Locating Publics: Co-Production of the Bt Brinjal Controversy and Publics in India

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Abbreviations

(Arranged in alphabetical order)

Bt	Bacillus thuringiensis
CEE	Centre for Environment Education *(Headquarters located in Ahmedabad)*
CFTRI	Central Food Technological Research Institute *(located in Mysore)*
CIC	Central Information Commission *(located in New Delhi)*
CSA	Centre for Sustainable Agriculture *(located in Hyderabad)*
DBT	Department of Biotechnology *(under the Ministry of Science and Technology)*
EC-I	Expert Committee – I
EC-II	Expert Committee – II
ERA	Environmental Risk Assessment
FAO	Food and Agriculture Organisation, United Nations
FBAE	Foundation for Biotechnology Awareness and Education *(located in Bangalore)*
FDA	US Food and Drug Administration
GE	Genetic Engineering or Genetically Engineered
GEAC	Genetic Engineering Approval Committee *(under the Ministry of Environment and Forests)*
GM	Genetically Modified
GMO	Genetically Modified Organism
GRAS	Generally Recognized As Safe
IARI	Indian Agricultural Research Institute
ICAR	Indian Council of Agricultural Research *(located in New Delhi)*
IIVR	Indian Institute of Vegetable Research *(located in Varanasi)*
IPM	Integrated Pest Management
ISAAA	International Service for the Acquisition of Agri-Biotech Applications
IT	Information Technology
OECD	Organisation for Economic Co-operation and Development
OPV	Open Pollinated Varieties
Mahyco	Maharashtra Hybrid Seed Company Ltd.
MKSS	Mazdoor Kisan Shakti Sangathan *(Organisation for the Empowerment of Workers and Peasants in Rajasthan)*
MNC	Multi-National Company

MoEF	Ministry of Environment and Forests
MoSEF	Minister of State for Environment and Forests
NCPRI	National Campaign for People's Right to Information
NGO	Non-Government Organisation
NIN	National Institute of Nutrition *(located in Hyderabad)*
NPM	Non-Pesticide Management of Crops
PIL	Public Interest Litigation
PMO	Prime Minister's Office
RCGM	Review Committee on Genetic Manipulation *(under Department of Biotechnology)*
RTI	Right to Information
SAU	State Agricultural Universities
SC	Supreme Court of India
TNAU	Tamil Nadu Agriculture University *(located in Coimbatore)*
UAS	University of Agricultural Sciences *(located in Dharwad)*
WHO	World Health Organisation

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Introduction: Locating Publics in the Bt Brinjal Controversy

On 9th February, 2010, the Indian Minister of State for Environment and Forests (MoSEF), Jairam Ramesh, imposed a moratorium on the agricultural production of Bt Brinjal after organizing a set of public consultations on the issue. In a statement released on the day, he said: "It is my duty to adopt a cautious precautionary principle based approach and impose a moratorium on the release of Bt Brinjal till such time independent scientific studies establish to the satisfaction of both the public and professionals the safety of the product from the point of view of its long term impact on human health and environment, including the rich genetic wealth existing in brinjal in our country" (PTI, 2010). The moratorium not only portrays the possibilities inherent within a public debate, but it also marks another significant event in the continuous evaluation of science and its impact on the developing economy of India. Right from the modern *Chipko Movement* of the early 1970s initiated as a protest against deforestation for industrialization to *Narmada Bachao Andolan* (Save Narmada Movement) since late 1980s against the construction of Narmada Dam, the public conversations on science in India are marked by distinct peaks of criticism within the generic troughs of belief that development through science is equivalent to progress of the country. In this thesis, the Bt Brinjal controversy has been understood as yet another critique of this belief system around science led development in India. The thesis looks at a sequence of historical events between 2005 and 2010 that led up to the National Consultations on Bt Brinjal in January and February, 2010 organized for the Ministry of Environment and Forests (MoEF). Within this historical sequence, it evaluates the persistent notions of science governance in India and places them within the historicity of the controversy.

The intention of this thesis is to establish that an understanding of the Bt Brinjal controversy requires an exploration in time as well as space. I am not referring to spaces as geographical places; but as arenas within institutional setups where discussions on public issues happen. For example, *Chapter 2* deals with PIL as an institutional mechanism setup by the Supreme Court of India to enable citizens to litigate on issues ranging from the rights of the poor, to environment and probity in governance. Such mechanisms provide spaces where public issues are discussed. This analysis is not simply as assessment of history wherein the events that eventually led up to the National Consultations are studied. It has also required an assessment of spaces where these events unfolded. These spaces have created the possibility for the events that have been studied. Hence, the chapters that deal with these events also provide a brief history of these spaces and how they developed into an arena where these events could happen. Continuing the example, a brief history of the institution of the mechanism of PIL will be discussed in *Chapter 2* to provide a context to the petition that has been studied. This exploration into the history of these spaces takes the analysis into other events that may seem to be unrelated to the controversy at hand, but they provide the necessary background within which the controversy has developed. Within this context, this thesis will locate publics in these spaces.

