledge is practical and useful. Knowledge should be produced in a context-sensitive way, but we cannot take the context for granted. We do not always know what our question is or how to ask the question properly. For example, can we possibly produce socially robust and context-sensitive risk knowledge about GM food when we do not know how to define the contexts in

which GM food should be situated? The definition of risk becomes ambiguous and controversial when we cannot agree on which context we refer to. More importantly, can we possibly produce knowledge about GM food which is socially robust for everyone when we do not define the problem of GM food in the same way? We need to discuss how to define the problem before we consider how to produce practical and useful knowledge which can help us to solve the problem.

The third way of proposing an alternative narrative is to introduce different ways of problematising into public discussions about GM food. The first way emphasises the openness of the discussion and the second way emphasises the efficiency of the methods which we use to find answers to our questions. But they do not consider what kind of question we should ask about GM food. The third way aims to propose alternative narratives in which the technology can be examined not only in terms of its risk. It suggests that we should examine our assumptions about GM food. GM food should not be accepted as a ready-made object resulting from technological progress but should be examined as something which is developed by someone for some purpose and in favour of particular interests. In other words, the third way aims to propose alternative narratives in which different questions about GM food can be asked and examined. In alternative narratives we see the possibility that we can take a more active role and participate in the process of shaping the technology.

The dominant narrative leads us to naturalise the present form of the technology. Therefore, in the reality represented in the dominant narrative, we can only decide whether to accept the technology but not consider how we can develop and use it. When we pay attention only to the effect of the technology, we fail to recognise that the present form of the technology can actually be examined and changed. We also fail to recognise that the effect of the technology is an effect which the technology is developed to have. The third way aims to deflect our attention away from the risk of GM food toward other issues concerning the development of genetic engineering. For example, we can examine the future which the technology of genetic engineering claims to create. The dominant narrative is problematic because it does not

encourage us to examine the technological development of genetic engineering as a proposal for the future of our society. A technology is always developed along with the prospect of a 'better' future. As Michael argues:

To enunciate a research question, to formulate a research programme, to outline a prospective technological system, to posit the coordination of industry, government and university sectors in the pursuit of 'sound technoscience' – all these entail statements made (or rather performed) in the present that draw (on) the past and the future. That is to say, there is a 'fabrication' of past and future that make these enunciations, formulations, outlines and positings seem eminently sensible and do-able. Thus, the past is represented as entailing some problem (e.g. the chaotic state of science policy), some absence (e.g. the lack of transplantable human organs), some wrong (e.g. environmental degradation), and the future is represented as the 'place' where solutions are realised, presences manifested, and wrongs righted (Michael, 2000: 22).

In the case of GM food, we should consider why the past without GM food was problematic and why we need the technology of genetic engineering to make our future better. The future which the technology promises to create is not a future which we should merely accept. If it is a future in which we plan to live, we should have the right to decide what kind of future it will be. We need the alternative narratives which can lead us to consider whether the future with GM food is the future in which we hope to live.

When we begin to represent reality in different ways, we also begin to see the possibilities of producing reality differently. Alternative narratives do not change reality literally; rather, they can change reality by suggesting different ways of seeing our world and of positioning ourselves in it. The GM debate is not necessarily restricted to particular debaters; rather, it can be opened to diverse debaters if we think that we should discuss the problem of GM food in a more inclusive way. Scientific knowledge produced in well-controlled and well-designed experimental settings is not necessarily practical and useful for us; rather, scientific knowledge can be produced in a context-sensitive manner if we redefine our definition of good science. We do not have to define the problem of GM food narrowly as a problem of

its risk; rather, we can define the problem more broadly and creatively if we start to situate GM food in different social, cultural, economic and political contexts. We do not have to accept GM food as an inevitable result of technological progress; rather, we can participate in the process of shaping the technology of genetic engineering if we start to think that we should have the right and the power to do so.

Therefore, alternative narratives can change reality in the sense that they change our knowledge about it and our way of producing it. Alternative narratives are not truer than the dominant narrative but are better in the sense that they can help us to create a more democratic and productive discussion about the technology of genetic engineering. Therefore, proposing alternative narratives is a political action based on particular values. It does not aim to find the best representation of reality. Instead it requires us to examine the reality which we naturalise and constantly reproduce. In the next section, I give an example of an alternative narrative in which the reality of GM food/crops is represented differently. I argue that the reason why this alternative narrative is better than the dominant narrative is not because it reveals the hidden facts about GM food/crops, but because it encourages us to consider different issues about the development of genetic engineering. It aims to encourage more discussion about GM food not in terms of its risk but in terms of its history. It is a political action based on the value that a technology should be developed in a more democratic way.

Turning nature to history: example of an alternative narrative

The dominant narrative is problematic because it turns the history of GM food into its nature (Bourdieu, 1977). The present form of the technology, which is an option chosen by someone for particular purposes in the process of technological development, is naturalised as an inevitable outcome of technological progress. When we are concerned only with the effect of GM food/crops on human health and the environment, we regard GM food/crops as a ready-made object whose properties can be determined. We ignore the fact that there were turning points where we could

decide to shape the technology in different ways in the process of technological development. In this section, I propose an example of an alternative narrative which leads us to pay more attention to the history of GM food/crops. I use the case of field trials which I have discussed in chapter 6 to demonstrate how the reality can be represented differently in an alternative narrative. The alternative narrative describes how the technology of genetic engineering was used to develop herbicide-resistant GM crops. The narrative suggests that we should consider the reason why the technology has to be developed and used in such a way. It suggests that we should not focus only on the effect of GM food/crops, but that we should consider why they have been developed to have this effect.

From news stories about the field trials of growing GM crops, we learn that growing herbicide-resistant GM crops can be harmful to the environment (see chapter 6). We, as readers of the stories, are led by the stories to think about the effect of growing GM crops. We consider herbicide-resistant GM crops to be ready-made objects whose effects can be determined by scientific practice. Herbicide-resistance is naturalised as an inherent property of GM crops, but is not regarded as a property which the crops are genetically modified to have. In other words, news stories do not lead us to consider why the crops have to be genetically modified in order to be resistant to a single herbicide. Shiva argues that ‘the dominant focus of research on genetic engineering is not on fertiliser-free and pest-free crops, but pesticide and herbicide resistant varieties’ (1995, 110). This is because the strategy for the seed-chemical multinational companies – such as Ciba Geigy, ICI and Monsanto – is ‘to increase the use of pesticides and herbicides by developing pesticide and herbicide tolerant varieties’ (110). For these companies, the strategy makes commercial sense because it is cheaper to adapt the plant to the chemical than to adapt the chemical to the plant. Shiva claims that ‘the successful development and sale of crop plants resistant to brand name herbicides will result in further economic concentration of the agro-industry market, increasing the market power of transnational companies’ (1995: 112). Therefore, if we consider herbicide-resistant

GM crops in terms of the reasons why they were made to be herbicide-resistant and not only in terms of their effect, we can see the possibilities of developing the technology in different ways so that we do not have to produce GM crops which are harmful to the environment. Herbicide-resistance is not an inherent property of GM crops; rather, it is a decision which was made by someone in favour of particular interests. When we start to consider the history of herbicide-resistant GM crops, we start to see that the reason why the crops are genetically modified to be resistant to a single herbicide is not as justified and acceptable as it seems to be.

Shiva argues that biotechnology is developed under the 'engineering paradigm' which 'offers technological fixes to complex problems' (1995: 109). However, the engineering paradigm often generates new problems which are later defined as 'unanticipated side effects' because it ignores the complexity of the problem. In the case of herbicide-resistant crops, Shiva argues that herbicide resistance excludes the possibility of rotational and mix-cropping 'which are essential for a sustainable and ecologically balanced form of agriculture, since the other crops would be destroyed by the herbicide' (113). The destruction in the third world will be greater because of losing higher plant diversity and the prevalence of diverse occupations based on plants and biomass (113). Enhancing the productivity of growing a single crop might not be a good solution to the agricultural problem of the third world. Therefore, the decision to produce herbicide-resistant GM crops should be made after the problem which they are produced to solve is considered carefully and deliberately. Perhaps the problems cannot be fully foreseen at the time when the decision was made. But this does not mean that we should make the decision without considering the complexity of the problem. When an alternative narrative leads us to see how the decision to produce herbicide-resistant crops was made and who made it, we also start to see how the decision could be made differently.

Therefore, when the alternative narrative leads us to consider the history of GM crops, we start to pay more attention to the issues concerning the value of the technology. We start to consider why the technology of genetic engineering is

valuable or desirable. The present form of the technology embodies the modernist ethic which 'sets humanity at odds with the purposes of the non-human world and constructs agriculture and the industrial economy as modes of activity which must be pursued against the grain of the economy of nature' (Northcott, 2003: 103). Northcott argues that 'it is possible to imagine a world where biotechnology is utilised to promote sustainable, low-energy, low-waste, low-pollution, labour-intensive, traditional mixing farming', but this world would be very different from the one we live in now (2003: 99). When biotechnology is developed to enhance the productivity of agricultural practice, it embodies the modernist view which regards the origins of life as inherently competitive, violent and conflictual, and the enterprise of agriculture as a war against pestilence, disease and famine (103). However, this is not the only way of interpreting our lives and our agricultural practice.

The principal justification for the genetic modification of plants is 'the enhancement of farming productivity' (Northcott, 2003: 96). It is difficult for the readers of the dominant narrative to examine this justification because the narrative leads them to be concerned only with the risk of the technology. But when we start to consider the history of GM food and the value of the technology, we also start to see the problem of this justification. Northcott argues:

Scientists and agronomists claim that genetic modification is the only way, with current level of soil erosion, that it will be possible to feed the growing population of the world into the next century. Such assertions are made with no reference to the social scientific literature on hunger and malnutrition and its causes even though we know from this literature that the principal cause of global hunger is not low farm productivity but land hunger and poor distribution systems of available food... The argument that the world needs ever greater quantities of cheap cereal crops to feed a growing population allows scientists to continue to ignore the unsustainable features of the agricultural revolution they have already visited on rural communities and the soil (2003: 96-7).

The dominant narrative suggests that the technology of genetic engineering is questionable only when we can reveal the facts about its risk. However, when we start to examine the declared benefits of the technology, we start to see that the

benefits are not as self-evident as they seem to be. An alternative narrative about the history of GM food leads us to consider the reason why the present form of the technology is valuable and desirable. We start to consider whether or not the values on which the technology is based are acceptable. We have to address the question of value in order to solve the problem of GM food in a more productive way. We do not have to accept GM food as an inevitable consequence of technological progress, but rather we should examine how the development of genetic engineering is justified and consider whether or not the justification is acceptable before we decide to develop the technology.

When we consider GM food in terms of its history, we start to see the turning point in the process of technological development. For example, the choice of herbicide-resistant but not fertiliser-free crops and the choice of farming productivity but not a more efficient distribution system of available food. When we do not take these choices for granted, we realise that we have various options and that we could develop the technology in different ways. The dominant narrative makes these turning points invisible and naturalises the existence of GM food and GM crops. When we turn the nature of GM food back into its history, we start to see why the issues of value are significant. Because all the decisions made in the process of technological development are not self-evident, they have to be examined and justified in a more public and democratic way. Because the practice of genetic engineering brings with it 'profound and challenging questions about humanity's place in the world' (Deane-Drummond et al., 2003: 38), we should be more cautious about embracing the possibilities offered by the technology. The reason why we need alternative narratives in which all the turning points are made visible to us is because we can start to see that the development of genetic engineering is an option but not a necessity. We can not only examine whether the process of decision-making is accountable and justifiable, but also consider how to develop the technology in a more democratic and reflective way.

Conclusion

In this chapter, I discussed three disadvantages of the dominant narrative and its ability to generate a more democratic discussion about GM food. First of all, it polarises the GM debate into either pro- or anti-GM stances and represents only the radical arguments from particular debaters. Secondly, it focuses only on scientific facts about the risk of GM food and leads us to think that science can answer the question which we ask about GM food. Finally, it defines the problem of GM food narrowly as a problem of its risk. I discussed three ways of proposing alternative narratives which can help us to create a more inclusive and democratic discussion. The first way is to include diverse opinions about GM food into the GM debate. The second way is to highlight the contextual nature of scientific practice and to advocate doing science in a context-sensitive way. The third way is to define the problem of GM food broadly and creatively. The dominant narrative has the symbolic power to represent reality as the world in which we live. But it is a reality in which the controversy of GM food is intractable and public discussion about GM food is unproductive. In order to solve the problem of GM food, we need alternative narratives which can help us to define and solve the problem in more democratic and productive ways. We need alternative narratives which can lead us to consider and produce the reality of GM food differently. In the final section of this chapter, I proposed an example of an alternative narrative which aims to make the history of herbicide-resistant GM crops visible. The reason why the alternative narrative is preferable to the dominant narrative is because it leads us to explore and examine why the technology is developed in a specific way and not passively accept the present form of the technology as an inevitable outcome of technological progress. We can develop the technology of genetic engineering differently, and more importantly, we can develop it more democratically and reflectively.

8. Conclusion

A news story is a narrative in which the world around us is transformed into an interpretable, graspable and communicable reality. As a significant source of our knowledge about reality, we learn from news stories how to interpret it and how to position ourselves in it. When news stories repeatedly represent reality in a ritualised way, their representations tend to become naturalised as if they are the reality in which we live. News stories often represent GM food as a ready-made object, and imply that its properties, such as its risk, can be clearly determined by scientific practice. News stories lead their readers to define the problem of GM food as a problem of risk and suggest that they should find a scientific fact which either verifies or falsifies that risk. In news stories about GM food, the public are characterised as consumers who can only choose to accept or to reject GM food products in the market. The public are not characterised as citizens who can actively participate in the process of shaping the technology of genetic engineering. News stories, as definers of social reality, lead us, as their readers, to interpret and produce reality in one way rather than another. They lead us to consider how to find the facts about GM food but not to consider how to determine the value of the technology. They lead us to examine the effect but not the reason why the technology has been developed and used as it is at present. Because of these disadvantages of the dominant narrative which is reproduced in the news stories about GM food, we need to propose alternative narratives which can lead us to interpret and produce the reality of GM food in different ways.

In chapter 3, I explore how the news stories about GM tomato puree represent GM food products as an example of technological progress. GM food is represented as an innovation which has been developed in the laboratory by disinterested scientists. GM food is represented as progress which will lead us to a better future. The value of the technology is unexamined but taken for granted in news stories. The news stories about American GM maize set up a contrast between the benefit and the risk of GM

food, and they implicitly argue that the risk of GM food is the only problem associated with it. GM food is riskified in such a way that its risk is objectified in order for it to be verified or falsified. Therefore, science is expected to produce facts about the risk of GM food so that we can make our political decision on the basis of these facts. The public discussion about GM food is confined to the issue of its risk. In the discussion, we have no opportunities to consider why we need GM food or how we should develop and use the technology.

However, when there are various and conflicting scientific facts about the risk of GM food, we need to determine which fact is scientific and credible in order to make our decision rationally. In chapter 4, I explore how news stories try to draw the boundary of good science in order to determine whose science we can trust. But the boundary-work of good science is problematic because the boundary which we draw between good science and bad science is an artificial boundary which is often challenged. The boundary-work leads us to consider if a fact is scientific and thus credible but not to consider if a scientific fact is relevant to the question which we need to ask about GM food. By following the boundary-work undertaken in order to find good science, we fail to recognise that the scientific facts produced in an experiment alone cannot answer our questions about GM food. We just reproduce the myth that science can solve all the problems which we face, but we do not consider what exactly our problem is. When we accept a scientific fact, we accept its way of defining the problem and representing reality. We fail to realise that the GM potato is created and produced by someone for some purpose and that it is not a ready-made object as represented in Pusztai's experiment.

When science fails to settle the controversy of GM food by producing a universal and uncontroversial fact, one way of solving the problem is to shift the responsibility of problem-solving to the individual consumer in the name of consumer sovereignty. In chapter 5, I explore how the news stories about the regulation of labelling assume that a capable consumer is able to solve the problem of GM food by making his/her informed choice as long as sufficient information is provided. To label GM food is to

make GM food visible to consumer, and it is an ordering practice which visualises the difference between GM and GM-free food. But the order which it aims to impose on the world is artificial, so it is often challenged. The regulation of labelling aims to individualise the responsibility of problem-solving, but it fails to recognise that the problem of GM food can and should not be solved individually. The individual is characterised as a consumer who can only decide whether to buy GM food products in the market, but not as citizen who can participate in the process of shaping the technology. GM food is considered to be a ready-made product, and the individual consumer can only make his/her decision *after* but not *before* the GM food product is produced and sold in the market.

Finally in chapter 6, I explore why a scientific fact produced in an artificial experimental arrangement cannot settle the controversy about GM food as it is expected to do. The scientific fact is produced in an experimental arrangement which is designed and arranged to produce that fact. Therefore, the fact is contextual and conditioned because it can be factual only in its experimental context. When we try to depoliticise and rationalise our political decisions by making them on the basis of scientific facts, we fail to consider the limitation of scientific facts. The question which an experiment is designed to answer is different from the question which we ask about GM food in a broader socio-political context. Moreover, we are lead by the fact produced in the field trial to consider only the effect of growing GM crops. But we forget to consider that the effect is something which the GM crop is developed to have but not something inherent in it. Therefore, when news stories lead us to accept the results of the trial as a scientific fact, they also lead us to take the present form of the technology for granted. Therefore, news stories do not lead us to think that we can actually develop and use the technology of genetic engineering in different ways.

The dominant narrative, which is reproduced in news stories, renders the controversy of GM food intractable and the public discussion about GM food unproductive. In order to define and solve the problem of GM food in more productive ways, we need alternative narratives in which the reality of GM food can be represented differently.

There are three ways of proposing alternative narratives about GM food. Firstly, we can include diverse opinions in the public discussion about GM food. Secondly, we can represent alternative methods of producing scientific knowledge so that we can see how to produce more practical and useful knowledge. Finally, we can discuss the problem of GM food not only in terms of its risk but also in terms of its history and value. We need alternative narratives which can lead us to consider why we develop the technology of genetic engineering but not passively accept it as inevitable technological progress. We need alternative narratives which can make the history of GM food visible so that we can have chance to examine why and how the technology has been developed in its present form. Therefore, I propose an example of an alternative narrative in which GM crops are not represented as ready-made objects but as technological artifacts which are developed by someone for some purpose and in pursuit of particular interests. When we start to consider the history of GM food and not only its effects, we also start to see the possibility of developing and using the technology in different and more open ways.

Perhaps news stories can lead us to consider that our political decisions about GM food should be made in more open and democratic discussions, such as citizen juries, but not only on the basis of expertise and scientific advice. Perhaps news stories can lead us to see the alternative to the agrobiotechnological research aiming only to enhance farming productivity. One example is the argoecological research aiming to identify the possibilities for the sustainability of agroecosystems, where sustainability is defined in a broader sense, including productive capacity, ecological integrity, social health and cultural identity (Lacey, 2003, 2005). Perhaps news stories can lead us to recognise that the problem of GM food is not only a problem of food safety, but also a problem of the desirability of the technology. This thesis aimed to examine why the stories in British newspapers cannot lead us to create a more open and democratic discussion about the technology of genetic engineering, or to see alternatives to the present form of the technology. The dominant narrative reproduces certain socio-cultural meanings about scientific practice, technological

development and risk management. These prevailing meanings lead to a narrow definition of the problem of introducing a new technology into our daily lives and to the acceptance of the status quo. Through identifying the disadvantages of perceiving and interpreting our world in terms of these meanings, this thesis argued that we need to propose different ways of making sense of the world in order to cope better with the problem associated with technological development. We can cope better with the problem when we realise that the present form of the technology is only an option but not a necessity, and that we should examine all the possibilities of developing it critically and democratically. We can cope better with the problem when the decisions to develop the technology in a specific way are made accountable to the public by including them in the process of decision-making.

Starting to see alternatives leads to another question: how can these alternatives be realised in our daily lives? On the one hand, we need to address the question of why news stories fail to challenge, but rather reproduce the dominant socio-cultural meanings. In this respect, the sociology of news production can help us to understand how news stories are produced and therefore to consider how they can be produced differently. On the other hand, we need to address the question of how a particular representation of reality is materialised and institutionalised in our life world. For example, we should consider how the authority of science is confirmed when scientists can dominate public discussion about technological development and can discredit other forms of knowledge by labelling them as irrational, subjective and political. We should also consider how risk discourse is legitimised by being used in various political and socio-cultural contexts. We should address both questions in further research in order to move from seeing alternative narratives to doing narratives alternatively.

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Appendices

Appendix A: Full texts of news stories in chapter3

'Genetic food first'

5th/February/1996

The Guardian

GENETICALLY modified tomato puree goes on sale in Safeway and Sainsbury's stores from today. Scientists have taken one of the "rotting" genes out of the tomato to allow growers to produce long-lasting, firmer-textured fruit. The result of this technology is initially only available as puree, but shoppers could eventually buy slow-rotting fruit and vegetables of all kinds.

'Hi-tech puree'

5th/February/1996

The Times

PUREE from genetically modified tomatoes goes on sale at Safeway and Sainsbury's today. Scientists have taken one of the "rotting" genes out of the tomato to allow longer-lasting, firmer-textured fruit to be produced. The modified tomato itself is not for sale.

'Tomatoes are puree gene-ius'

5th/February/1996

The Sun

TOMATO puree made from genetically engineered vegetables goes on sale today. Scientists have tinkered with the tomatoes and removed the gene that speeds up rotting. The food – on sale at Sainsbury's and Safeway – will also be 15 per cent cheaper than puree from normal tomatoes. Boffins hope eventually to grow whole fruit and vegetables using the process, including melons and bananas. They could also grow caffeine-free coffee.

‘On sale now, the puree taste of the future’

5th/February/1996

The Daily Mail

IT could herald the end of soggy tomatoes festering in the bottom of the fridge.

Genetically-engineered tomato puree goes on sale today at Safeway and Sainsbury stores. And shoppers could eventually reap the benefit of many kinds of fruit and vegetables that stay firm and fresh for longer.

The breakthrough is the result of 21 years’ research by Professor Don Grierson of Nottingham University, who teamed up with scientists from the Zeneca drugs company to study the hormone in tomatoes which triggers ripening colour, flavour, aroma and texture.

‘The benefits are that firmer tomatoes will not go squashy when they are handled, more tomatoes are harvested, more arrive at the shops intact, and once there they do not deteriorate as quickly,’ he said.

Caffeine-free coffee could also be produced genetically rather than chemically, as at present, and the process could next be applied to melons and bananas.

But for now, the new puree has another advantage – it is cheaper than the regular item at 29p for a 170gram can, compared to 140g of the traditional product for the same price.

‘Just add DNA to taste’

6th/February/1996

The Guardian

You say tomato, I say genetic nightmare

THE tomato was destined to become an early candidate for genetic engineering. Long before recent events caused it to be dubbed “Frankenstein’s plant”, it led a Jekyll and Hyde existence. For a start it’s a fruit that thinks it is a vegetable; a native of South America yet was first eaten in Britain before finding horticultural perfection in Italy; it is harmless yet was thought during 19th century to be poisonous. With a CV like that no wonder it feels confused. There is no doubt also that during the 20th century it has undergone a personality change. It simply doesn’t taste as nice as it did

decades ago.

Yesterday Sainsburys and Safeway introduced what Tony Blair might call New Tomato – a puree made from tomatoes genetically modified by blocking out the action of an enzyme which rots the fruit. The initial reaction from a panel of trainee chefs assembled by the Press Association was that it was a ‘hit’. But this is only the first step towards what could be the next agricultural revolution. Crick and Watson didn’t labour in their laboratories just to produce a modified sauce for hamburgers: Soon there will be genetically modified bananas, melons and caffeine-free coffee. If they don’t meet consumer resistance then more and more of our food and drink will be affected by genetic engineering. There are grave potential dangers as the Genetics Forum warned yesterday. But there are also huge opportunities for enrichment. Most people will agree with the Consumers Association that, providing the products are properly tested, there is no reason why they should not be sold – as long as the consumer is given a choice. Who knows, one day they may even find a way for the tomato to have a sex change so it can become the fully fledged vegetable it clearly craves to be.

‘Brussels opens Britain to mutant maize from U.S.’

Sean Poulter
19th/December/1996
The Daily Mail

BRITAIN was on collision course with Europe last night over a decision to allow genetically-modified corn to be imported from the U.S.

Environment Secretary John Gummer is opposed to the maize coming into the country because of fears of a possible health risk.

However, the EU yesterday succumbed to U.S. pressure and decided to authorise free access to European markets.

The corn has been laboratory-modified to withstand herbicides and bugs.

A leaked memo from a Department of Agriculture expert last week pointed out that it also contains a gene that is resistant to some antibiotics.

Britain officials are particularly worried that this resistance could build up in animals and humans, making it more difficult to treat disease.

Mr Gummer had argued: 'One of the important reasons for the EU is that we are strong enough to say to the Americans that we decide what we want in our food chain and not you.'

However his reservations have been thrown out by the EU, whose Environment Commissioner Ritt Bjerregaard said: 'We have studied the reports carefully and have come to the conclusion that they provide a sufficiently strong basis to approve this product.'

Mr Bjerregaard agreed that any products containing the corn should be properly labelled to inform consumers.

The decision removes any restrictions on selling the modified maize on EU markets as a food or as seed. Initially it will be used as a cheap cattle feed.

Greenpeace condemned the European decision as 'idiotic'. A spokesman said: 'The Government must ignore Brussels and impose its own ban to safeguard UK consumers from potential risks.'

'Even Government scientists have expressed concern that antibiotic resistance will spread through the human food chain if the maize is fed to livestock.'

'The EU decision is idiotic.'

'No one knows the long-term threat to the environment or human health. It offers no benefit to consumers.'

Greenpeace pointed out that Tesco had already banned the corn, called BtMaize, as an animal feed ingredient within its meat supply chain.

Labour's consumer affairs spokesman Nigel Griffiths said his party would be calling for a ban on any product not labelled as having been genetically modified no matter what Brussels decided.

‘Greens attack EU go-ahead for genetically modified crops’

Stephen Bates
19th/December/1996
The Guardian

GREENPEACE last night threatened legal action against the European Union following a decision in Brussels to allow genetically modified maize to be imported from the United States.

The decision by the European Commission, which headed off a further damaging trade row with the US, came in the face of opposition from the government of most member states, including Britain.

The EU has dithered for months over admitting the maize because of concerns about its potential effect on human and animal health.

The cereal, produced by the chemical giant Ciba Geigy, contains a bacterial marker gene which increases the plants’ resistance to pests and disease, but is also resistant to the antibiotic ampicillin, which is used in animal and human medicines. The go-ahead for the modified maize to be exported to Europe is now expected to double the company’s share of the world corn market.

Although the gene is eradicated by processing, some environmentalists and scientists have claimed that it could enter the food chain through animal feed.

The commission followed scientific advice from three committees that the modified maize was safe to eat. It will also now be allowed to be grown in Europe, although only France has said it wants permission to do so.

Dismissing the safety concerns, Ritt Bjerregaard, the Danish environment commissioner said: “The scientific advice provided a sufficiently strong basis to go ahead and approve this product.”

The question of whether the grain should be separately labelled in foodstuffs was postponed until next year.

The decision has come in the nick of time for the US, which has a \$500 million annual corn trade with the EU. Subsidised grain shipments are to start shortly from this year’s harvest and the modified maize – which forms about 0.6 per cent of the

total US crop – has not been separated out. Nor can it be detected without scientific analysis.

The move does reduce one potential source of conflict between the EU and US, whose relations are already strained because of Congress's attempt to penalise European companies trading with regimes it does not like, such as Cuba, Libya and Iran.

Last week Jacques Santer, the EU president, is understood to have promised President Clinton that the embargo on genetically modified maize would be lifted.

Louise Gale, Greenpeace's spokeswoman in Brussels said: "They have made a big mistake. We are going to call on member states to stop this coming into their countries and to take the commission to court."

Appendix B: Full texts of news stories in chapter 4

'Scientists complain GM debate was mishandled'

Tim Radford
1st/November/2003
The Guardian

MORE than 100 scientists have signed a letter to Tony Blair, complaining about the way the debate on GM crops was handled.

Public meetings had been hijacked by anti-GM groups and "misleading" reports in the press had not been corrected, they complained. The same method of public consultation could put other technologies at risk of "prejudice and procrastination".

The letter was triggered by the outcome of an elaborate exercise in consultation which seemed – in the eyes of some scientists – simply to widen the gap between researchers and protesters.

This was followed by a report that after four years of large-scale trials, genetically modified rape and beet had turned out to be "worse" for wildlife than conventional varieties. This verdict was greeted with delight by the GM protesters, but in fact the government's own expert advisory committee has yet to report on the evidence.

The complaint to the prime minister said scientists felt "thoroughly demoralised".

Derek Burke, one of the signatories, told Radio 4's Today programme: "We want arguments based on evidence and what we are getting is arguments based on opinion. We are saying to Tony Blair loud and clear that the science community is disaffected."

Christopher Leaver, professor of plant sciences at Oxford, and another of the signatories, said yesterday that this disaffection could cost the country dearly. Only one plant biotech company now remained in Britain.

"We are a small offshore island. We have no natural resources except our education system and our brains to use science to develop raw materials and make products we can sell and make money for our pensions," he said.

"We are having significant problems recruiting people into science teaching. The industry is rapidly leaving. We are having problems recruiting science graduates... to some extent because of the public attitude that science is not a good thing, that science is potentially a bad thing."

But because of scientific research, life expectancy, quality of life, and the safety of food and medicines had improved astronomically, he said.

"I think of myself as a servant of society. I am paid by the taxpayer. We have been encouraged by successive governments to become involved in industry. We are now told that if we work with industry we are not allowed to comment or be involved in advice which forms the basis of political decisions – which is stupid. The best scientists will work with industry."

But Greenpeace told the Press Association: "The biotech industry and its cheerleaders have lost the debate because science has gone against them. The government and biotech-funded scientists have tried hard to foist GM on to an unwilling public but the case against it just keeps on mounting, and sour grapes from its supporters won't change that."

The Department of Environment, Food and Rural Affairs said advice from the government's Advisory Committee on Releases to the Environment would inform any decision on whether GM crops should be grown commercially in Britain. "We

recognise that the biotechnology industry is a vital part of the country's economy. However, our approach to GM is based on the precautionary principle. Each GM crop application is considered on a case-by-case basis."

'Scientist's letter to Blair on GM'

1st/November/2003

The Guardian

FULL text of letter by 114 scientists to the prime minister, Tony Blair, criticising government silence on the GM debate.

Dear Prime Minister

The results of the Farm Scale Evaluations of three GM crops announced on October 16 were reported across the media as "the end of GM in the UK". In fact the FSEs did not assess the effects of genetically modifying the crops, but rather the impact of different types of weed control. They had little to do with genetic modification, its processes or potential.

However, the government's reaction to the latest misleading reports on GM was to remain silent. Since 1999, the government has sponsored several protracted deliberations on GM but has consistently neglected opportunities to address any of the unsubstantiated assertions about the process of genetic modification and possible risks.

We feel you should be aware of the consequences of this ongoing failure to respond and to give a lead:

1. Demoralisation

Some scientists are leaving the UK, but many more are thoroughly demoralised by hostility to the work they do, which is continually misrepresented and even sabotaged. This is despite the new scientific opportunities afforded by developments like genomics. Those who have contributed many hours to public communication and government-sponsored deliberations feel undermined by the government's failure to contradict false claims about "Frankenfoods", health risks and

“superweeds”.

2. Declining contribution to scientific development

Work on the basic science of genetic engineering and its applications to plants is being scaled down. This will inhibit our ability to contribute to scientific knowledge internationally, and to meet challenges like yield improvement, drought tolerance and reduced reliance on pesticides. The government’s many initiatives in this prolonged deliberation on GM crops have been structured in a way that makes it impossible to clarify the nature of the scientific work or its opportunities. Genetic engineering of plants has been reduced to a matter of consumer preference; the public has been misinformed; and the efforts of scientists to communicate about genetic engineering have been misused.

For those of us who have spent our lives “doing research, publishing research and teaching research” in the UK, it is distressing to experience such a backward slide; for others of us, and our students just starting out, it is deeply discouraging. More importantly, for society as a whole, if the same framework is applied in future decision-making, we risk seeing other technologies lose out to prejudice and procrastination.

Yours sincerely

Signed by Professor Derek C Burke, professor and vice-chancellor of the University of East Anglia (1987-1995), chairman ACNFP (1987-1997); and 113 other individual scientists (the full text of this letter can be found on the website of the Guardian; <http://education.guardian.co.uk/higher/sciences/story/0,,1075119,00.html>; last visit: 21st/June/2005)

‘Scientists back critic of gene modified potatoes’

Annie Flury
12th/ February/ 1999
The Times

THE Government was urged last night to re-examine the claims made by a scientist who was publicly discredited after raising concerns over the safety of genetically

modified potatoes.

Arpad Pusztai, 68, was suspended by the Rowett Research Institute in Aberdeen and ordered to retire last August after claiming that government-funded research had shown that rats which ate modified potatoes had suffered damage to their immune systems.

The institute said that Dr Pusztai had released “misleading information” and that he had been talking about the wrong potatoes.

However, Vyvyan Howard, a toxipathologist from Liverpool University who was among 20 international scientists to examine Dr Pusztai’s findings, has now said that they could find nothing wrong with his conclusions.

He said: “We found that his data are sound. We think it would pass peer review and be published and we are at a loss really to explain why the Rowett Institute came to the conclusion it did.”

Stanley Ewen of the pathology department at Aberdeen University was also reported to have repeated the experiments and reached similar conclusions to Dr Pusztai.

Jack Cunningham, the Cabinet Office Minister, said that any new data would be “thoroughly and quickly” examined by government scientists but expressed doubt that Dr Pusztai’s claims would be backed.

However, Paul Tyler, the Liberal Democrat’s food spokesman, said he would ask the Commons Agriculture Select Committee to investigate the affair.

‘Food scandal exposed’

Michael Sean Gillard, Laurie Flynn and Andy Rowell

12th/ February/ 1999

The Guardian

International scientists back shock findings of suppressed research into modified food

TWENTY international scientists have signed an unprecedented memorandum supporting the controversial findings of suppressed research which found that rats fed on genetically modified potatoes suffered a weakened immune system and

damage to vital organs.