What is Bt Brinjal and Why the controversy?

Brinjal (*Solanum melongena* L.) is a south-Asian word for a vegetable that is generally known as egg-plant and aubergine in Europe. Bt Brinjal is transgenic brinjal created by inserting a gene cry1Ac from the soil bacterium *Bacillus thuringiensis* into Brinjal. "This bacterium naturally accumulates large amounts of toxin proteins during its spore or resting stage. If insects ingest these spores, the toxin causes their gut to become paralysed, feeding stops and death ensues. The toxins kill only larval insect stages and are not toxic to adults or other organisms. Bt spray formulations have been used as bioinsecticides since late 1950s, and are an important pest control tool" (Nottingham, 2002, p. 42). The insertion of this gene enables the Brinjal plant to produce the same toxin and it provides resistance against lepidopteran insects like the Brinjal Fruit and Shoot Borer *Leucinodes orbonalis* and Fruit Borer *Helicoverpa armigera*.

Bt Brinjal is the first Genetically Modified (GM) food crop in India that reached the approval stage for commercialisation in 2010. It was developed by Maharashtra Hybrid Seed Company Ltd. (Mahyco), a leading Indian seed company. Monsanto, a US-based multinational agricultural biotechnology corporation, has a minority stake of 26% in Mahyco, through Monsanto Holdings Private Limited – a 100% subsidiary of Monsanto Company, US. The method of inserting foreign genes into Brinjal is called event EE1 and it was developed by Monsanto in late 1980s and early 1990s. Bt Brinjal was developed in a Public Private Partnership mode where the Bt technology available with Mahyco was transferred free of cost to Tamil Nadu Agriculture University (TNAU), Coimbatore, University of Agricultural Sciences (UAS), Dharwad and the Indian Institute of Vegetable Research [(IIVR)], Varanasi with the support of the Agriculture Biotechnology Support Project from Cornell University.

Bt Brinjal contains three foreign genes which have been inserted namely:

1. "The *cry1Ac* gene which encodes an insecticidal protein Cry1Ac, is derived from common soil bacterium *Bacillus thuringiensis* (Bt) subsp. *kurstaki* to produce the insecticidal protein. The *cry1Ac* gene is driven by a viral promoter, the cauliflower mosaic virus (CaMV) 35S promoter.
2. The *nptII* gene for an antibiotic resistance marker, neomycin phosphotransferase-II.
3. The *aad* gene for another marker 3" (9) O-aminoglycoside adenyl transferase" (CEE, 2010, p. 10).

Mahyco, through this new gene sequence, has encoded insecticidal protein in all parts of Brinjal plant which will last through its lifetime. All of these three foreign genes work together produce the insecticidal protein that is toxic to the targeted insect.

The controversy that surrounds the commercialisation of Bt Brinjal can be understood within the uncertainty of scientific risk assessment of GM crops (National Research Council, 2000; Nottingham, 2002; Wheale, von Schomberg, & Glasner, 1998). While there is scientific evidence to suggest that GM crops are safe for consumption and the environment; the critics of this scientific evidence claim that the Environmental Risk Assessment (ERA) model that these scientific evidences use is too narrow in its scope of analysis (Nottingham, 2002). For Bt Brinjal, the recommended biosafety tests conducted on Bt Brinjal had lead to the conclusion that Bt

Brinjal is safe for consumption as well as cultivation (Expert Committee II, 2009). However, others have criticized the process by which these tests were conducted to be unscientific (Andow, 2010; Seralini, 2009) and have questioned the integrity of the regulatory authorities that have assessed the biosafety tests conducted under voluntary consultations with Mahyco (Kuruganti, 2010a).

This uncertainty in the scope of ERA is only one aspect of the controversy. In the various events that will be analysed in this thesis, a variety of arguments in opposition to the field trials and the commercialisation of Bt Brinjal were made by civil society activists. These arguments range from pest management concerns such as secondary pest infestation and environmental concerns such as the loss of biodiversity through genetic contamination to human health and biosafety concerns around allergenicity and toxicity of Bt Brinjal and livelihood concerns such as the corporatisation of seeds. This thesis with illustrations of these arguments spread out in different events provides an explanation as to how the scientific uncertainty around GMOs travels from the domain of facts and objectivity to subjectivity, cultures of food and livelihood, and the politics of GM regulation.