In a report published for the first time today, the scientists, from 13 countries, also demand the immediate professional rehabilitation of the British scientist Arpad Pusztai, who discovered these preliminary findings last year and was forced to retire after speaking about his concerns.

Dr Pusztai's pioneering research into the effects of GM crops on animal nutrition and the environment including feeding genetically modified (GM) potatoes to rats to determine for the first time whether they had any harmful effects on their guts, metabolism and immune system.

The unexpected results of the £1.6 millions Scottish Office-funded research project showed that after 10 days of feeding trials the kidney, thymus, spleen and gut were adversely affected, and immune systems were weakened.

The Guardian can also reveal that the rats' brain size decreased. Dr Pusztai did not refer to this at the time because he felt the political repercussions would be too severe. A more recent piece of research on the same rats by the senior pathologist Stanley Ewen, of Aberdeen University Medical School, is understood to validate Dr Pusztai's preliminary findings.

Dr Ewen found that rats fed the GM potatoes used in Dr Pusztai's experiments suffered from an enlarged stomach wall.

The implications for the biotech industry, already suffering from a public backlash against GM foods, could be severe, says Vyvyan Howard, a foetal and infant toxico-pathologist at Liverpool University, who also signed the memorandum. "They will have to do rigorous hazard assessment and do it repeatedly."

Jonathan Rhodes, Professor of Medicine at Liverpool University, said: "One key problem that keeps coming back time and again is that regulation of food is nothing like as strict as the regulation for drugs. And when you start tinkering around with the genetic structure of food you have to move towards thinking of food products as pharmaceuticals."

The Cabinet Office minister, Jack Cunningham, said last night that any new data

would be examined by government scientists. Asked on BBC2's Newsnight if he thought GM foods were safe, Mr Cunningham replied: "There's no reason why they cannot be safely produced."

The scientists' memorandum demands an immediate funding programme to research the effects further and determine the causes.

If it can be shown that the lectin, a naturally occurring insect-resistant protein inserted into the potato, was responsible, this could implicate GM crops containing other lectins, namely Bt toxin.

Last year there were approximately 7.7 million hectares of these crops, such as maize, worldwide. The maize is found in various forms, such as corn flour and tortilla chips in British supermarkets.

However some scientists believe that the problem may lie with one of the key genes that forms part of the genetic engineering process itself. The so-called cauliflower mosaic promoter is used in most GM foods available in the UK, such as soya, present in an estimated 60 per cent of processed foodstuffs.

It was these far-reaching implications for one of the world's most aggressively expanding industries that had put Dr Pusztai in the eye of the storm since last August when he spoke out on ITV's World In Action.

He said he would not eat GM potatoes and found it "very unfair to use our fellow citizens as guinea pigs".

Some of the scientists who have viewed the evidence believe the circumstances surrounding Dr Pusztai's removal and the closing down of his research team cannot be understood outside political and commercial parameters.

The Aberdeen-based Rowett Institute, where the research was done, said at the time of his removal that it was unhappy with his having made public the results of preliminary research which had not been subject to peer review. He was subsequently exonerated by an internal inquiry.

'Ousted scientist and the damning research into food safety'

Laurie Flynn, Michael Gillard and Andy Rowell

12th/ February/ 1999

The Guardian

Laurie Flynn, Michael Gillard and Andy Rowell on the tests on rats that raised serious questions about the effects of genetically modified food on internal organs

LAST week in parliament William Hague asked Tony Blair why the government was ignoring advice from its environmental advisers to call a three-year moratorium on the commercial release of genetically modified (GM) crops until more research is done.

The Prime Minister, wary of mounting public concern, especially in middle England, replied ebulliently: "It is important that we proceed on the basis of the scientific evidence. The first stage of meeting public concern is to debate the information."

Today the Guardian publishes for the first time worrying details of publicly funded scientific research. The authors, two eminent British scientists, demand that the Government honours its commitment to transparency on the issue of biotechnology and initiates an immediate evaluation of the potential health risks.

They are backed by 20 international scientists, who call on the Government to release further funding for follow-up research, and to clear one of the authors who has been maligned.

The story begins in October 1995 when the Scottish Office commissioned a research project from the Aberdeen-based Rowett Research Institute into the effect of GM crops on animal nutrition and the environment. This included, for the first time, feeding GM potatoes to rats to see if they had any harmful effects on their guts, bodies, metabolism and health.

A former senior Scottish Office official involved in commissioning the project told the Guardian there was "little regard" at the time for research into the human nutritional and environmental consequences of GM foods. The £1.6million research grant was allocated to redress this imbalance. Dr Arpad Pusztai, a senior research scientist at the Rowett, beat off 28 other tenders to co-ordinate the project. He has

always kept an open mind about GM foods and conditionally supported their release as long as there were rigorous and independent trials.

The other members of the project were the Dundee-based Scottish Crop Research Institute (SCRI) and Durham University biology department who grew the GM potato used in the feeding trials. All three bodies had links with the biotech industry through the pursuit of commercial research contracts.

There was no reason to believe that the research project would produce the controversial findings that could threaten the scientific foundations of the biotech industry they sought to embrace.

In December 1996, Dr Pusztai suddenly became aware of the inadequate level of existing scientific trials on GM maize when a member of the Government's Advisory Committee on Novel Food Production asked him to assess the validity of a licensing application from one of the industry's leading companies.

He faxed his two-page assessment to the Ministry of Agriculture warning that tests into nutritional performance, toxicology or allergenicity were insufficient and inadequate.

In his final paragraph he asked for "proper experiment" with the GM plants and added: "Do not leave it to chance."

There was no legal requirement for further tests to be carried out and approval for licensing was granted.

His own project, now a year old, was also presenting difficulties. Rows had broken out after preliminary findings emerged from Dr Pusztai's team and the SCRI and Durham University's biology department showed growing discomfort – sources told the Guardian – about the validity of some of his methodology and the implication of the results.

A Scottish Office immunologist was called in. She approved the methodology used by Dr Pusztai's team.

The preliminary results of Dr Pusztai's work had begun to show unexpected and worrying changes in the size and weight of the rats' bodily organs. The team found

liver and heart sizes were decreasing – worse still, the brain was getting smaller. There were also indications of a weakening of the immune system.

With so many unanswered questions, far more public money would be needed, Dr Pusztai concluded. But the Guardian understands that the Scottish Office and the Rowett Institute declined his funding requests.

For Dr Pusztai, the funding crisis and the prospect of his unexpected results not being published led him to reconsider his attitude to the media.

In January last year he appeared, with the Rowett Institute's permission, on BBC2's Newsnight and voiced his concerns in measured terms about weakening of the immune system in the rats fed GM potatoes.

In April, Granada TV's World in Action approached Dr Pusztai and – again with the institute's consent – he gave an interview which was broadcast in the documentary that August.

Dr Pusztai told ITV viewers that he would not eat GM food. He found it "very, very unfair to use our fellow citizens as guinea pigs. We have to find [them] in the laboratory," he insisted.

Two days later Dr Pusztai was summarily suspended and forced to retire by the Rowett Institute's director, Professor Philip James, who had personally cleared the interview with Granada and put his name to official press releases supporting the programme.

Dr Pusztai was denied access to his research data and an internal investigation by the Rowett's senior management was launched after unsourced allegations of scientific fraud against Dr Pusztai appeared in a scientific journal.

Six months later, the truth about what happened in those two days is still shrouded in mystery. The Pusztai camp claim there was industry and political pressure on the institute to silence him but a press release at the time stated that Dr Pusztai had presented provisional data in public without peer review.

This week the institute director declined to discuss the matter or to be interviewed by the Guardian. The deputy director, David Blair, also refused all requests for further information.

But the institute did complete an audit report in August last year with the input of two outside scientists. The report concluded that the research data did not link GM potatoes to any health risks.

Dr Pusztai wrote his reply once he was allowed access to his data. He strongly re-confirmed his findings.

In another twist, Professor James gave evidence to the House of Lords Committee on European regulation of GM in agriculture on the same day last October that his audit report was published.

Asked about events at the institute, Professor James told the Lords "there is no question of any malpractice [by Dr Pusztai]." He apologised for the confusion, saying: "Dr Pusztai has come out of this audit review exonerated."

As for Dr Pusztai's conclusions, they remained unproven, said the Rowett report. Dr Pusztai was not called to the committee hearing. But the Guardian understands that a Liberal Democrat MP, Archy Kirkwood, provided the Lords with a copy of the scientist's alternative report.

By October, Dr Stanley Ewen, a pathologist at Aberdeen University Medical School, working on Dr Pusztai's team, was finalising his measurements on stomach sections of rats used in Dr Pusztai's experiments.

Dr Ewen believed he had established that something in the GM potato had caused elongation of a section of the stomach. In addition, after 10 days' feeding, a section of the stomach wall had increased dramatically.

The Guardian has also learned that Dr Ewen did not expect these results. According to a source close to the research, the differences caused Dr Ewen concern.

As a result of the preliminary findings, Dr Ewen and Dr Pusztai are strongly in favour of more research to further test their controversial results and their

implications for human beings. The scientists are anxious not to repeat the mistakes of the BSE scandal.

They are asking for further funding to examine these problems in a more benign atmosphere – away from the secrecy, intrigue and recriminations of the past six months.

The treatment of Dr Pusztai and the virtual disbandment of his research team led the international group of 20 scientists to go public. Two of the signatories have worked for the institute. Both were concerned about the attack on scientific freedom.

Dr Kenneth Lough, aged 71, who was the principal science officer at the Rowett Institute for 31 years until he retired 12 years ago, attacked the "draconian position" taken by the institute in suspending Dr Pusztai without the proper "free exchange" of data.

The absence of this free exchange of publicly funded data would be useful to the GM industry which is unable to convince the British public about the quality of its product.

The 20 scientists want to know why the changes in organ size and weight are taking place – whether the problem was the new gene or the method of transplanting.

Alternatively, was it the "virus promoter" – the "light switch" which GM companies are using to turn on the genes? Increasingly, the Pusztai team began to focus on the promoter, the so-called cauliflower mosaic virus.

Preliminary analysis redoubled their anxieties and with it the possible implications for the GM industry. This was the same virus that had already been used in the modified tomato paste, soya oils and maize that the Government and the European Union had approved for use in industrial and convenience foods and which were making their way into hundreds of products on supermarket shelves.

Dr Pusztai's preliminary research also questions the safety testing for the products the biotech industry is bringing to the supermarket shelves, in some cases unlabelled. None of the food that has been approved for consumption in Britain has undergone long-term feeding trials.

"One key problem that keeps coming back time and again is that regulation of food is nothing like as strict as the regulation for drugs," Professor Jonathan Rhodes, of Liverpool University, told the Guardian. "And when you start tinkering around with the genetic structure of food you have to move towards thinking of them as pharmaceuticals."

Vyvyan Howard, also of Liverpool University, added: "We are saying that we need a moratorium."

The vast majority of the British support this call, although Tony Blair's government stands by the biotech industry, recently putting another £13 million into the DTI's Biotechnology means Business programme. A Mori poll last June showed 77 per cent of respondents in favour of a moratorium; 61 per cent did not wish to eat GM food.

A clear sign of the importance attached to the unpublished research was given last week in private by the Nick Tomlinson, the civil servant who is secretary to the Advisory Committee on Novel Food Production.

In a letter to Dr Ewen on February 4, he stated: "If there are lessons to be learned, it is vital that these are taken on board as soon as possible." He asked for Dr Ewen's research as "a matter of urgency".

At the weekend, British negotiators will fly to Colombia to negotiate the Biosafety Protocol in an attempt to set up international regulations governing GM organisms.

The Government is being criticised by many countries pushing for rigorous safety assessments in the protocol. Tewolde Egziabher, representing the African nations argues that "the position of the UK delegation is shaped by corporate interest, probably reinforced by transatlantic pressure."

Michael Meacher, the Environment Minister, argues: "Our aim is to establish a predictable, science-based and transparent regime which establishes controls proportionate to the risks."

Will these new findings force Tony Blair to change Britain's negotiating position to adopt a stance based on the precautionary principle? Mr Blair's position on GM organisms is now at odds with public opinion.

Labour MP Alan Simpson said: "What on earth would it take to put the people's government at such a remove from the people that they have a delegation flying out to Colombia on Sunday that could end up signing the country to an agreement that prevents interventions to protect human health?"

"For a government that has been meticulous in courting middle income, middle England, there has to be a bigger explanation why they want to side with an industry increasingly heading towards zero public tolerance.

"I think as the Government we have an obligation to identify who frustrated this research? If Dr Pusztai is right, this could be BSE mark two.

"What is at stake here is the whole scrutiny process affecting human and environmental health."

‘A doctor destroyed for being in the right’

Sean Poulter
13th/ February/ 1999
The Daily Mail

PROFESSOR Arpad Pusztai, the scientist who warned of the potential dangers of eating genetically-modified food, is a broken man.

After a lifetime of valuable, though little recognised, endeavour, the 68-year-old academic was kicked out of his job.

His crime was to warn the world that tests were needed to establish the impact on human health of eating GM foods.

Professor Pusztai spoke out after he was alarmed to find that the organs of rats fed with a genetically-modified potato had shrivelled and their immune systems had been harmed.

He was rubbished by the biotech industry which stands to make billions of pounds from the technology.

But the most damning criticism came from colleagues and Professor Philip James, his boss at the Rowett Institute in Aberdeen. They claimed he had got the science hopelessly wrong, that he had been ‘muddled’ and had ‘embarrassed’ himself.

Professor Pusztai was marched into retirement to a chorus of patronising put-downs suggesting it was astonishing that such a well-organised scientist could have got it so wrong. But he did not get it wrong, as the evidence of 22 distinguished scientists from around the world testified yesterday.

To be vindicated so completely must be a relief to Professor Pusztai but the trauma of seeing a professional reputation earned so painstakingly over 40 years so swiftly destroyed has proved desperately hurtful.

‘He has been depressed and down,’ said one former colleague. ‘Clearly the way he was treated has had a deep impact on him personally. They can’t really re-instate him, too much has happened, but they must restore his reputation.’

His wife, Susan Bardocz, a colleague from the Rowett, is also signed off from work. She too has suffered upset and stress because of her husband’s humiliation.

Professor Pusztai, who came to Britain from his native Hungary in 1956, is no scaremonger. He had an open mind on GM food and crops and certainly did not set out to prove that GM foods might be dangerous.

His work began after the Scottish Office commissioned a research project from the Rowett Institute in October 1995, looking at the effect of GM crops on animal nutrition and the environment. This included an experiment where laboratory rats were fed GM potatoes to see if they had any effect on their gut, metabolism and health.

A £1.6million research grant was allocated and Professor Pusztai, a senior research scientist, beat off tenders from 28 other academics to co-ordinate the project. As the work went on, Professor Pusztai became increasingly concerned about the lack of trials to assess the impact of eating GM foods on humans. Professor Pusztai was surprised and alarmed by the preliminary results of the trials. The size and weight of

the rats' organs – the brain, liver and heart – were found to be shrinking. There were also changes to the immune system.

Despite the clear need for further research, his plea for more cash to investigate further appear to have been turned down both by the government and the Rowett Institute.

He sought help from the media, hoping that going public with the findings might stimulate interest and perhaps open up avenues to research funding.

An appearance on BBC2's Newsnight in January last year was followed up in April with his research central to a programme on food safety produced by Granada TV's World in Action.

He told viewers that he thought it was 'very, very unfair to use our fellow citizens as guinea pigs'.

The public outcry was huge. But it was soon stifled when the professor's findings were called into question by the Rowett Institute and he was effectively sacked.

His boss, Professor James, apologised that 'misleading' information had been given to the programme.

Now the 22 leading academics who have reviewed the work insist it was perfectly valid and worthy of publication.

The Rowett is paranoid about secrecy. Professor James has imposed a gagging order on Professor Pusztai and yesterday an E-mail was sent to all staff ordering them not to talk to the press.

Quite why Professor James was so quick to do away with Professor Pusztai and silence his claims has always mystified colleagues.

Yesterday, they were speculating that he could have been leant on, either by the government, through the Scottish Office, or by the industry.

Professor James, 61, was New Labour's guru on food safety and he was chosen to draw up the plans for a Food Standard Agency. At one time he was widely tipped to head the new body, but it is now clear that his name is no longer in the hat.

His management style at the institute has upset many and an assessment of the running of the body last year by an independent body found serious flaws.

Shortly after signing a new five-year contract last year, Professor James announced that he had changed his mind and would be going in June this year.

He has denied his sudden departure – after 17 years at the helm – was in any way connected with the GM food row or the unfavourable management review.

‘Supermarkets rush to ditch mutant food’

Trevor Kavanagh and Paul Crosbie

13th/ February/ 1999

The Sun

Genetically-modified grub ‘may cause cancer’

THOUSANDS of fearful shoppers jammed supermarket hotlines yesterday as a cancer storm erupted over genetically-modified food.

Marks and Spencer immediately joined frozen food chain Iceland in banning own-brand grub made from the “mutant” ingredients.

And the backlash by customers forced other High Street stores to slash the number of products on shelves.

The uproar was triggered when 20 world-renowned scientists backed a colleague who said genetically-modified spuds damaged immune systems in rats and shrank their brains.

The experts hit out over the sacking of government scientist Dr Arpad Pusztai, who made the discovery.

His findings had been rubbished by his bosses in Aberdeen.

But leading food expert Vyvyan Howard, of Liverpool University, insisted last night:

“We found that his data is sound.”

A huge 60 PER CENT of UK processed food has genetically modified ingredients such as soya, maize and tomatoes. Britain faces a “doomsday scenario,” according to top food scientist Dr Ronald Finn. He warned: “We could be going into a Mad Cow situation.”

Swamped

Dr Finn said if the food damaged immune systems, people would risk diseases such as cancer.

But PM Tony Blair REFUSED to ban the foods.

He urged “care and caution” over the scare.

Agriculture minister Jack Cunningham dismissed the storm as “ridiculous”.

But his Tory Shadow Tim Yeo called for him to be sacked for misleading MPs.

Mr Cunningham had claimed the Government’s own watchdog English Nature had not demanded a ban – when it had.

Asda’s customer service hotline staffed by 25 operators was swamped. A spokesman said: “It’s been the busiest day ever for questions about one topic.”

Like Tesco – whose hotline was also inundated – the chain is to slash the number of products which include the controversial ingredients. Asda said: “We are reflecting customers’ views.” Sainsbury’s is to relabel foods so customers know what is in them.

Restaurant diners have no way of knowing if their meals are affected.

But McDonalds and Burger King declared immediate war on any genetically modified ingredients in their food.

Heinz and Kelloggs rushed to reassure consumers products were safe.

The big move against modified grub could gather pace today when millions of families do their weekly shop – and demand to know what is in their food.

‘Blair resists calls for ban’

Philip Webster and Nigel Hawkes

13th/February/1999

The Times

Scientists back colleague who blew the whistle, report Philip Webster and Nigel Hawkes

TONY Blair was staving off calls for a ban on genetically modified food last night after a claim that because of it, hundreds of people could die as a result of a simple flu outbreak, and that cancer rates could rise.

The Prime Minister and Jack Cunningham, the Cabinet "enforcer", were under pressure to explain why the Government had been quick to stop the sale of beef on the bone in the "mad cow" disease scare while taking a seemingly far more relaxed attitude to GM food. Friends of the Earth also claimed that Mr Blair had been urged by President Clinton to ease the way for the commercialisation of GM foods.

The ministers found themselves in the firing line after 20 international experts backed the fears of a publicly discredited scientist who last year raised serious doubts about the safety of GM potatoes.

Arpad Pusztai was suspended in August from the Government-funded Rowett Institute in Aberdeen and forced into early retirement after claiming that laboratory rats fed with GM potatoes had suffered damage to their immune systems and internal organs.

Yesterday, he found support from a conference of experts at Westminster. One of them, Ronald Finn of Liverpool University, said: "If it is proved conclusively that GM food damages the immune system then we can expect a spiralling of cancer rates."

The past president of the British Society of Allergy and Environmental Medicine said: "Dr Pusztai's results to date at the very least raise the suspicion that genetically modified potatoes may damage the immune system." If that happened the consequences of something like a flu epidemic, which currently might lead to a small number of deaths, could be much more serious, he said. "You can imagine a doomsday scenario. If the immune system of the population was weakened, then the mortality would be increased many, many times."

Mr Blair insisted that there was as yet no scientific justification for a moratorium on GM foods. "There is no GM food that can be sold in this country without going through a very long regulatory process," he told a BBC local radio station. "Let's

proceed on the basis of genuine scientific analysis and inquiry, proceed with very great care and caution and not get the facts mixed up."

The head of the Rowett Institute, Philip James, who ordered Dr Pusztai's suspension, said he was mystified by the claims of the scientists who were now supporting him.

"I am not embarrassed. I am intrigued as to what they have seen that I haven't had the opportunity of looking at," he told BBC Radio 4's *The World at One*. He said that Dr Pusztai had been suspended under "standard, routine procedures" and that he had always been a "strong supporter" of his research work.

Professor James helped to draw up the plans for the Government's food standards agency and is widely tipped to be its first head. He strongly denied that he had been responding to political or commercial pressures when he ordered Dr Pusztai's suspension.

Dr Cunningham rejected claims by Charles Secrett, executive director of Friends of the Earth, that President Clinton had put pressure on Mr Blair over GM foods. Mr Secrett said: "If that type of pressure has occurred, as we suspect, then it helps to explain why the Government is doing all that it can to rush through these potentially very dangerous crops and foods before adequate testing has been carried out." Dr Cunningham said: "I absolutely reject allegations that somehow the UK Government, the Prime Minister, or the rest of us are bowing to pressure from the American Government or from American businessmen."

Dr Cunningham also said that in respect of the beef-on-the-bone ban, the Government had clear advice from its advisory bodies to act; there was no similar advice in respect to GM food.

When Dr Pusztai's findings about GM potatoes became known, he was accused of having muddled his results. A subsequent review at the laboratory concluded that his experiments did not support any suggestion that the potatoes had any effect on the growth, organ development or immune function of the rats.

Yesterday, his backers said that re-examination of Dr Pusztai's results showed exactly the kind of damage denied in the laboratory's review. They gave their support to an alternative report of the experiments, so far unpublished.

Professor Finn, of the Department of Medicine at Liverpool University, said: "The two reports just do not add up. I haven't seen the raw data, and it all needs repeating, but the experiments do raise the suspicion that genetically modified potatoes may damage the immune system."

‘Professor who champions healthy eating’

Nigel Hawkes
13th/February/1999
The Times

PHILIP James, the man at the centre of the dispute, is no simple scientist chained to a laboratory bench. Whenever a dispute arises in the area of nutrition, it is a safe bet that Professor James will be involved.

The irony is that the institute he heads is not even involved in human nutrition. The Rowett's main purpose is animal nutrition but Professor James has never allowed that to stand in his way. He has championed the cause of healthy eating, acting as a powerful figurehead for pressure groups seeking to change the British diet.

His supporters saw him as the obvious candidate to lead the food standards agency when it is finally set up - he wrote the blueprint for the agency at the request of Tony Blair - but age and a couple of high-profile controversies have probably put paid to that ambition.

Last year, as a prominent member of the Committee on Medical Aspects of Food Policy (COMA), he was involved in an embarrassing row over what advice ministers should give on the risks of eating red meat.

Frank Dobson, the Health Secretary, was persuaded by someone on the committee to issue strong advice suggesting that even an average intake of red meat could increase the risk of cancer. However, the COMA sub-committee charged with assessing the evidence disagreed and after a long impasse Mr Dobson was forced to withdraw his

advice. Many in Whitehall have blamed Professor James for the fiasco, although he has firmly denied responsibility for it, in a letter to *The Times* and in evidence given to a parliamentary select committee.

The GM potato controversy, which suggests that he has lost control at the Rowett, has further damaged his career prospects. His future probably lies as an adviser for the United Nations, for which he already chairs an international obesity task force.

‘Blair rules out block on new genetically modified crops’

Tim Radford
13th/ February/ 1999
The Guardian

Guardian evidence reveals full extent of scientific research as Cabinet tries to play down fears

TONY Blair yesterday ruled out a moratorium on the introduction of new genetically modified foods after the Guardian revealed evidence of danger from laboratory experiments with staple crops.

Research showing that rats fed genetically modified (GM) potatoes suffered damage to their vital organs and a weakened immune system was endorsed by an international group of scientists, who yesterday warned of a potential doomsday scenario if more independent research was not undertaken.

But the Government yesterday tried to play down mounting concern from scientists, MPs and consumer groups as it committed Britain to a pro-GM policy at an international conference in Colombia beginning tomorrow.

Cabinet minister Jack Cunningham repeatedly insisted that GM food was safe. But today the Guardian publishes for the first time the evidence showing that his reassurances are premature - photographs of the enlarged stomach wall of a rat fed GM potatoes.

At a press conference in Westminster, Ronald Finn, a former president of the British Society of Allergy and Environmental Medicine, gave warning that the research by

Arpad Pusztai last year had shown that GM potatoes fed to rats had interfered with their immune systems.

If they did the same to humans, cancer cases could be expected to rise, and the nation could be at prey from epidemic infection, in the way that BSE had posed a threat to humans after cattle were fed animal carcasses.

"We in the UK have just had a very narrow escape following the epidemic of mad cow disease. I think we have probably got away with it," he said. "We have been warned once, we have had an escape and we should be extremely careful to monitor any further major change in food technology."

He was one of a group of scientists who yesterday called for a five-year freeze on new GM foods. They did so on the day the Guardian exclusively published a statement from 20 scientists in 13 nations, backing the findings of the British researcher. Dr Pusztai was suspended from the Rowett Research Institute in Aberdeen.

But Mr Blair insisted that there was no scientific justification for a moratorium.

"There is no GM food that can be sold in this country without going through a very long regulatory process," he told the BBC. "Let's proceed on the basis of genuine scientific analysis and inquiry, proceed with very great care and caution and not get the facts mixed up."

Four GM foods are available in British shops, but hundreds of "altered" crops are being developed by industry and universities all over the UK, Europe, Asia and North America. More than 170 governments will meet in Cartagena, Colombia, on Monday to discuss international agreements on the traffic of modified living organisms – crops, animals and microbes – across national frontiers.

The food row focused at first on GM soybeans developed by Monsanto, the US company. Dr Cunningham, the cabinet "enforcer", yesterday denied claims by some campaigners that the Government was under pressure from the US to speed up the commercialisation of GM foods.

"It is simply not true. There is not a shred of evidence to support it," he said on BBC Radio's World At One.

Yesterday Marks & Spencer announced that it was looking into alternatives to all the GM ingredients used in its ready-made meals. Safeway said it would continue to sell products with GM ingredients provided they had approval from regulatory authorities - and offered "tangible benefits" for consumers. Iceland has banned GM foods, and Asda said yesterday it was working to prevent the use of any new GM ingredients in its products.

‘Will Blair be made to eat his words?’

Victoria Owen and Richard Alleyne

16th/ February/ 1999

The Daily Mail

How Gummer choked on his stunt

WHEN John Gummer and his daughter tucked into beefburgers during the BSE crisis, the Agriculture Minister's subsequent attack of indigestion lasted for years.

Mr Blair will be hoping that his actions yesterday will not have a similar disastrous effect. But, we can reveal, his insistence that he will not be taking GM foods off the menu may be more of a hollow gesture. For his favourite restaurants would not touch GM foods with an oven glove, far less serve them to their most important customer.

Even the place where he orders his sandwiches every day has a strict policy of using only natural – untampered-with – ingredients. And Mr Blair's famous passion for sun-dried tomatoes is unlikely to be affected by the latest food scare.

In fact it is only during his occasional dabblings into less upmarket fare, such as his celebrated love of fish and chips, curries and Chinese takeaways, that he exposes himself to the controversial foodstuff.

Along, perhaps, with two home-made dishes which he is known to love but rarely has the chance to savour – fresh fettuccine covered in olive oil, and carrot and sweet potato soup. They, too, could conceivably contain GM ingredients.

However one of his favourite restaurants, Frederick's, near the former Blair residence in Islington, North London, was most put out at any suggestion that it might serve ingredients which had an element of the laboratory about them.

Robert Wingate, the manager of the restaurant where a meal costs about £50 per head, sniffed: 'We tend to buy our food from reputable sources.'

In fact so concerned is he to protect the good name of the eatery, where the PM and his wife Cherie have been known to tuck in to foie gras baked in brioche followed by pan-fried veal chops, that he has decided to be extra vigilant. He said: 'We try very hard not to have GM foods on the menu if we can. I will be giving it some more thought and we will have to start looking more closely into the problem.'

At another Blair haunt, Terence Conran's flagship Le Pont de la Tour near Tower Bridge where a meal for one can easily cost £75, staff boast that they pride themselves on using organic foods. Dominic De Vetta, spokesman for the restaurant where the Blairs entertained President Clinton and his wife Hillary a couple of years ago, said: 'As much as possible we use fresh farm foods and organic produce because it tastes better. Even the suppliers of our soy sauce confirmed that they do not use GM ingredients.'

Christopher Gilmour, who owns the other Blair favourite Christopher's in Islington, said: 'It is unlikely we use GM foods – we don't need to. From what I can see the modified ingredient helps for a longer shelf life which is something that we don't need. We only use fresh ingredients.'

Even Pret-a-Manager, the London chain where Mr Blair sends his aides to pick up his sandwiches, felt GM foods were too risky for its customers. 'We only use natural ingredients. Even our bread is free from GM flour.'

Only on his trips to the North East and his constituency of Sedgefield, where he always samples the fish and chips and the occasional take-out meal, does Mr Blair expose his family to the chance of eating GM foods.

A food expert at the Consumers' Association said: 'Fish and chips can be cooked in soya-based oils which could be genetically modified. Fettuccine can also be affected

if certain emulsifiers are used while home-made carrot and sweet potato soup might have GM vegetable stock.’

‘Tony Blair does a John Gummer’

Trevor Kavanagh
16th/ February/ 1999
The Sun

I will feed genetically modified food to my family, says Premier

TONY Blair put his head on the block yesterday and offered his unqualified support for so-called “mutant” food.

He abandoned his usual caution and insisted he would feed genetically modified food to his family.

“He is perfectly confident about the safety of genetically modified food,” said a Downing Street spokesman.

The statement revives stark memories of former Agriculture minister John Gummer who fed beefburgers to his daughter Cordelia at the height of the Mad Cow crisis.

Mr Gummer was never allowed to forget the TV images as subsequent evidence plunged the beef industry into the crisis from which it has still to recover. Labour, under Mr Blair’s leadership profited immensely from that backlash as voters added the BSE scandal to the list of Tory sins.

Pandemonium erupted when scientists first revealed a link between BSE and cow fodder which contained the remains of dead cattle.

The Sun was one of the few newspapers at the time which warned against over-reaction.

We did NOT believe tens of thousands would die from the human strain of BSE – and we have been proved right.

Nor do we believe there is any reason today for shoppers to panic over altered foods.

As time passes, a properly controlled development of genetically modified vegetables and other products is likely to be a massive boon to mankind.

But this is a brand new science at the cutting edge of food technology. And you don't have to be a health freak to worry that food industry grants may be cutting corners or concealing facts. We have learned hard lessons from the tobacco and sugar industries who spent hundreds of millions of pounds persuading the world their products were safe.

There is no reason to suspect the huge Monsanto conglomerate of anything but the purest of motives. We have to assume they carried out exhaustive research before unleashing the products of mutant crops.

But the British government's first duty is to its voters, not an American multinational which appears to have tentacles throughout New Labour.

We know that two of the architects of Labour's landslide election victory now work for the Bell Pottinger agency which represents Monsanto in Britain.

Propaganda chief David Hill earned £100,000 a year as a key advisor and is assigned to the Monsanto contract. Cathy McGlynn, who acted as political advisor to former Agriculture minister Jack Cunningham, now the Cabinet "enforcer", is also on the payroll. GM food firms have met ministers 81 times since the election. Monsanto has visited the Department of Agriculture and Environment Department 22 times.

To be fair, other food technology firms like Zeneca have met ministers and officials more frequently.

Monsanto has close links with American President Bill Clinton and his former aide Stan Greenberg is one of its advisors. Mr Greenberg is a partner of Mr Blair's advertising guru, Philip Gould.

One of Mr Blair's most trusted ministers – supermarket billionaire Lord Sainsbury – is the government's most outspoken advocate of altered foods. Lord Sainsbury, the junior Trade and Industry minister, is so enthusiastic about the new science that he has confessed he puts its success above all other ambitions. He is also one of Labour's most generous benefactors, donating a slice of his £3billion personal fortune to party coffers before the election.

There are question marks over the suspension of food scientist Professor Arpad Pusztai, the expert who first raised cancer scares after experiments on rats. Friends of the Earth, with no evidence, claim he lost his job after pressure from the “highest government level.”

None of this is intended to suggest anything untoward has happened in the development, production or promotion of GM crops. But the Government has a duty to reassure worried consumers. Shoppers need more information. NOW.

All food containing GM ingredients must be labelled so that Mums have the chance to choose whether to turn their families into guinea pigs.

A fullscale investigation must be mounted and maintained by independent scientists. Food must be monitored on a long-term basis, financed if necessary by taxes on the food industry itself.

And the new Food Standards Agency, headed by Mr Blair’s nominee, Professor Philip James, must be charged with the task of co-ordinating these studies.

In the meantime, this cloud over our dining tables has one silver lining. It is certain to lead to a massive explosion in sales of organic veg – once seen as a daft fetish for plant-lovers and tree-cuddlers like Prince Charles.

Ironically, Sainsbury supermarkets – no longer under Lord Sainsbury’s personal control – have spotted the trend.

Their stores provide Britain’s biggest range of organic food available on the hypermarket shopping circuit.

‘Blair eats “healthy” genetic food’

Philip Webster, Roland Watson and Susie Steiner

16th /February/ 1999

The Times

Lord Sainsbury owns key GM patent

TONY Blair gave his blessing to genetically modified food yesterday when Downing Street said that he had eaten it, regarded it as safe, and believed it could lead to tastier, cheaper and healthier products.

But, fearful of a repetition of the controversy that surrounded John Gummer after he fed a beefburger to his daughter, a spokesman refused to be drawn on whether the Blair children also ate GM foods.