The next three sections of this *Introduction* will focus on the theoretical heuristics that have been used to study the Bt Brinjal controversy. I will illustrate the points of entry into the controversy and lay out the way in which the diachronic progression of events will be studied. While the conceptualisation of publics by Dewey (1927) offers the vantage point from which the analysis could begin, the co-productionist idiom offered by Jasanoff (2004) has been used to identify the pathways along which the controversy ultimately developed. The persistent notions of science governance in India have been used to explain the background in which these conversations of Bt Brinjal emerged.

Science: The Panacea for Progress and Development

It is difficult to create a straight-forward narrative for the belief system that surrounds science in India. The modern conversations on science have a long history in India originating from the *Swadesi Movement* initiated in 1905. It traversed through different conceptualisations of the practice of science within different ideologies of the Gandhians, the Theosophists, the Swadesi advocates, the Traditionalists, the Neovitalists and the Intermediate technologists (Visvanathan, 2001). The focus of this section is on the current paradigm of belief system around science which originated from the first decade of the post-independence era that began in 1947. "In the fifties [Science] was like a magic wand. No nation-state felt complete unless it had both a flag and a science policy document" (Visvanathan, 1997, p. 4). This view was strengthened by the policy directives issued by India's first Prime Minister Jawaharlal Nehru. "For Nehru, the tryst with destiny was a rendezvous with the modern industrial world and 'the future', he proclaimed, 'belongs to those who made friends with science'" (Visvanathan, 1997, p. 4). Nehru's vision had a deep influence on the way science policy was created in India till the 1980s. For these generations of Indians since independence, "dams and laboratories were literally the temples of India, and there was deep pride that India had the third largest pool of scientific talent in the world" (Visvanathan, 1997, p. 4).

In an interview with Shiv Visvanathan, a social scientist from India, he pointed out the following assumptions in Nehru's model of industrialization post-Indian independence.

1. Science was theoretical and its applications in practice were seen in terms of technology. Establishing technology as an applied science was envisioned as a model of innovation chain.
2. While science was universal, technology could be contextualized and its uses could be reinterpreted based on the problems it solved.
3. Science was good and if technology as its application could be contextually envisioned, it would solve the problems of poverty and malnutrition.
4. Three requirements for making use of these technologies even in rural areas of India were: scientific temper in citizens, good science policy in bureaucracy and outreach programmes to educate the rural poor.

"These assumptions were almost completely rampant until the Emergency period of 1975-1977." (S. Visvanathan, Interview, June 11, 2010).

Offering a complete picture of the development of different ideologies around the practice of Science in India is outside the purview of this thesis, but, these assumptions are important in understanding the circumstances around which the policy paradigm around Green Revolution was adopted. "The Green Revolution in the 1960s and 1970s saw massive increases in food production, thanks to the application of high-yielding varieties and modern chemical inputs. This hailed the end of national-level food shortages and the ushering of the new age of plenty and surplus, at least for some. […] The scientists who led the national breeding efforts – Swaminathan, Pal, Borlaug – the minister of agriculture, C. Subramanian who pushed the vision, are portrayed as national heroes whose efforts were key to the transition to a modern India" (Scoones, 2006, p. 18). The success of the Green Revolution only boosted the presence of these assumptions and strengthened the belief that science-led agricultural progress was the solution to the problem of food security in India.

The critique of these generalized assumptions around the practice of science led development and modernization in India did not originate from science and technology studies scholarship within the academia. "The grass-roots groups were the dissenting academics of India in the eighties and nineties which raised issues that the universities were reluctant to confront. In their raucous celebration of democracy, these groups attempted to show that the politics of knowledge is an intrinsic part of democratic politics" (Visvanathan, 1997, p. 13). It is within these grass-roots movements that the *Chipko Movement* and *Narmada Bachao Andolan* stand out among the many other movements that were orchestrated by the rural citizens of India. These movements demanded an understanding of the social within the practice of science. "So 1977-1995, a huge wave of what I call civil society movements exploded in India" (S. Visvanathan, Interview, June 11, 2010). These critiques were not limited to science or development and modernization of India; they envisioned alternative paths for India's development by recognizing the tribal way of life and creating feminist and ecological critiques of the way scientific progress was equated to the nation's progress. But, these diverse movements seem to have had little impact on the way science policy around agriculture is devised in India.

The imagery and the symbolism of the success of the Green Revolution have persisted in the Indian imagination of science policy around agriculture, even to this day. "It is in this context that agricultural biotech is seen as a potential saviour – both to the long-term problems of cereal supply and food security and to the emergence of a lean, efficient, competitive agricultural sector. Thus, the rhetoric of moving from 'Green Revolution' to a 'Gene Revolution', or the ushering in of a biotech-led 'Second Green Revolution' conjures up a strong sense of continuity with the heroic successes of the 1960s and 1970s" (Scoones, 2006, p. 27-28). Hence, Bt Cotton became the first GM crop to be commercialised in India in 2002 and commercialisation of Bt Brinjal would have been the logical next step.

Within such a policy paradigm, the moratorium on Bt Brinjal seems to be out of place. The reasons for the imposition of the moratorium originate from the parallel narrative of civil society movements as established above. The development of these critiques have ultimately caught up with the vision for science led development and modernization. The Civil Society, in the specific case of Bt Brinjal, had realized that the only way of critiquing this vision of science-led development is to find a scientific rationale for opposing it. The uncertainty within the risk assessment of GM crops offers the scientific vantage point from which the appropriation of Bt Brinjal could be questioned. While using this vantage point, the civil society activists have also created a social critique of GM technology pointing out that the commercialisation of GM crops is also livelihood issue and a consumption issue apart from being a scientific issue. Within this context, the movement of the opposition to the commercialisation of Bt Brinjal falls in line within the larger history of dissent movements in India.

While documenting this larger history is outside the purview of this thesis, the realization that the opposition to Bt Brinjal is a part of a larger attempt to breakdown a belief system that equates science with progress and development is important. It situates the controversy within a larger understanding of the practice of science in India within which treating Bt Brinjal as a scientific issue that needs to be resolved in consultations with experts is no longer viable. Bt Brinjal ultimately was made into a public issue by civil society activists where ordinary citizens were invited to express their opinion on its commercialisation. This shift in the understanding of Bt Brinjal from a scientific to a public issue falls into the process of the change that was initiated post-Emergency when the practice of science came to be seen with the lens of the social.

Despite these efforts, the belief system that equates scientific progress with national progress still persists. As Rajesh Krishnan, a Greenpeace campaigner, pointed out in an interview, "One of the observations that I personally have is that, the moment one opposes GM crops, one is seen as anti-Science and anti-modern technologies. Whereas the truth is that GE as a technology is just one of the technologies and might not be the best technology. And that doesn't come out; it's always projected as a Science vs. Civil Society kind of a fight, which actually it is not" (R. Krishnan, Interview, June 22, 2011). While the civil society activists do not consider this controversy to be Scientists vs. Civil Society, the controversy's historic progression reveals that expert committees of scientists were setup with the mandate to respond to civil society concerns, apart from evaluating the biosafety of Bt Brinjal. These committees did not have a member who voiced the concerns of the civil society in their meetings; they simply replied to the documented responses that they received from the civil society prior to their setup. In the absence of a face-

to-face dialogue (apart from the National Consultations), the controversy does represent the presence of these two distinct factions in the controversy.

Dewey's Publics and the Issues that They Gather Around

John Dewey, an American pragmatist philosopher, has defined two characteristics of the notion of public that he constructs in his book *The Public and Its Problems* (Dewey, 1927). First, the public is situated in a predefined context of an issue. The public is not an omniscient presence that expresses itself synchronically in time. The public is contextually knowledgeable and finds expression diachronically as events unfold. The public has a fragmented existence that comes together when the issue at hand invokes the necessity of a public. For example, the system of elections in a democracy could be understood as such an invocation. Secondly, the public goes beyond the idea of being a collective of individuals. It is not simply a site for identifying commonalities within plurality of opinions and observations; it is a negotiated space for actionable insights. Applying the heuristics of the social construction of technological facts and artefacts (Pinch & Bijker, 1984), the public is a collective of social groups (the relevance of these social groups is dependent on the context of the issue) that exists within the period of interpretive flexibility around an issue (instead of an artefact, though an artefact could also be an issue) until closure (even if it is temporary) is achieved. Without an issue to be addressed, the public reverts back into a nascent fragmented state until the historicity of events precipitate into a demand for another public.