Mr Blair's personal opinion was released in an attempt to counter negative publicity about the foods. He is said to be frustrated that informed arguments in favour of the foods were not being aired, and officials sought yesterday to emphasise its safety controls and efforts to monitor developments in biotechnology.

Officials said: "The Prime Minister is very strongly of the view that these products are safe. He has no hesitation about saying that and eating the products himself."

Ministers are worried by polls suggesting that the public is alarmed about genetically modified food and by suggestions that the Government is too close to the industry. But that concern is bound to increase with the disclosure last night that the Science Minister Lord Sainsbury of Turville owns a firm which controls a gene at the centre of the controversy. Diatech Ltd owns the patent to the "cauliflower mosaic virus promoter", which has been said to damage the vital organs and immune system of laboratory rats.

Lord Sainsbury's interest in the gene was placed out of reach in a blind trust when he joined the Government and the Department of Trade and Industry said that Diatech had nothing to do with his ministerial work. But the disclosure of another of his extensive links to the GM food industry is certain to prompt Tory demands for his resignation.

Conservatives have already called for greater openness about the foods, and Labour MPs have also begun to call for a more cautious approach. The former minister Joan Ruddock said: "The industry has been much too hasty in introducing these foods and we need a moratorium so we can properly evaluate the science."

The Government has promised that all products containing the foods will be properly labelled, but the campaigning group GeneWatch has accused it of misleading people over the extent to which genetically modified foods were on sale - the Government

says that they are used only in tomato puree, some cheeses made with rennet, maize and soya.

That soya has been found in Linda McCartney sausages and vegetarian mince, in spite of the manufacturers' assurances that they operate a carefully policed non-GM policy.

An investigation by *Newsnight* found traces of Monsanto's Round-Up Ready in the McCartney range, the only products among several tested to prove positive.

Sir Paul McCartney said: "If there has been contamination, the problem will have arisen from the fact that GM soya and non-GM soya were being mixed by some producers. There is no way on earth that the McCartney family is going to be trying to sneak GMs into our products."

Linda McCartney foods are manufactured by McVities, whose owner United Biscuits said it used soya and maize from segregated crops only.

‘Revealed: Lord Sainsbury's interest in key gene patent’

Laurie Flynn and Michael Sean Gillard

16th /February/ 1999

The Guardian

LORD Sainsbury of Turville, the supermarket billionaire and science minister, owned for 11 years the company that controls the worldwide patent rights over a key gene currently used in the genetic modification process, the Guardian can reveal. The holding was switched into a blind trust last July, three days after he joined the Government.

The same gene is at the centre of the food scandal revealed last week in the Guardian which has split the Government, led to calls for a moratorium on the release of genetically modified foods and provoked demands for an independent ethics commission to look at the whole issue. The controversy is focused on the suspension from work last year of Arpad Pusztai, an eminent scientist whose publicly funded research at the Rowett Institute in Aberdeen, was terminated after he spoke out about the potential risk to human health from GM foods.

Dr Pusztai's suppressed preliminary research - funded by a £1.6 million Scottish Office grant - showed that rats fed GM potatoes suffered damage to their vital organs and a weakened immune system.

He and his colleagues believe the harm, including shrinkage of the brain and thickening of the stomach wall, could have been caused by the cauliflower mosaic virus promoter, a conclusion which threatens the multi-billion pound GM industry. It is the cauliflower mosaic promoter which is owned by Lord Sainsbury's private company. The promoter is vital because it acts as an "on/off switch" to boost the growth of the GM product.

Lord Sainsbury's patented gene is used in most GM foods available worldwide and in Britain – such as soya, which is found in some 60 per cent of processed foodstuffs.

The revelation comes in a week when the Government backed GM food safety despite mounting public concern and ignored opposition demands for Lord Sainsbury's resignation.

As science minister at the Department for Trade and Industry and a member of the cabinet biotechnology committee, Lord Sainsbury, aged 58, is accused of having a conflict of interest with his outspoken support for GM foods and business links to biotechnology companies.

His appointment to the cabinet committee was made soon after Dr Pusztai was suspended last August.

The Guardian can reveal that this patent is owned by Diatech Ltd, a London-based company wholly owned by Lord Sainsbury according to the 1997 annual return. Diatech director, Christopher Stone, said that the junior minister 'indirectly owns' Diatech through his blind trust which was set up when he was appointed a DTI minister last July. He added: 'It is important that Lord Sainsbury does not know what Diatech is doing. The company provides services to Lord Sainsbury and his immediate family and some of Diatech's work includes plant biotechnology.'

Diatech applied for the world patent in June 1987, well before David Sainsbury was ennobled by Tony Blair and while he was finance director of Sainsbury plc. The

application was granted in 1990 and has been held by his London-based private company since then. It was transferred into the blind trust only last July at the same time as the peer entered the Government.

Lord Sainsbury did not declare his shareholding in Diatech Ltd in the December 1997 Register of Lords' Interests, before he was made a minister. But he did declare that he was a 'holder of licensed plant biotechnology patent'. A DTI spokesman for Lord Sainsbury told the Guardian he would not comment beyond the information contained in a statement put out last July when he was appointed science minister.

The spokesman would not answer any questions about the nature of the patent other than to say it went into an unnamed blind trust when he became a minister. The July 1998 press release goes into detail about his substantial shareholding in Sainsbury plc, but does not mention Lord Sainsbury's lucrative private ownership of the patent for cauliflower mosaic promoter.

His blind trust was set up in order to avoid any 'actual or potential conflict of interests' with his ministerial responsibilities. The junior minister is also the beneficiary of offshore trusts in the British Virgin Islands, a well-known tax haven.

Jack Cunningham, the minister who chairs the cabinet committee on biotechnology and GM food safety, said: 'David Sainsbury is a man of complete integrity. He has no financial interests while he's serving in the Government. He's a very valuable member of the ministerial team.' The inventor of the patent is listed as Michael Wilson, who until 1988 worked at the John Innes Institute which shares facilities with the Sainsbury plant biology lab in Norwich.

The Guardian has established that Mr Wilson worked at the Scottish Crop Research Institute (SCRI) as the deputy director during Dr Pusztai's research project. The SCRI, which collaborated in aspects of the Pusztai research programme, was said to be uncomfortable with Dr Pusztai's preliminary findings.

Lord Sainsbury was reported last month as saying he would stand aside in the case of a genuine conflict of interest. He said the cabinet committee on biotechnology had only met once and GM foods had not come up.

He is also in charge of the Office of Science and Technology, which monitors all government funding of research and controls official science policy.

It is likely that today's revelations will increase pressure on Lord Sainsbury to resign.

‘Sainsbury opts to stay out of GM decisions’

Philip Webster, Nick Nuttall and Mark Inglefield

17th /February/ 1999

The Times

Tories say Science Minister is a lame duck, report Philip Webster, Nick Nuttall and Mark Inglefield

LORD Sainsbury of Turville, the Science Minister, was accused of being a "lame duck" last night after announcing that he would leave government meetings whenever genetically modified food policy was raised.

As Tony Blair stood by the former head of the supermarket chain, protesting that he was being "hounded" over disclosures that he owned a patent connected to biotechnology, the Tories claimed that it was "ridiculous" that a Science Minister had to absent himself from scientific discussions.

At the same time the Government gave the first indications of a shift in response to the growing public concern over the issue. In the Commons Jeff Rooker, the Food Minister, ruled out any planting of commercially grown genetically modified crops this year. Only two weeks ago he said that any new planting was unlikely before the autumn.

Although officials denied any shift of policy, Mr Rooker and Mr Blair repeatedly emphasised the extreme care with which the Government was proceeding and suggested that its attitude would be determined in the light of trials now taking place. Tim Yeo, the Shadow Agriculture Minister, said last night: "I welcome this change of tune but it is nothing like far enough."

There was fresh embarrassment for the Government last night when Mr Blair's leading green adviser suggested that emergency measures to deal with genetically modified food which "go wrong" should be drawn up urgently.

Sir Crispin Tickell, chairman of the Government's panel on sustainable development and a former Ambassador to the United Nations, said that he was concerned about the threats to human health and the countryside posed by the new technology. He did not want genetic engineering of foods and plants to lead to a repeat of epidemics such as Aids to which the emergency response had been "distressingly ad hoc ... and panicky".

Sir Crispin said genetic engineering promised new drugs, foods and more environmentally friendly methods of agriculture. "But I am fundamentally concerned about the human and health consequences of genetically modified organisms. Suppose a food is developed that is extremely bad or a new virus is developed that is dangerous to human health; we should at the least have some idea about what we should do in the circumstances."

The scientist at the centre of the controversy broke his silence yesterday to claim that his fears would be proved correct. Arpad Pusztai, whose research suggested that the growth and immune systems of rats suffered after they were fed modified potatoes, spoke after a gagging order was lifted. He said he felt bitter at his treatment and hoped that a select committee would vindicate him. The scientist, who suffered a heart attack amid the intense pressure, said: "I would not eat these potatoes."

Lord Sainsbury, the third minister with previous business links to come under pressure during this Parliament, issued a lengthy statement yesterday explaining how he had placed his interests in a blind trust and how on becoming a minister he had said that he would stand aside from discussions having any effect on the Sainsbury company. He had not taken part in any government decisions or discussions relating to genetically modified food policy. He disclosed that on one occasion when such policy was discussed at the Cabinet committee on biotechnology he had left the meeting.

A spokesman for the minister added that that as he had no knowledge of what was in his blind trust he could not be accused of being able to influence those concerns.

Lord Sainsbury developed his interest in science while at Cambridge in the 1960s. He went up to read history but the work of the Nobel prizewinning scientists Crick and Watson, who made ground-breaking discoveries about DNA, encouraged him to switch to psychology. Since then he has immersed himself in science. He said recently that he dreamt of his "fairy godmother turning him into a Nobel prizewinner in plant genetics".

Yet on leaving university he did not pursue a scientific career. Instead he entered the family firm and followed his other great passion, politics.

He joined the Labour Party in the 1970s but left to join and help to fund the SDP. He returned to Labour after Tony Blair became leader in 1994 and was created a Labour peer after the 1997 election. During his six years as Sainsbury's chairman, until 1997, he was a powerful advocate of genetically modified food.

‘Sainsbury boss a “lame duck” in gene storm’

George Pascoe-Watson

17th/ February/ 1999

The Sun

SUPERMARKET tycoon Lord Sainsbury was labelled a “lame duck” member of Tony Blair’s Government yesterday as the row over Frankenstein foods escalated. The junior science minister owns a company involved in developing genetically -modified foods. And that means he is BANNED from all Government talks about the biggest scientific issues of the day.

Shadow Trade Secretary John Redwood said: “It’s ludicrous. He is in danger of becoming a lame duck minister.”

“It would be best if he resigned so we could start to restore public confidence.”

Last night the Prime Minister was forced to defend his aide as the gene row threatened to spiral out of control. He accused the Tories of a witch-hunt and insisted Lord Sainsbury had “followed the rules to the letter, as he should do. There is no conflict of interest whatsoever.”

A Downing Street spokesman confirmed: "He has not and will not take any part in discussions or decisions about GM food."

Multi-millionaire Lord Sainsbury works unpaid for the Government but holds the purse strings for biotechnology research worth £180million of taxpayers' cash.

He is an expert on the subject and bought the patent to a key ingredient of the GM food process.

His shares in his company Diatech – now placed in a blind trust – would soar if his product was widely used in foodstuffs. So even though he has temporarily handed over control of the firm, he cannot intervene in discussions in case it is seen as a conflict of interest.

Worried

The Lord is a member of a Cabinet committee in charge of biotechnology policy, but he walked out of one of the two meetings held so far to be seen as whiter than white.

Meanwhile a helpline set up by Sainsbury's for worried customers took 300 calls in its first four hours yesterday.

'The man who spurned rock and roll for science'

Nicholas Watt
16th /February/ 1999
The Guardian

Lord Sainsbury finds himself under Tory fire for backing GM foods

IN the early 1960s, when his contemporaries spent their nights jiving to rock and roll, Lord Sainsbury turned his back on his arts friends and transformed himself into a scientist.

Bored with churning out history essays at Cambridge, the future Labour peer switched over to study psychology because of the excitement generated by the scientists Crick and Watson who had made ground-breaking discoveries about DNA.

"I met a whole group of new people, scientists, who were having a wonderful, exciting time," he recalled. 'Crick and Watson were working down the road. It was a world I knew nothing about, so I started reading up a bit.'

Since then Lord Sainsbury has immersed himself in the world of science and likes nothing better than to curl up in bed at night with the latest tome on cognitive neuroscience or plant biology. When asked his ambition in life, he reportedly said he dreamed of his fairy godmother turning him into a Nobel Prize winner in plant genetics.

When the call came from Downing Street last year summoning him to join the Government as science minister, Lord Sainsbury hoped he would be able to indulge his two lifelong passions of science and politics. He can have had no inkling that his passion for science, and most particularly his support for genetically modified food, would turn him into a target for opposition attacks about conflicts of interest among Government ministers.

During six years as chairman of Sainsbury's, the Labour peer was a powerful advocate for GM food which, he believes, could dramatically reduce supermarket bills. Tories claim his interest is inspired by more than intellectual curiosity because Lord Sainsbury owns a £1 billion shareholding in the family supermarket chain whose profits are set to soar if GM food is allowed to reach its potential. He also owns shares in two firms involved in plant genetics, Diatech and Innotech Investments. His shares were placed in a blind trust when he became a minister.

In recent years Lord Sainsbury has poured millions of pounds into the study of genetically modified organisms through the Gatsby Charitable Foundation which he set up in 1987. The foundation, which was named after F Scott Fitzgerald's 1920s playboy, gives most of its GM investment to the Sainsbury Laboratory in Norwich which leads the field in research into the genetics of plant disease resistance.

Lord Sainsbury was asked recently why he named such a worthy foundation after such an extravagant playboy. "It's a great romantic book and I am a very romantic person," he said. "Romantic to me means having a vision of something you pursue that is way beyond what is reasonable."

Tories are hoping that such wild ambitions have made Lord Sainsbury vulnerable. However, Tony Blair will be reluctant to dispose of such a high profile businessman

because he believes that the presence in Government of the likes of Lord Sainsbury and Lord Simon of Highbury, the former BP chief executive, sends a powerful signal of New Labour's support for business.

Lord Sainsbury was one of a handful of multi-millionaire business leaders who supported Mr Blair after he became Labour leader in 1994. He was listed among donors as giving Labour more than £5,000 in 1997, although the true figure is believed to be closer to £3 million.

His support for Mr Blair proved a canner move than his first foray into politics when he bankrolled the SDP, allying himself closely to Lord Owen. When the SDP/Liberal Alliance fell apart after the 1987 election, Lord Sainsbury stood by David Owen and remained a trustee of the SDP until 1990.

‘Lord Sainsbury, the GM evangelist’

Paul Eastham
17th /February/ 1999
The Daily Mail

Analysis

LORD Sainsbury has always been a man torn by a private, all-consuming passion.

Friends say the shy, diffident, cerebral billionaire shows more enthusiasm for the genetically-modified food innovations funded by his personal charitable trust than for his family's mundane grocery business.

Once, in an unguarded moment, he even confessed: ‘If a fairy godmother waved a wand and said I could be Noble Prize winner in plant genetics or a successful chairman of Sainsbury, I would find it a very difficult choice.’ David John Sainsbury likes nothing better than to curl up in bed at night with the latest tome on genetic modification. Few acquaintances imagine that if he had not been born a Sainsbury it would ever have occurred to him to be a grocer.

Which is why eyebrows were raised yesterday across Westminster when the peer, now Minister for Science with a string of official responsibilities for overseeing and

funding GM technology, sought to deny taking part in ‘any Government decisions or discussions relating to GM food policy.’

The reason is that Lord Sainsbury of Turville, who tops the Sunday Times list of Britain’s richest 1,000 people with a fortune of £3.3billion, is one of the most evangelical backers of GM food technology, investing millions of his own.

Observers were frankly baffled by the denials. The truth is that Lord Sainsbury sits on the Cabinet committee in charge of GM foods, his officials are co-ordinating Government biotechnology policy, he is in charge of the Government’s Foresight programme, including the Food and Drink Panel dealing with which GM foods should be eaten. The peer chaired a meeting on December 15 at the start of a major consultation with scientists and the public about GM foods. He is responsible for deciding the level of funding for the Biotechnology and Biological Research Council, which ploughed £180million into biotechnology and gene foods last year.

In fact, Lord Sainsbury is a unique figure in Britain – standing at the heart of the whirlpool of genetically modified trouble swirling around the Government.

He has fingers in all three GM food pies. Firstly, he is the Government Minister in charge of gene policy. Secondly, he has millions invested in companies and laboratories developing mutant crops.

Thirdly, as the head of his family firm for three years, he pioneered the sale of Frankenstein food to the public which still continues.

Significantly, he was never at ease as Sainsbury chairman. His real passions lay outside supermarkets, in hobbies such as plant biology.

In 1987 he set up the Gatsby Charitable Foundation, which since 1990 has donated about £2million a year to the study of plant-science. Most has gone to the Sainsbury Laboratory in Norwich, which leads the field in research into the genetics of plant disease resistance. When he joined the Government last May, he set up a ‘blind’ trust run by his family solicitor Judith Portrait. This holds his £1billion worth of shares in the family supermarket giant – as well as shares in two firms involved in plant genetics, Innotech Investments and Diatech, through which he personally owns the

worldwide patent on a ‘translator enhancer’ gene. Every time it is used in a GM food, he gets a royalty. The potential profits are huge.