In this thesis, the idea that public is scattered, mobile and manifold can be illustrated by looking at the variety of arguments that have been used to gather them around the issue of the Bt Brinjal. While scientists as a part of this public gather around the issue of scientific uncertainty in the risk assessment of GMOs, the bureaucrats as a part of this public gather around the issue of regulation of GMOs. The farmers gather around the issues of pest management, livelihood and corporatization of seeds while the Indian middle class gathers around the biosafety of GM food. All of these arguments emanate from a common source (Bt Brinjal in this context) but these are different aspects of the main issue around which this fragmented public has gathered. The differences in these arguments reflect the differences in the groups that make the public that gathers around the issue of Bt Brinjal.

I have treated Dewey's conceptualisation as a set of theoretical heuristics instead of treating it as a full-fledged theory. The difference between the two could be understood by looking at the work of Noortje Marres's analysis (Marres, 2007) on pragmatist contribution to the study of Public involvement in a controversy. She combines the work of John Dewey with Walter Lippmann, to offer a set of ideas that one could borrow in the study of a controversy. She treats the work of these philosophers as a theory and finds that, "one crucial difference between the pragmatist perspective and the current approaches in social science […] is that the former assumed that all public issues are ultimately *solvable* by a combination of political and scientific means. Thus, while the pragmatists did use the term 'issue', they considered it interchangeable with the notion of 'problem"' (p. 768). Treating Dewey's ideas as a theory would inevitably leave impressions of positivism in any analysis.

By treating Dewey's ideas as theoretical heuristics, I have followed Dewey's argument of how theories should be worked out as tools. He creates two approaches to developing methods that enable discussions on issues, "First, […] concepts, general principles, theories and dialectical developments which are indispensable to any systematic knowledge [should] be shaped and tested as tools of inquiry. Secondly, that policies and proposals for social action be treated as working hypotheses, not as programs to be rigidly adhered to and executed" (Dewey, 1927, p. 202-203). By treating theories as tools, the importance of the assumptions within theories can be reduced. Theories could be contextualized depending on the problem at hand instead of being a rigid framework. Dewey observes that by using these two approaches, "Differences of opinion in the sense of differences of judgment as to the course which it is best to follow, the policy which it is best to try out, will still exist. But opinion in the sense of beliefs formed and held in the absence of evidence will be reduced in quantity and importance. No longer will views generated in view of special situations be frozen into absolute standards and masquerade as eternal truths" (Dewey, 1927, p. 203). If the pragmatist opinion on the *solvability* of an issue is treated as a 'working hypothesis', it does get reduced in importance in the absence of evidence to support it. Dewey's ideas conceptualized in the format of a functional theory do have their shortcomings, but treating them as a tool-kit or a set of theoretical heuristics enables a contextualization of Dewey's thesis on publics for the issue at hand.

For the purpose of studying the Bt Brinjal controversy, the following suggestions made by Dewey (1927) form the set of theoretical heuristics that have been used:

1. "The prime difficulty [in any democracy] is that of discovering the means by which a scattered, mobile and manifold public may so recognize itself as to define and express its interests" (p. 146). There are two points that Dewey makes in this quote. First, the public is a fragmented entity and second, that the prime objective of any democracy is to enable this fragmented public to express its interests.

2. "Systematic and continuous inquiry into all the conditions which affect association is a precondition of the creation of a true public. But it and its results are but tools after all. Their final actuality is accomplished in face-to-face relationships by means of direct give and take. Logic in its fulfilment recurs to the primitive sense of the word: dialogue" (p. 218). The methods used for inquiry into conditions that affect association are tools that enable conversations. Dewey placed these methods within the concept of social inquiry. Social inquiry as a concept could simply be understood as a public discussion. Dewey treated governance within democracy "as public discussion [which, in turn, could be] viewed as the best way of dealing with the conflict of interests in a society: 'The method of democracy – inasfar as it is that of organized intelligence – is to bring these conflicts out into the open where their special claims can be discussed and judged in the light of more inclusive interests than are represented by either of them separately' [(Dewey, 1987, p. 56)]" (Festenstein, 2009). These public discussions are spaces where a fragmented public manifests itself. Hence, these methods, ultimately, enable social inquiry and the creation of the public.

3. These methods that enable social inquiry require rigour and legitimacy. Dewey uses the methods employed within the practice of science as an example of this legitimacy. For him, scientific practice inevitably lends itself into putting certain conclusions into circulation and a layman will treat these conclusions to be science. "But the scientific inquirer knows that they constitute science only in connection with the methods by which they are reached. Even when true, they are not science in virtue of their correctness, but by reason of the apparatus which is employed in reaching them" (p. 163).

4. These methods will also be dependent on the context of space and time. Hence, "in its deepest and richest sense, a community must always remain a matter of face-to-face intercourse" (p. 211). The public as a community can be understood through events of face-to-face interactions between people who constitute this community. Dewey goes on to suggest that, "unless local communal life can be restored, the public cannot adequately resolve its most urgent problem: to find and identify itself" (p. 216). So, a public is created through social inquiry enabled by the methods that study conditions that affect association. Social inquiry itself remains an activity between two or more groups of people at a certain point in time and space using local logistical solutions. Within the multiplicity of conversations enabled by social inquiry across time and space, the emergence of public could be theorized.

I have studied historical events in this thesis using the lens of these methods to enable a larger conversation on Bt Brinjal. Each of these methods located in different spaces adds a different discourse to these conversations and hence, they affect association of different groups into the conversation. For example, adding the discourse of health risk in consuming GM food to the Bt Brinjal controversy enables the Indian Middle Class to get associated with the controversy. On the other hand, adding the discourse of corporatization of seeds enables the Indian farmers to get associated with the controversy. Hence, it becomes essential to document the historicity of events in time as well as space that led to the construction of this public from its nascent fragmented state to its ultimate gathering for negotiations during the National Consultations on Bt Brinjal.

Co-production: The Reciprocity between Science and Society

I have interpreted Jasanoff's (2004) proposition of co-production of science and society as a progression of the theoretical heuristics established using Dewey's ideas. Treating the practice of science as an issue that has consequences; consequences that concern society as a whole, the society as public gathers around it to establish certain mechanisms so that actions emanating from science are confined within prescribed limits, and have moderately predictable consequences. The practice of science creates this public in society and this public, in turn, influences the way science is practiced.

The crucial difference between the theoretical heuristics established using Dewey's conceptualisation and Jasanoff's co-productionist idiom is that Jasanoff suggests that, "co-production occurs neither at random nor contingently, but along certain well documented pathways" (Jasanoff, 2004, p. 6). The four most common pathways or 'instruments of

coproduction' for Jasanoff are making identities, making institutions, making discourses and making representations. On the other hand, the theoretical heuristics inferred from Dewey's conceptualisation look at methods that enable social inquiry in a more generic sense. These methods lead to conversations that could also be random and contingent and they don't necessarily imply a certain well-documented pathway along which issues are negotiated. For example, one of the comments made during the National Consultations on Bt Brinjal on issues concerning livelihood was that, "The girl child is sent to work in the Bt Cotton fields instead of to school" (CEE, 2010b, p. 31). While this comment would be essential to any conversation on gender issues or the state of education or agricultural workforce in India, it is out of place in a conversation on the commercialisation of Bt Brinjal. Within Dewey's suggestion of a method, such comments hold value because they enable conversations, but by adding the layer of co-production on top of Dewey's heuristics, such comments can be filtered out to garner more relevance to conversations that move along the pathways as suggested by Jasanoff. The co-productionist idiom gives these conversations emanating from social inquiry a certain order and flow which helps in a better understanding of how these methods were used and appropriated. In this sense, in an analysis of a controversy, the methods that enable social inquiry lead to conversations that could be studied using the four common instruments of the co-productionist idiom.

Co-production is also treated as a theoretical heuristic in this thesis. "As an interpretive framework, co-production begs for illustration rather than proof" (Jasanoff, 2004, p. 6). While an illustration is simply a call for an example serving to clarify a statement, a proof is an evidence or argument establishing or helping to establish a fact or the truth of a statement. The distinction is subtle, but an important one. Jasanoff suggests that co-production "should not be advanced as a fully fledged theory, claiming lawlike consistency and predictive power. It is far more an idiom – a way of interpreting and accounting for complex phenomena" (Jasanoff, 2004, p. 3). In making a case for the co-productionist argument to be an idiom, she gives a certain plasticity to its conceptualization. It gives it a certain pragmatism with which the idiom can travel across "the domains of nature, facts, objectivity, reason and policy [to] those of culture, values, subjectivity, emotion and politics" (Jasanoff, 2004, p. 3). An idiom requires an illustration; while a theory requires proof. This argument makes co-production more of a heuristic than a theoretical framework.

The following points explain the four common instruments of the co-productionist idiom (Jasanoff, 2004):

1. Making Identities
   "A staple category of post-structuralist social analysis, identity is particularly germane to co-productionist accounts because, whether human or non-human, individual or collective, it is one of the most potent resources with which people restore sense out of disorder" (p. 39). This is specifically relevant in understanding the formation of Coalition for GM-Free India, a network of organisations that was instrumental in organizing an opposition to the commercialisation of Bt Brinjal. Their methods have been studied in detail in *Chapter 5: The Communitas of Anti-GM Civil Society*.