His other enthusiasm is middle-of-the-road politics.

He used to bankroll the old Social Democratic Party, then funded a grateful Tony Blair after he became Labour Leader in 1994. Sainsbury threw his full weight and some of his personal fortune behind New Labour during the election campaign. He became the party’s biggest donor. In the two years before the landslide he reputedly gave the party £2million.

A delighted Premier Blair made him a life peer in 1997. After a brief sojourn chairing Mr Blair’s pet project, the University of Industry, he was propelled into Government as Minister for Science and Technology. The appointment was tailor made for the new peer. If he had been able to buy a job in Government, this is the one Sainsbury might have chosen, a heaven-sent opportunity to immerse himself in his personal obsessions – including gene technology, where there was a chance to boost its development.

Until yesterday, that is, when the scale of the potential conflicts of interest became too embarrassingly obvious and the Government began backpedalling hard.

But the Sainsbury episode demonstrates that the stakes involved in the mutant foods issue are high. It is not just a matter of GM company Novartis sponsoring a £5,000 seminar at Labour’s annual conference. The fact that Labour’s former chief spokesman David Hill is now a high-paid adviser to American gene giant Monsanto is relatively small beer.

Mr Blair is learning that his fascination with rich men and his desire to ensure their aura of success rubs off on him comes with a price tag.

In big business, there is no such thing as a free lunch. Especially if it is prepared with genetically modified ingredients.

‘Why Americans are happy’

Julian Borger
20th/ February/ 1999
The Guardian

The US: consumers have never had a food scare, and the industry is backed by the food regulator and has strong links to the Clinton presidency

AMERICA’S vegetable aisles bloom like a multicoloured banner for the Land of Plenty. In a typical supermarket in the nation's capital, peppers, sweetcorn, potatoes and onions overflow in the produce section.

For Vic Foster, stocking up on a day off, it all looks good. He is not a vegetarian but sees himself as a health-conscious consumer who rarely eats red meat, due to the possible risks of heart disease and cancer. He has faith in greens, but admits having not given much thought to the possibility his purchases might have been genetically modified.

'The way I look at it is that if there was any threat to the consumer, we'd be told about it, like tobacco or salt. I mean we have the most consumer-oriented system in the world,' said Mr Foster, a telecommunications engineer.

His assumption that all is well is representative of US opinion. In a survey this month by the International Food Information Council, 62 per cent of those questioned said they would be more likely to buy vegetables that had been genetically engineered to taste better or fresher.

Compared to Europe, there is little public debate on the issue of genetically-modified (GM) foods, and the Food and Drug Administration (FDA) does not require food labels to inform consumers when a product has been altered.

Consequently, agriculture has undergone an extraordinary revolution with none of the sound and fury that has accompanied parallel changes in computer science and Mr Foster's trade, telecommunications. More than 50 million acres of farmland are currently sown with GM foods, mostly soya, corn, cotton and potatoes. Four years ago, that acreage was zero. More than half the soya products on sale in the US have been genetically engineered, as have 75 per cent of processed foods.

According to Mark Hertzgaard, author of *Earth Odyssey* – a book on the global environment, published in the UK next month – the main cause of this silence is political.

“Corporations have a greater control of the debate here,’ Mr Hertzgaard said. ‘It’s cultural here. Everything is already wrapped in plastic. You take it for granted. It’s like the air you breathe.”

The links between the GM industry and the government have been carefully cultivated.

The dominant corporation in the field, Monsanto, a \$7.5 billion (£5 billion) giant with 25,000 employees, has covered all its bases, making significant financial contributions to both Republicans and Democrats. It successfully lobbied the Reagan administration in 1986 to persuade it that no new legislation was required to regulate research and production of GM foods. Congress was thus kept out of the argument.

Monsanto's links with the Clinton presidency are even stronger. One of its board members is Mickey Kantor, the chairman of Mr Clinton's 1992 presidential campaign and a former chief trade negotiator. Marcia Hale, another former Clinton aide, is the company's international regulatory director.

When Monsanto brought a group of Irish journalists to the US recently to combat a spate of bad publicity, the visit included a tour of the White House.

Administration officials have taken the lead in lobbying for Monsanto and the rest of the GM food industry, in the trade confrontation with Europe over the issue. Even Al Gore, the supposedly environmentally-friendly vice president, was brought on board when it came to lobbying Paris to permit the sowing of GM crops in France.

An analysis of Monsanto's workings in the *St Louis Post-Dispatch* in December found that 'where Monsanto seeks to sow, the US government clears the ground'.

Significantly, at the cusp of the Bush and Clinton administrations, when the FDA was drawing up guidelines for deciding whether GM foods should be labelled, a key decision-maker was Michael Taylor, who had hitherto been a lawyer for Monsanto.

The FDA determined that whether a food had been genetically engineered was not a “material fact”. James Maryansky, its biotechnology co-ordinator, said the FDA would not “require things to be on the label just because a consumer might want to know them”.

Some government officials also argue that GM labelling would refer not to the nature of the product itself, which has 'substantial equivalence' to naturally-grown vegetables, but to a process - and therefore does not have to be signposted.

The FDA rules mean that even risk-assessment data can also be withheld as “confidential business information”; in some states food companies can sue competitors under “veggie libel” laws, if they label their products as having no genetically-engineered ingredients, on the basis that this might imply superiority to GM products.

The more optimistic health and environmental activists believe that although Monsanto and the GM industry may have won almost all the battles so far, the war has only just begun. Jeremy Rifkin, the head of the Foundation on Economic Trends, points out that US activists began the world-wide campaign against the first major GM issue, Bovine Growth Hormone when it began to be heavily used in the dairy industry in 1994. And two years ago, when the FDA ruled that GM foods could be labelled “organic”, 250,000 Americans wrote in to complain.

Since then, Mr Rifkin admits, interest has fallen off. “Journalists say to me: This is a non-story.”

The US has yet to undergo a serious food scare on the scale of Britain's brush with BSE, so consumer faith in food producers continues. But attitudes have also shown themselves extremely brittle and could change radically in the event of a mishap. The honeymoon between the GM food industry is already showing signs of tarnish, after incidents of crop failure; Monsanto blamed weather, but in Mississippi cotton farmers successfully sued for damages when their genetically-altered crop failed in 1997.

Consumer activists argue the relationship with farmers may worsen further in the aftermath of developments like “The Terminator” – a GM seed which self-destructs after its first crop, so farmers are obliged to return to the manufacturers each season. 'The Terminator seeds turns farmers into junkies. That's scary,' Mr Hertzgaard said. But in the absence of some health or production capacity, the industry's influence and consumer apathy have all but removed the subject from the national debate. Even the bullish Mr Rifkin admits: 'It's going to be a 100-year struggle.'

‘Do we care about the truth?’

Nigel Hawkes
19th/ February/ 1999
The Times

Our fears over genetically modified foods have been fuelled by a media frenzy and inaccurate reporting, says Science Editor Nigel Hawkes

THE scare over genetically modified food has been a classic example of a little-studied phenomenon, the media feeding frenzy. From small starts, frenzies quickly develop a terrible momentum. Sense and judgment are the first casualties; public understanding the final victim. For as long as it lasts, readers and viewers are buried in a blizzard of stories that compete to paint apocalyptic visions of horrors to come. Politicians shamelessly join in. Then, like a tap being turned off, it stops.

Absolutely the finest example in my experience was the flesh-eating bug which transfixed the press in the summer of 1994. This was a strain of *Streptococcus* capable of killing those unlucky enough to be infected with it.

There was nothing new about the organism or the symptoms it caused, which had been beautifully described in a surgical journal by a doctor working in Shanghai as long ago as 1919. Nor was there any real evidence of an epidemic, or even a significant increase in the number of cases. Yet for a week or two the flesh-eating bug made huge headlines. Then it was gone - and hardly a word has appeared on the subject since.

The GM-food frenzy was triggered by a two-page spread in *The Guardian* on February 12, claiming that tests on GM potatoes had damaged rats which had eaten them. Curiously, an almost identical article which had appeared in *The Mail on Sunday* at the end of January had passed unnoticed.

The Guardian article, despite its length, did not address two key issues: that the GM potatoes tested were not intended as human food, and would never have passed muster as such; and that the gene inserted into them was for a toxin. Small wonder, perhaps, that they might have had damaging effects on the rats, though whether they actually did is still in dispute. By all normal journalistic standards, the story was holed below the waterline.

But it made no difference. The controversy quickly took wing, sprouting subplots and generating a tremendous row more or less about nothing. As it happens, GM foods have been better monitored and controlled in Britain than anywhere else in the world. Small trial plots are all that have been planted. No ill-effects to health have been observed, nor are they likely. Possible environmental effects are being carefully monitored. Is this the impression left by the row? I think not.

Frenzies are caused partly by bad reporting, but could only happen in an environment ripe for them. We live in a society increasingly anxious about risks, real and imaginary, as the sociologist Frank Furedi has pointed out in his book *The Culture of Fear*. He cites a study of the medical literature which showed that in the five-year period between 1967 and 1972, about 1,000 articles containing the word risk were published. In the period between 1986 and 1991, there were 80,000 such articles.

Had risks increased eightyfold in such a short time? Clearly not. We live in a far less risky time than our parents or grandparents. Today fewer than one woman in 10,000 dies in childbirth: in 1940, one in 300 did. The disappearance of the Soviet Union is the greatest risk reduction in our lifetimes; but better drugs, a more plentiful diet, social security and other changes have also cut the ordinary risks of life.

What has changed is attitude to risk. At a time when most risks are actually declining, people are worrying more. But they lack the skill to assess risks, to develop a true

calculus of risk in which real dangers are distinguished from mere scares. Driving a car is far more dangerous than flying, but we seldom hear of people with driving-phobia.

The second reason comes closer to home for journalists. It sounds pompous to say so, but today's journalists are not much interested in the truth. As the American academic Peter Sandman of Rutgers University in New York puts it: "In the epistemology of routine journalism, there is no truth, or at least no way to determine truth. There are only conflicting claims, to be covered as fairly as possible."

So journalists feel they have done their job if they quote both sides of an argument, "tossing the hot potato of truth into the lap of the audience", as Sandman says. This approach has the effect of giving all sources equal value, of making the most outrageous claims seem credible – and a lot more interesting – than the sober responses elicited from official sources.

Nobody would want to deny a hearing to those opposed to GM foods, but crying wolf is seldom sensible, unless a wolf is truly at the door. If one believed all the scares floated by environmentalists and health campaigners, one would never set foot out of doors, though, of course, that would still leave one the option of falling down stairs.

Newspapers that join in a feeding frenzy put their reputations at risk and earn the contempt of readers who know about the subject. Worse, they help to create an atmosphere of fear which could threaten the forces which have made life less risky in the past century. Fortunately, I suspect that most readers treat frenzies with the disdain they deserve.

Appendix C: Full texts of news stories in chapter 5

'Restaurants face fines if they deny GM food on menu'

James Meikle
19th/March/1999
The Guardian

THE Government made a fresh attempt to allay fears over genetically modified foods yesterday when it announced tougher labelling controls which will also be extended to restaurants and cafes.

From today, food manufacturers are liable to fines of up to £5,000 if they break rules on listing main GM foods and in six months there will also be penalties for 125,000 caterers, from the smallest hot-dog vans to large restaurants.

Small bakers and delicatessens will also have to obey the rules, which will be policed by trading standards officers.

But supermarkets and anti-GM campaigners said the new labelling laws will still be failing consumers.

Caterers will not have to list every GM food on the menu, but will have to have notices assuring customers that they need only ask to find out which meals contain it.

Staff will have to be trained to answer customer questions on GM ingredients.

Jeff Rooker, the food safety minister, said: "I cannot see why a small business should not know as much about what they are selling as a large one. They all have suppliers.

The rules are clearly enforceable"

The rules, covering GM maize and soya, enshrine in UK law European requirements that came into effect last September, although they go further by including restaurants and fines.

However, they do not cover additives such as flavouring and colouring, although Mr Rooker said the Government was pressing Europe to do so.

Neither do they include ingredients refined to the point where their GM status is undetectable. 'If people have an ethical or environmental objection to the manufacturing process, I cannot police it,' said Mr Rooker.

He admitted that the new rules did not cover GM tomato puree because that was approved for sale years ago, although there would be a 'moral obligation' to tell consumers about it. However, all new GM foods, including tomatoes, which are likely to be the first whole GM vegetables on sale, will be covered.

Robin Maynard, of Friends of the Earth, said: 'This hardly gives the sophisticated consumer any choice. Many people don't want GM ingredients at all and don't want to support GM technology. This does not allow them to avoid supporting it.'

Some supermarkets have already promised to withdraw own-brand GM products from their shelves and the British Retail Consortium, which represents the major retailers, said other members would label all GM additives and oils in their own-brand food whether or not any modified DNA remained. 'Government legislation does not go far enough to help consumers,' it said.

David Smith, chief executive of the Federation of Master Bakers said: 'The vast majority of the food industry has no desire to mislead people. I am sure everyone wants to label accurately. But we are going to have difficulty knowing because there is no legal obligation for our suppliers to tell us.'

The Restaurant Association said it would be telling its members to comply with the law 'if they have a similar requirement for suppliers.'

But London restaurateur Michael Gottlieb, who owns three businesses, said he thought 'the Government is going completely bananas'.

He said: 'No customer has ever asked me whether anything contains GM food. I don't think people want to face life or death decisions when they go out. Either GM food is safe, and the Government should not be kowtowing to certain groups, or if it is not safe, it should be banned.'

Mr Rooker's department last night made clear caterers and bakers should insist on knowing whether there was GM food in their supplies when they signed contracts. They could then pursue suppliers through the civil courts.

‘Caterers given respite over GM labelling’

Valerie Elliott
19th/March/1999
The Times

SHOPS and supermarkets face fines of up to £ 5,000 from today if they fail to label any food which contains genetically modified soya and maize.

However, the country's 125,000 restaurants, fast-food outlets, cafes, pizza chains and hot-dog stands have until September 19 before they must know the GM contents of the dishes they serve. Menus will not have to list the GM content of every dish on offer. Instead notices will be on display on premises if any food contains GM soya or maize.

Customers will have to ask waiters and waitresses for specific information about dishes which contain a GM product. Restaurants will not be able to get away with "defensive labelling" saying that food "may contain" GM products. Jeff Rooker, the Food Safety Minister, said: "Forget 'may contain'. We are not in the business of 'may contain'. It's got to say genetically modified or genetic modification. The EU directive states 'does contain'.

"What we are asking restaurants to do is to be in a position so that if a customer asks if there are GM ingredients to know, not to say 'I will check and find out next week'." GM tomato paste is excluded from the new law but Mr Rooker said that premises had "a moral obligation" to inform customers if it was used.

He suggested that Zeneca's tomato paste could also soon be covered by further new laws which would also be extended to the GM content of additives and flavourings. The Government would also have to decide soon if a GM-produced tomato by Zeneca could be approved for sale.

The six-month gap for catering companies will allow staff to be trained to answer queries and will give them time to check upon their own supplies and if their ingredients contained GM soya or maize, Mr Rooker said. If mistakes were made, the prosecution would be against the catering owners or management and not the table staff.

The new laws will be enforced by environmental health officers but it is understood they intend to "go gently" until people understand the requirements. The new laws will not apply to ingredients such as the emulsifier lecithin and cooking oils. Although these products are derived from the GM process they contain no GM protein and so any meal cooked in GM soya oil or a chocolate biscuit can be labelled GM-free.

Most supermarkets in Britain have already introduced their own GM labels and most have also included GM derivatives not covered by the new laws.

Some retailers have also banned GM ingredients in their own-brand products. Catering companies said that the new laws were unworkable and unenforceable. Michael Gottlieb, director of the Restaurants Association, said: "Our members have spent a lot of money designing and printing menus and these may have to be changed to accommodate the new rules.

"Also, most of our suppliers don't have a clue whether or not their products contain GMs so how can they tell restaurateurs in the first place?"

He called on the Government to say if the foods were safe: "If they are not they should not be produced and if they are then the Government should stick to its guns and not bow to idiotic pressure."

The new laws were also described as inadequate by environmental groups who believed the Government had deceived the public and put the burden on small businesses instead of large companies such as Monsanto. Friends of the Earth said: "The reality is that the public will still be eating unlabelled food containing GM ingredients even after this law is passed."

'Enforcement is likely to be costly and slow'

Nigel Hawkes
19th/March/1999
The Times

ENFORCING the food labelling regulations is likely to prove an expensive operation for trading standards officers.

Tests exist for detecting whether foods contain genetically modified ingredients but they cost £ 100 to £ 200 a time and take ten days. At present only two public analysts' laboratories in Britain are equipped to carry them out.

One of the laboratories, at Worcestershire County Council, tested 200 food products for GM soya last autumn and found that about 60 contained some. Bob Stevens, a public analyst who works for the council, said that although they had been busy they had not yet had to turn away work. That could change if the new regulations produced a string of complaints to trading officers and they needed to be investigated.

The Food and Drink Federation, which welcomed the announcement by Jeff Rooker, says that it now urgently needs clarification from the European Commission over the details of the regulations.

In particular, an FDF spokesman said, the EC needed to set a threshold below which foods would count as GM-free. That was likely to be set well below 1 per cent and Mr Stevens feared it would add to the problems of testing. "We can test for GM ingredients and say whether they are there or not but it is difficult to say how much is there" he said. "In any case, people who want to avoid GM foods will want to ensure that there is none there, not that it falls below an arbitrary threshold."

Friends of the Earth criticised the regulations for excluding foods that are derived from GM crops but which no longer contain any evidence of it. Examples include oils prepared from soya beans, which contain no proteins, and lecithins (emulsifiers made from soya).

Mr Rooker argues that labelling such foods would be misleading because the accuracy of the labels could never be checked. But consumers who object to GM foods on moral rather than safety grounds, as some do, are unlikely to be satisfied by that answer.

Pete Riley of Friends of the Earth declared that the regulations were worthless because they were "built on sand". Until soya and maize entering the country was segregated into GM and non-GM, he said, more and more foods would contain GM

ingredients. "All this means is that UK food manufacturers and hot-dog men will pay the costs imposed on us by unscrupulous multinational corporations."

'Eat up or starve, shopper is told'

Nigel Hawkes
19th/March/1999
The Times

A supermarket chain told a shopper that she would starve if she refused to eat genetically modified food.

The warning was given to Jean Evans, of Kingsbridge, Devon, after she contacted Somerfield asking about its policy on GM food. Stephen Ridge, a quality assurance executive at Somerfield, said in a letter that it was almost impossible to guarantee that a product did not contain any GM ingredients.

"While I have every sympathy with the position you have decided to take, ie, avoiding eating any genetically modified ingredients or foods, I regret to say that in the near future you will starve," he wrote.

The letter angered a local pressure group, Kingsbridge Action on Genetic Engineering. A spokesman said: "At the very least, we expect supermarkets to adopt a supportive attitude to the consumer and to label all GM food."

A spokesman for Somerfield said it had not been the firm's intention to shock Mrs Evans. "The fact is that soya and maize have been co-mingled, making it almost impossible to guarantee GM-free status. We feel it is better to warn our customers about the reality of the situation than to say something that isn't true," the spokesman said.

Mr Ridge wrote to Mrs Evans to make clear that although the company had every sympathy with her determination not to eat GM foods, the reality was that it was difficult to avoid such foods.

The spokesman said that rival supermarkets' claims of a ban on GM foods were based on the fact that they allowed a tolerance, or threshold, of 1 per cent. "We would say that makes it GM food," she said. "We have told our suppliers that

wherever possible they should source non-GM foods or ingredients and where they cannot do that the food will be labelled."

‘Modify your menus’

Sean Poulter
19th/March/1999
The Daily Mail

Restaurant chiefs attack order to list GM foods

RESTAURANT bosses were told yesterday that they must list all the genetically-modified ingredients in the food they serve.

But the new laws, which also cover caterers and fast food outlets, were widely condemned as unworkable last night.

Many restaurateurs were outraged at Government rules requiring them to reprint menus and train their staff to answer question on genetic engineering.

Those who fail to comply after a six-month period of grace face fines of up to £5,000.

‘These rules are difficult to comply with, time-consuming, costly and burdensome,’ said Mike Gottlieb of the Restaurateurs’ Association. ‘They will accomplish nothing other than to create uncertainty.’

One London Restaurant owner described the rule as ‘complete madness’.

‘I buy my food from a wholesaler and I can’t keep track of what all the different suppliers are doing,’ said Xavier Claustres, of Le Tigre et la Grenouille in Bethnal Green.

Gilberto Pizzi, 51, who owns La Trevi restaurant in Highams Park, East London, said: ‘Restaurant have to rely on suppliers and even they don’t know the answer.’

While Labour’s U-turn on GM foods has been welcomed by consumers, there is concern about the way it is policing its new policy. The Government has gone further than any other European nation in giving teeth to flawed EU regulations which came into effect in September, 1998.

Council trading standards officers will be expected to check alleged GM-free meals

by sending samples off for laboratory tests.

Details of the new laws drew attacks from all sides last night, including the trading standards officers who will have to enforce them.

Consumer groups said loopholes in the proposals would lead to 75 per cent of 'Frankenstein food' being unidentified.

But Food Safety Minister Jeff Rooker insisted: 'We think it's highly practical for claims to be checked out and consumers to be properly informed. It is possible to enforce these regulations.'

The EU rules require food companies and retailers to label foods which include GM soya or maize as main ingredient – such as vegetarian burgers or corn chips.

But derivatives of these GM crops, such as lecithin from soya, and starch, glucose and dextrose from maize, do not have to be labelled.

These ingredients are used in many products including pizza, biscuits and ready-meals. The regulations also fail to cover GM tomatoes and a host of enzymes used in food processing.

The failure of the new rules is demonstrated by the fact that they have already been left behind by the country's major supermarkets.

Marks & Spencer, Sainsbury's, Waitrose and the Co-op have banned GM ingredients, while other major stores are going further than the law requires to label the derivatives. The director of the Consumers' Association, Sheila Mckechnie, described the failure to include derivatives of GM soya and maize as 'a great disappointment'.

Animal feed is also excluded from the tougher labelling regulations. In answer to a parliamentary question, Mr Rooker last night admitted it was 'not possible' to know how much of 3.6million tons of imported soya and maize fed to cows, pigs and other animals came from mutant crops.

Soya and maize from abroad – which could contain GM ingredients – made up about a sixth of the feed bought by farmers in 1997-98.

‘What the labels will not tell you...’

19th/March/1999

The Daily Mail

THOUSANDS of products which may contain substances derived from GM food are exempt from labelling laws.

Dr Tim Lobstein of the Food Commission has helped compile a guide to such ingredients.

SOYA LECITHIN OR LECITHIN (E322): Made from soya fat, it bind water and fat together and is used as a thickening agent in milkshakes, biscuits and chocolate bars.

EMULSIFIER: An umbrella term which can include lecithin. Found in cake and bread.

SOYA OIL: Used in sauces, pastries, cakes and deep-fried foods as a form of fat to give extra taste and texture.

VEGETABLE OIL OR VEGETABLE FAT: All-encompassing terms which can include soya oil. Most commonly found in biscuits and frozen fried foods such as chips.

MALTODEXTRIN: A type of starch which can be made from GM maize. Added in powder form to help food flow through machinery at factories, it also acts as a ‘bulking agent’. Used in baby foods, powdered soups, cake mixes and powdered desserts.

MODIFIED STARCH OR MODIFIED CORN STARCH: Can include starch from GM maize. Cheap thickening agents used in baby foods, sauces for baked beans and tinned pasta, soups and tinned stews.

XANTHAM GUM: Another cheap thickening agent, made from maize starch. Used in tinned and packet soups where a slightly thicker texture is required.

GLUCOSE OR GLUCOSE SYRUP/GLUCOSE SYRUP SOLIDS: Sugars which can be derived from maize starch used as sweetening agents. Found in soft drinks, powdered desserts and instant soups.

DEXTROSE: Similar to glucose and can also be derived from maize starch. Used in cakes, chips and biscuits to achieve a browned finish. Also used as a sweetener in

high-energy sports drinks.

HIGH FRUCTOSE CORN SYRUP: Similar to dextrose but sweeter. Used in the same range of products as glucose and dextrose.

‘GM food to be labelled in all cafes’

19th/March/1999

The Sun

SHOPS and restaurants must label “Frankenstein foods” from today.

Those who don’t will face fines up to £5,000 under sweeping reforms announced yesterday.

Food Safety minister Jeff Rooker, pledging to enforce EU regulations, said: “This is not an issue of food safety.

“We are determined consumers should be able to choose whether or not to eat genetically modified foods.

“This includes food in restaurants, cafes and take-aways and not just supermarkets.”

GM soya and maize products will have to be labelled in all Britain’s 500,000 retailers and 125,000 catering outlets.

Restaurants will not be allowed to use a “cover all” statement saying that meals may contain GM ingredients.

Appendix D: Full texts of news stories in chapter 6

‘Beet and rape harmful, but maize beneficial’

Valerie Elliott

17th/October/2003

The Times

GROWING genetically modified crops can be harmful to the environment. Results from three-year, £ 5.9 million government farm trials of the new technology paint a grim picture of a landscape denuded of many farmland birds, butterflies, insects and common field plants.

The findings, revealed yesterday, made clear that there were dramatic effects on wildlife when farmers grew GM varieties of oilseed rape and beet. There remain

question marks over GM maize, which was found to be better for wildlife than conventional maize.

It emerged, however, that 75 per cent of farmers growing conventional maize sprayed their crop with Atrazine, a herbicide so toxic that it is to be banned in the European Union. The verdict is still out on GM maize until the analysis of data from farms where other herbicides were used. Chris Pollock, chairman of the scientific steering committee which monitored the trials, indicated that this work would be completed within weeks.

The findings will be discussed by the Government's Advisory Committee on Releases to the Environment and recommendations sent to ministers before Christmas.

Dr Pollock said the trials, the largest in the world, would have an impact on the future of farming. Novel processes would not be allowed unless they had been subjected to rigorous scrutiny, he said. The findings, published yesterday by the Royal Society in its journal, *Philosophical Transactions: Biological Sciences*, made clear that fields sown with conventional spring rape were the richest in plant and animal life. In GM rape fields there were 80 per cent fewer weed seeds and in GM beet fields about 60 per cent fewer seeds. The seeds are an important part of the diet of many animals and birds, so a shortage poses a threat to species which rely on them for survival.

Butterflies also suffered in the trials and in GM rape fields were down 24 per cent. Researchers said that if weeds declined over a number of years, there would be even fewer flowering seeds for the butterflies to feed.

In GM beet and spring rape crops there were greater numbers tiny insects called springtails. They were attracted to the GM crops because the GM herbicide is used later in the season, when weeds are much larger. However, researchers believe that with commercial growing this benefit would be short-lived as there would be fewer weeds left.

The impact on many field plants in GM rape and GM beet trials was marked. Fat hen,

or *Chenopodium album*, was down by 80 per cent and annual meadow grass down 60 per cent. The researchers counted half a million seeds, 1.5 million insects and made 4,000 farm visits. There was a total of 273 field trials.

‘Decision on GM crops postponed until after election’

Valerie Elliott
17th/October/2003
The Times

MINISTERS are likely to delay any decision on the commercial planting of genetically modified crops until after the general election.

Elliot Morley, the Environment Minister, last night ruled out biotechnology companies being granted any GM licences in Britain next year and said that the country was "some way" from reaching any final decision on the issue.

He spoke out after government scientific tests showed that GM oilseed rape and beet harmed the environment. Mr Morley even accepted that, given the impact of these crops on wildlife, particularly on farmland birds, they may never be licensed for use here.

Ministers realise that were they to allow some commercial planting they would be renegeing on their commitment to reverse the decline in the number of farmland birds by 2020. The results of the GM field trials suggest a huge threat to birds such as the skylark and corn bunting. With public opinion overwhelmingly against the technology, ministers have seen its political dangers.

Speaking to journalists last night, Mr Morley appeared keen to defer the issue and said he was not putting pressure on the Advisory Committee on Releases to the Environment to make recommendations to ministers soon. He did not believe that any biotechnology company wanted to start planting a GM crop in Britain.

He appeared to suggest that the evidence could halt the planting of GM crops in the European Union. The European Commission and member states had been awaiting the results, he said, adding: "I don't think any European country can ignore these results."

The mood in Government appears to have changed over the summer after the Cabinet Office analysis which suggested that there was no economic case for the technology at present and that the public were rejecting it.

Mr Morley said: "I think we are some way from commercial planting. There are a number of hurdles to cross. It will definitely not be next year. It depends on whether GM crops satisfy tests, but there has to be a market and the market is not here in the UK and the tests are not of great interest to UK farmers."

Ministers may also be reining back from GM crops because they know the issue would produce a big row with regional colleagues, particularly the Welsh Assembly, which wants to keep Wales GM-free.

The Government is also anxious not to allow opposition parties to exploit the issue. David Lidington, environment spokesman for the Conservatives, and Andrew George, for the Liberal Democrats, said the scientific evidence pointed to a need for more caution.

The latest findings nevertheless will lead to further debate, especially as GM maize was found to be better for wildlife than the conventional crop.

Mark Avery, of the Royal Society for the Protection of Birds, said that GM crops could be "the final nail in the coffin for some species". Stephen Tindale, of Greenpeace, said: "For years the GM corporations have been claiming that their crops would reduce weedkiller use and benefit wildlife. Now we know how wrong they were."

There are concerns that the Government may use the positive results for GM maize to push for limited commercial planting. Patrick Holden, of the Soil Association, which campaigns for organic food production, said: "The Government mustn't use the maize results as a justification for GM crops. GM maize cross-pollinates easily by wind and would pose a danger to conventional and organic farmers."

But Paul Rylott, of the Agriculture Biotechnology Commission, said: "This evidence shows that GM crops can enhance biodiversity. It is time to move forward with responsible case-by-case introduction of GM crops."

TIMESONLINE www.timesonline.co.uk/specials The GM reports in full

MAIN FINDINGS If GM crops were planted on a large scale:

- * GM oilseed rape and beet would be bad for birds, butterflies and bees
- * There would be fewer flowering weeds, depriving birds of seeds
- * Weeds in GM maize crops may double the number of seeds for birds and insects
- * Managing land for wildlife could lessen GM crop effects
- * Effects on human health and GM traits in environment were not examined

'New seeds of doubt on GM reinforces Monsanto sale decision'

Carl Mortished
17th/October/2003
The Times

OPPONENTS of genetically modified (GM) crops pounced on a report by British scientists yesterday which found that GM rapeseed and sugar beet were more harmful to local wildlife than conventionally grown plants.

The report, based on trials of GM rapeseed produced by Bayer CropScience, a British unit of Bayer, and sugar beet produced by Monsanto, the US agrochemicals firm, shows that fields of GM rapeseed and sugar beet supported less wildlife than those with conventional crops.

The findings' published in eight lengthy papers by scientists backed by the Government's Scientific Steering Committee, come a day after Monsanto said it would close a key GM research unit in Cambridge, with the loss of 80 jobs.

But Monsanto's decision to sell its European wheat business is not so much an admission that it has been unable to persuade Europeans to eat so-called "Frankenstein foods", but a simple confirmation that the seeds business has been a disastrous investment. Monsanto paid £ 350 million for Unilever's plant breeding business in 1998, a deal that raised eyebrows because the price was about 20 times the revenue earned by the business. But those were heady days; Monsanto had already spent \$5 billion (£ 3 billion) buying three seed businesses, Dekalb Genetics, Delta Pine & Land and Cargill's operation. Monsanto took the view that the future for agribusiness was seeds and the technology of producing new varieties. Dupont

was in hot pursuit, as was Novartis, the Swiss drug company.

The future was in seeds but Monsanto was unable to develop successful hybrids with wheat and cereal farmers who have the annoying habit of saving seed for next year, a strategy that can reduce their royalty payments. The Cambridge plant breeding station has never made a profit, so it must go.

That does not mean that Monsanto's biotechnology strategy is wrong; the Cambridge business was about conventional hybrids. It just means that Unilever saw a Yank coming with a fat wallet and took him to the cleaners.

Monsanto has lost some of the arrogance that led to the battle of words five years ago with the Prince of Wales over "Frankenstein foods" but more discrete lobbying has failed to win over European consumers. The European Commission wants to open the door to Monsanto's Roundup Ready maize and soya but it is doubtful that labelling will soften anxiety and America's decision to sue the EU in the World Trade Organisation is simply foolish.

Developing countries want more and cheaper food but in Europe, food quality, not quantity, is the main concern. Monsanto's experience has been with US consumers; they are happy to eat GM food, caring more about volume and price than origin or quality. For a people so rich, that approach seems strange, but food habits go back hundreds, if not thousands of years, and it is worth remembering that most Americans are descended from people who arrived barefoot in the land of plenty.

If Monsanto learns any lesson from its retreat from Cambridge it could do worse than talk to Unilever, the vendor. Unilever's chairman, Niall FitzGerald, is a supporter of biotechnology but the firm will not use GM products if consumers don't want them. Unilever knows its business is about selling food, not technology, a distinction that escapes Monsanto.

‘Two GM crops face ban for damaging wildlife’

Paul Brown and John Vidal
17th/October/2003

TWO GM varieties, oil-seed rape and sugar beet, face a Europe-wide ban after long-awaited field-scale trials showed that the crops damaged wildlife, and would have a serious long-term effect on bee, butterfly and bird populations.

Three years of trials growing GM crops alongside conventional crops, the largest field study undertaken, has provided a legal basis for banning the two crops under European Union rules, which say that either health or environmental detriment must be proved.

The government is now faced with an embarrassing about-turn on its enthusiasm for GM technology. Loss of birdlife in the countryside has been put forward as a key "quality of life" indicator by the government and it is pledged to reverse the trend.

Scientists from the independent panel set up to conduct the field trials were surprised that the results – revealed in the Guardian earlier this month – were so dramatic. In the case of conventional oil-seed rape, five times as many weed seeds survived, providing food for birds like skylarks, than in the GM field. The results were uniform across the country, giving Professor Chris Pollock, chairman of the scientific panel, confidence that the results would be the same across all of Europe.