2. Making Institutions
   "As stable repositories of knowledge and power, institutions offer ready-made instruments for putting things in their places at times of uncertainty and disorder" (p. 39-40). This is specifically relevant in understanding the role of Supreme Court and the regulatory authorities of India during the span of the controversy and it offers a vantage point to understand the public demand for the setup for a new transparent public institution to conduct biosafety testing of GM crops during the National Consultations.

3. Making Discourses
   "Solving problems of order frequently takes the form of producing new languages or modifying old ones so as to find words for novel phenomena, give accounts of experiments, persuade sceptical audiences, link knowledges to practice or action, provide reassurances to various publics, and so forth" (p. 40-41). This will become relevant in understanding the shifts in the expression of the problems with GM crops as the Coalition dealt with different audiences, ranging from scientists and bureaucrats to Indian Middle class and farmers.

4. Making Representations
   The most useful aspect of representation for the purpose of this thesis will be the uptake of scientific representations by other social actors. It is relevant to understanding the campaigns launched by the Coalition to gather public support in the opposition of commercialisation of Bt Brinjal. It will also look at how the same scientific data when interpreted by the regulatory authorities of India is considered to be adequate while when it is interpreted by independent scientists upon the request of the Coalition turns out to be inadequate and unscientific.

These pointers are meant to introduce the progression of the thesis and the conclusions that can be expected from the final chapter. Before concluding the *Introduction*, the next section will offer not only the sources from which the empirical data has been gathered but it will also establish the historic flow of the events in the Bt Brinjal controversy from 2005 to 2010 in the progression of the chapters.

Studying the Bt Brinjal Controversy

Most of the empirical data that has been presented in this thesis has been gathered from the documentation of the events available on the internet. These sources of information have mostly been primary, such as the documentation of the National Consultations on Bt Brinjal authored by Centre for Environmental Education (CEE, 2010b) and in some cases; they are secondary such as newspaper articles and magazine articles on the activities of the Coalition for GM-Free India. These sources will be listed out in detail in the short introductions to the forthcoming chapters below. Two interviews with the members of the Coalition were conducted, in addition to locating these documents. The first interview was with Kavitha Kuruganti, Spokesperson of the Coalition and Consultant on Research and Campaigns working with Centre for Sustainable Agriculture (CSA), Hyderabad and the second with Rajesh Krishnan, Campaign manager at Greenpeace India, who is based in Bangalore. The interview with Shiv Visvanathan, Professor of

Science and Technology Studies at Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT), Gandhinagar was conducted as a part of a separate research project on the history of Creative Dissent Movements in India, but a few of his comments were relevant in establishing the persistent notions of science governance in India.

Chapter 2: Locating Public in Litigation: Aruna Rodriguez and Others vs. Union of India and Others, 2005 explores Public Interest Litigation (PIL) as a method to convert the regulation of GMOs into a public issue. It analyses the content of the petition (Rodriguez et. al., 2005) filed by four activists, Aruna Rodrigues, Devinder Sharma, PV Satheesh and Rajeev Baruah in the Supreme Court (SC) of India (Writ Petition (Civil) No. 260 of 2005) requesting that field trials of GMOs in India should only be allowed once comprehensive, scientific, reliable and transparent biosafety tests have been carried out. To explain the nature of the space provided by SC to make the filing of such a petition possible, the chapter also explores the history of PILs in India by looking into secondary literature on the topic and one SC judgment *State of Uttranchal v. Balwant Singh Chaufal and Others* (2010) where the Court specifically commented upon the evolution of PILs in India. During content analysis of the petition, the chapter also offers the list of sources from which the petition has gathered the information that it presented to the SC.

Chapter 3: The Informed Public: The Use of Right to Information from DBT explores the use of the Right to Information (RTI) Act (Government of India, 2005) by a Greenpeace India campaigner, Divya Raghunandan, in 2006 to procure the results of the biosafety tests (Mahyco, 2008) done on Bt Brinjal. This RTI application is interpreted as a method to create a conversation, not only on the secrecy with which the data was protected until it was released in 2008, but also on the distinction between what constitutes public information and what is private in the specific case of biosafety test results on Bt Brinjal. It RTI application was made to the Department of Biotechnology (DBT) and the progression of events within the case has been studied by looking into the judgments passed by Central Information Commission (CIC) (2007a; 2007b). To establish this space created by RTI for activism, the chapter explores secondary literature on the genesis of RTI and Mazdoor Kisan Shakti Sangathan (MKSS), the organisation that initiated the National Campaign for People's Right to Information (NCPRI) for the legislation of the Act.