David Gibbons, another panel member, said the results were "unexpectedly dramatic. There were very big differences, three to five times more seeds, for example. There will be less food for birds if [the GM crops] are grown commercially".

Ministers were cautious although Elliot Morley, the environment minister, said the results showed "GM crops had severe implications for wild birds". The government would await advice from the Advisory Committee on Releases to the Environment (Acre) but he said: "I cannot see any European government ignoring these results and their affect on wildlife."

There has been huge public hostility to GM crops found in the widest public consultation on a single issue. The government also has to contend with other recent scientific findings that GM genes could disperse in the countryside and create superweeds. It has been told by the Cabinet Office that there is no economic benefit to Britain from the technology now, and to grow GM crops might cause civil unrest.

Acre recommended GM oil-seed rape in 1997, saying it could see no danger to the environment.

A question mark hangs over a third crop, GM maize, which did well in the trials compared to conventional maize. At least part of the trials will have to be repeated if they are to be conclusive, another scientific panel member, Dr Geoff Squire, from the Scottish Crop Research Institute, said.

Conventional crops which did so badly in the maize trials in conserving wildlife compared with GM crops had been treated with a powerful herbicide called Atrazine which is to be banned. New tests will be done with a less virulent herbicide before deciding which of the two types of maize is better for the environment.

Michael Meacher, the former environment minister who set up the trials with industry in 1998, said that two of the three crops had been shown to be indisputably bad for the environment, and the third would have to be re-tested with another herbicide.

"The government said that if the trials showed harm to the environment then they would not proceed with GM. We've always known the public is hostile, and now the science shows the same. That settles the argument," he said.

Almost all Britain's leading environment, conservation, wildlife, countryside and consumer groups called for the banning of GM crops or for more tests. "We now have confirmation that GM crops harm the environment, make no economic sense and are deeply unpopular. Tony Blair must stand up to US pressure and declare Britain GM-free," said Tony Juniper, of Friends of the Earth.

Scientists were more cautious. Professor John Lawton, head of the Natural Environment Research Council, said: "We have a wealth of new information about the biodiversity of the UK's major habitat, agricultural land, and rigorous data that will be of great value to decision makers."

The GM industry took a different view. "This evidence shows that GM crops are more flexible and can enhance biodiversity," said Dr Paul Rylott, of the Agricultural Biotechnology Council, which represents Monsanto, Syngenta and other leading GM

companies.

‘Birds and the bees: how wildlife suffered’

Paul Brown
17th/October/2003
The Guardian

Result of £5m trial surprised scientists

THE farm scale trials were the largest and most thorough of their kind in the world. Scientists had never previously been able to observe how changing farm practices are affecting wildlife across the country. They cost £5m and lasted four years.

The trials were designed to test whether weeds and insects fared better in fields of conventional crops or crops which had been genetically altered to be resistant to a single herbicide.

In GM crops it meant that the farmer could use one application of herbicide to kill a large spread of weeds in one go without harming the crops. Conventional crops might need several applications of different herbicides at different stages in order to keep weeds under control.

The trials were held because there had already been a steady decline since the 60s in the number of weeds because of intensive agriculture. As a result, there had been a reduction in a wide range of animal species, including bumblebees, grey partridges and corn buntings. They were losing both their food sources and their habitats.

Scientists were surprised to find considerable differences between conventional and GM crops and that they were so marked – as much as five to one in the number of weed seeds produced in conventional oil-seed rape compared with the GM variety. The results were also remarkably consistent across England, Scotland and Wales, although scientists had expected regional variations. This led them to believe the results would apply across the whole of Europe.

There were 273 field trials, 68 fields of maize, 67 of spring oil-seed rape and 66 of beet, both for sugar and fodder. Studies on winter oil-seed rape are still to come.

The GM maize and rape were resistant to Liberty (glufosinate-ammonium) made by

BayerCropScience, and the GM beet to Roundup (glyphosate) made by Monsanto. Each trial field was divided into two, half sown with the GM crop and half with its conventional equivalent. Farmers were allowed to treat the crops as they would normally, deciding when to plough and when to plant crops, and when to treat with herbicides.

The researchers monitored the plants and animals in the fields, around the ploughed edges of the fields, before, during and after the crops were grown. Each field was visited 15 to 20 times a year.

Researchers measured the number of grasses and broad-leaved weeds and calculated the weight of the dried weeds. This gave a good measure of the quantity of foliage, flowers and stems that were above ground and available for animals to eat, as well as how many seeds the weeds produced. Another measure was how many seeds fell from the weeds on to the soil surface, known as "seed rain". This allows scientists to predict how many seeds would be available for insects and birds to eat. This is particularly important because some farmland birds – skylark, corn bunting and yellow hammer – which rely on weed seeds in the autumn and winter have been declining. The number of weed seeds left to provide plants for the future was also measured.

The researchers monitored the numbers of insects in and around crops including butterflies, bees, ground beetles, springtails (which live in the soil), and true bugs (which eat other bugs), as well as spiders.

Crops

Beet

In spring the density of weed seedlings in the GM beet fields was four times that in the conventional crops because many farmers had sprayed to kill weeds in conventional crops before the beet had emerged. However, applying Roundup to the GM crops in May halved the weed density compared with conventional crops. After this the biomass of the remaining weeds was six times lower and the "seed rain" was three times lower compared with conventional crops.

Although there were never many bees and butterflies in beet crops, there were even fewer in the GM beet crops, probably because there were fewer flowering weeds to attract them. There were also fewer butterflies in the tilled margins. Bee numbers, generally low everywhere, were even lower in the GM crops. Growing GM beet is likely to affect populations of weeds in the long term as seed stores will shrink, and will be unlikely to recover.

Spring oil-seed rape

There was 70% less volume of weeds in GM crops and 80% fewer broad-leaved weed seeds. Springtails were significantly more abundant in GM crops in July, and spiders in August, just before the harvest. This was probably because the springtails feed on rotting weeds, which were more abundant in GM crops late in the year. The GM herbicides are used later in the year so the weeds are bigger when they are killed, providing more food for springtails. The spiders were probably feeding on the springtails.

Maize

Both the density and size of broadleaved weeds was three times higher in the GM maize fields than in conventional maize fields. Taken together the weeds in the GM crops produced twice as many seeds as the weeds in the conventional crops. Over the growing season butterflies were attracted to the GM maize fields and field margins in the same numbers as conventional fields. There were three times as many honeybees in the GM field boundaries because of more flowering plants, but researches stress that even in GM fields numbers were low. Insects were found in similar numbers in both.

Growing GM maize would be an option for farmers wanting to replace more intensive and persistent herbicides such as atrazine, which is being phased out as too toxic. More weeds and seeds were produced in GM fields, suggesting that birds as well as small mammals like mice might benefit.

Species

Butterflies

The trials found fewer weeds in spring rape and beet fields and butterfly numbers were significantly lower. In the short term butterflies could move elsewhere to find plants to feed on but in the longer term the effect might be important. There were one third fewer butterflies in GM beet crops in July than in conventional crops and in GM spring rape it was half.

Farmland birds

Numbers of birds were not studied directly but farmland birds rely heavily on weed seeds for survival, especially over the winter. For GM beet, weed seeds were reduced by 70% and for GM oil-seed 80%. In addition, for GM spring rape the reduction in seed meant that while the seedbank (the number of seeds in the soil) doubled following conventional crops, it did not increase at all following GM crops. This suggests that GM spring rape plantings will make worse the long term decline in plants, some of which will be important to the diets of farmland birds.

The results for GM maize were the opposite with twice as much "seed rain" on the GM halves of the field.

Bumblebees

These thrive where there are weeds in grassland and uncultivated farmland but are generally low in arable fields. There were no differences in the numbers of bumblebees on margins in conventional or GM crops for beet maize or spring rape. While numbers are unlikely to be affected by a lack of weeds in any one year, because they will search elsewhere for food, in the longer term it could have an impact by seriously depleting weed populations within fields. Any reduction in long-term weed numbers could exacerbate the current decline in bumblebee populations in the UK.

Beetles

One species of seed-eating ground beetle, *Harpalus rufipes*, is common in arable fields all over the UK. The beetles flourished in conventional spring rape and beet crops later in the season when weeds were producing lots of seeds, but did less well in the GM equivalents because there were fewer weeds and seeds. However, the

researchers observed more beetles in GM, rather than conventional, maize crops. If GM crops were grown more extensively than conventional crops the effect on this beetle could be significant over years.

‘Outright ban, caution or green light?’

John Vidal
17th/October/2003
The Guardian

All sides draw comfort from report

REACTIONS to the report varied from calls by environment groups for an immediate ban on GM crops to pleas by biotechnology companies for the government to decide in their favour.

Consumer

Consumer groups urged the government to do more tests and not bow to industry pressure. Monique Warnock, of the Consumers' Association, said: "Today's results have confirmed our concerns that commercialisation of GM will destroy consumer choice once and for all. The GM crops evaluated cannot exist side by side with conventional crops without contamination."

Environment

Environment groups wanted immediate bans on the crops. Stephen Tindale, head of Greenpeace and a former adviser to the environment minister, Michael Meacher, said: "These trials clearly show that the alleged benefits of GM do not exist. For years the GM corporations have been claiming that their crops would reduce weedkiller use and benefit wildlife. Now we know how wrong they were."

Tony Juniper, director of Friends of the Earth, said: "These trials have shown that GM oil-seed rape and beet cause more damage to the environment than even conventional crops. The results will force Tony Blair to show who he really represents – the British people or Bush and the multinationals.

Industry

The Agriculture Biotechnology Council, which represents GM companies Bayer,

Dow AgroSciences, DuPont, Monsanto and Syngenta, said the tests "were not GM on trial". "As this report shows, genetic modification is a tool which can be used in different ways with different management practices resulting in different outcomes."

Cropgen, an industry-funded pressure group, said the government should decide in favour of the crops. "Millions of farmers across five continents are taking advantage of GM technology. Are British farmers to be told that they cannot have access to these same benefits?"

Wildlife

The Royal Society for the Protection of Birds, with more than a million members, said that two of the crops should be banned because of their adverse effects on wildlife. "Ministers have no choice now but to ban GM beet and GM spring oil-seed rape", said Dr Mark Avery, RSPB head of conservation.

Countryside

The National Trust, with three million members, urged caution. "These ... inconclusive results highlight how much more work is required before the government can draw any definitive conclusion on the introduction of GM crops."

Political

Margaret Beckett, the environment secretary, said the results would "inform" the government's position and would be forwarded to all other EU member states. "I shall reflect carefully on these results. The government is neither pro- nor anti-GM crops. Our overriding concern is to protect human health and the environment, and to ensure genuine consumer choice."

The Conservative party urged caution. "The evidence published today would not justify a decision to authorise the commercial growing of GM crops. There should be no blanket approval," said David Lidington, shadow environment secretary.

Local groups

Local groups have taken part in the destruction of many of the trial crops over the past few years. "[The tests] represent a huge setback to the GM crop industry, and vindicate everything the anti-GM campaigners in Fife and elsewhere in Britain have

been saying", said a member of Fife Against GMOs.

Agriculture

Sir Ben Gill, president of the National Farmers Union, said: "The decision on whether to allow these crops to be grown commercially must be taken on a case-by-case basis. Studies to develop best practice for the management of these crops ... will be important if farmers are to deliver maximum environmental benefits."

Patrick Holden, of the Soil Association, speaking for organic farmers, said: "GM is taking farming in a direction irrelevant to wildlife and to consumers. The UK should develop its farming industry in line with government policy, which is to respond to the wishes of consumers - who definitely don't want GM."

Activists

Kathryn Tulip, who has been acquitted of crop damage several times, said: "If Tony Blair ignores public opinion on GM as blatantly as he did on Iraq he can expect widespread direct action in the fields."

Science

Dr Mark Tester, senior lecturer, department of plant sciences, Cambridge University, said: "To generalise and say all GM is bad, or all GM is good is a crude over-simplification, and these new results provide classic evidence of the complexity of the real issues."

Dr Sue Mayer of science watchdog group Genewatch, urged caution. "These results should not be seen as a green light for GM maize. Two unsustainable systems were being compared and experience in the US shows the trials were not representative of what would happen in reality."

‘The death knell sounds for GM’

Sean Poulter
17th/October/2003
The Daily Mail

MINISTERS were preparing last night to backtrack on pushing for commercial GM crops amid overwhelming evidence of harm to the countryside.

After extensive farm trials, Environment Minister Elliot Morley indicated that genetically-modified oilseed rape and beet would never be approved.

He also questioned whether there would ever be a market for Britishgrown biotech food because of public opposition.

Mr Morley was speaking after yesterday’s publication of trial results which suggested that farming the so-called Frankenstein crops risks creating a biological desert by wiping out wild plants, butterflies, bees and birds.

The damning evidence came from Government trials on three GM crops on more than 100 British farms over three years – the biggest such tests anywhere in the world.

They showed that the number of butterflies, bees, beetles and weeds in and around GM crops of oilseed rape and beet were significantly lower than with conventional farming.

Butterfly numbers were down by almost a quarter in the margins around some GM crops.

Mr Morley said the research would have implications for the future of GM crops and food worldwide.

‘GM crops can only be grown if they get consent,’ he added.

‘Whether they get consent depends on whether there are environmental impacts. Now we know from the trials that there are environmental implications.’ He added that he did not believe any biotech crops will be grown commercially in the UK in 2004 and possibly for some time after – if ever.

Maize was also tested, with the research appearing to show that GM farming practices were kinder to wild plants and other life.

However, the comparison was against farming involving the powerful weedkiller atrazine, which is about to be banned by the EU.

Consequently, virtually any maize farming regime would have appeared more wildlife friendly.

The results – which follow a campaign by the Daily Mail against GM foods – fuelled demands for a ban on biotech crops in Britain.

Greenpeace said: ‘For years, GM corporations have claimed their crops would reduce weedkiller use and benefit wildlife.

‘Now we know how wrong they were, Tony Blair should close the door on GM crops for good.’ Michael Meacher, sacked by the Prime Minister as Environment Minister because of his scepticism towards ‘Frankenstein farming’, said: ‘GM oilseed rape and beet should not be grown in Britain.

‘The effect of using broad spectrum weedkillers that kill everything – the network of lice, insects, worms, butterflies as well as weeds – was significantly worse than conventional weedkillers.’ He added: ‘The trials showing GM maize was better for the environment are invalid.’ Friends of the Earth said: ‘Going ahead with the commercialisation of any of these GM crops would be totally unacceptable.

‘Information collected at public expense now confirms that GM crops harm the environment, make no economic sense and are deeply unpopular.’ During the trials, techniques and weedkiller spraying patterns associated with GM crops were examined and compared with those used on conventional farms.

The GM beet, oilseed rape and maize had all been transformed in the laboratory to have an in-built resistance to spraying with special powerful weedkillers.

It was these chemicals, used with the GM crops, which destroyed flora and fauna.

Dr Brian Johnson, of Government advisors English Nature, said: ‘The results show there were significantly fewer wild plants and seeds in fields of GM spring oilseed rape and beet compared with conventionally managed fields

‘There were significantly fewer bees and butterflies in the GM fields.

‘If these crops were grown commercially in the UK, we now know that there would

be further declines in farmland wildlife.’ Dr Mark Avery, the RSPB’s director of conservation, said: ‘Commercial GM beet and oilseed rape could be disastrous for birds.’

‘Ministers now have no choice but to refuse their approval.’ Dr David Gibbons, head of conservation science at the bird charity, was on the Scientific Steering Committee overseeing the trials.

‘There will be far less food for farmland birds if GM beet and spring oilseed rape are grown commercially,’ he said. ‘Agricultural intensification has already caused declines of these birds.’ Looking at oilseed rape, researchers found 1.7 times more weeds in conventional fields than GM and five times more seeds.

The flowering weeds provide food for bees, butterflies and other bugs, while the seeds are eaten by birds.

Conventional beet fields had 1.3 times more weeds and three times more seeds.

The evidence from the farm trials also found that yields from the GM crops were unlikely to be any better than traditional farming, contrary to the claims of biotech firms.

‘Critics hail retreat of seed giant’

17th/October/2003

The Daily Mail

ANTI-GM campaigners yesterday welcomed the decision by biotechnology giant Monsanto to pull out of the European seed cereal business.

The U.S. based GM pioneer announced its intention ‘to exit from its European cereal seed business’ and closed a multimillion research centre in Trumpington, Cambridge. Operations in France, Germany and the Czech Republic will also be affected by the closure.

It followed this week’s attack on GM companies by EU Environment Commissioner Margot Wallstrom, who accused U.S. biotech firms of ‘trying to lie’ and ‘force’ the technology on to Europe.

Monsanto said it will seek a buyer for all or part of its cereal seed business. It blamed

the failure on the lack of a market for hybrid wheat seeds, saying the move was a 'strategic decision'.

Anti-GM campaigners insist the decision was related to the anti-GM climate in Europe.

Friends of the Earth spokesman Pete Riley said: 'They set up the operation in Cambridge five years ago with the clear intention of introducing GM wheat and barley into Europe. This has been a pretty abject failure.' Only two companies – Syngenta and Bayer CropScience – are now involved in GM crops in Britain.