Chapter 4: Locating Public in Scientific Risk Assessment: GEAC and the Expert Committees explores the scientific debate that happened around Bt Brinjal between 2006 and 2009. It looks at the recommendations (Expert Committee II, 2009) of the two Expert Committees EC-I and EC-II setup by Genetic Engineering Approval Committee (GEAC) in 2006 and 2009 respectively. In parallel it also examines the scientific feedback given by the Coalition to these recommendations (Kuruganti, 2010b; 2010c; 2010d; 2010e; Manjrekar, 2010; Ramanjaneyulu et. al., 2010) along with the responses sent by international scientists (Andow, 2010; Seralini, 2009). The feedback sent to these recommendations has been treated as a method to generate conversations on the adequacy of the tests conducted and the nature of GMO regulation in India. To establish this space of Scientific Risk Assessment, the chapter evaluates the notion of familiarity (Dommelen, 1998) that is often used to justify the biosafety of GM crops and it places the criticism offered by the independent scientists in the work of Funtowicz & Ravetz (1993) on science in the post-normal age.

Chapter 5: The Communitas of Anti-GM Civil Society: Coalition for GM-Free India traces the activities of the Coalition for GM-Free India between its initiation in 2006 up till 2009. There is a lack of available sources of information as to how the Coalition was instituted; hence interviews were conducted to ascertain the space from which the Coalition originated. The chapter picks three activities organized by the Coalition to illustrate the nature of their dissent. First, the 'I am no Lab Rat' Campaign ("I Am No Lab Rat," 2008) organized to suggest that the commercialisation of Bt Brinjal was a large scale experiment on Indians to test the safety of GM food. Second, the release of documentary films *Poison on the Platter* (Kanchan, 2009) and *So Shall You Reap* (Bhardwaj, 2007) to document the problems with GM food and GM crops respectively. And third, allegations of plagiarism (Eminent Citizens, 2010; Eminent Scientists, 2010) on the letter authored by Prithviraj Chauhan, Minister of State in the Prime Minister's Office, entitled *Concern on Introduction of Genetically Engineered Crops and Food.* These activities are again treated as methods that add diverse discourses to the issue of Bt Brinjal that enabled scattered and diverse social actors to gather around it.

Chapter 6: Locating Public in Participation: National Consultations on Bt Brinjal and the Moratorium explores the ultimate gathering of public around the issue of Bt Brinjal. It studies the documentation (CEE, 2010b) of the conversations that happened during the National Consultations on Bt Brinjal. It establishes the method used in the organisation of the consultations and analyses the text of the primer issued (CEE, 2010a) as a prelude to the Consultations. It identifies the trajectories that the conversations followed and documents the evolution of the debate during the consultations by studying the arguments offered for and against the commercialisation of Bt Brinjal. Finally *Chapter 7: Conclusion: Tracing Co-production of Publics and the Bt Brinjal Controversy* uses the four common instruments of co-production as suggested by Jasanoff to illustrate how the public and the methods used to gather them and the Bt Brinjal Controversy have co-produced each other.

The Bt Brinjal controversy is embedded in a diversity of ideas. While it is about scientific uncertainty and the paradox of scientific authority (Bijker, Bal, & Hendriks, 2009) on one hand, it is also a study of the nature of dissent orchestrated by the civil society activists in India and how they enable the co-production of publics and the Bt Brinjal controversy. While it is about public participation in a scientific controversy, it is also about the scientific models that are used in risk assessment of GM crops. While the controversy develops diachronically, it is also enabled by a larger history of spaces around which the events that have been documented were made possible. While it is about the persistent notions of science governance in India, it is also about the critiques of science-led development in India. And finally, while it remains focussed on the appropriation of GM technology for agriculture, it is also a theatre of democracy wherein a multiplicity of social actors has played their roles.

2

Locating Public in Litigation: Aruna Rodriguez and Others vs. Union of India and Others, 2005

> "We have every reason to think that whatever changes may take place in existing democratic machinery, they will be of a sort to make the interest of the public a more supreme guide and criterion of governmental activity, and to enable the public to form and manifest its purpose still more authoritatively" (Dewey, 1927, p. 146).

Dewey, in this quote, is exploring the expected results of the methods that enable social inquiry. This inquiry then leads into adoption of bureaucratic changes that have the interest of the public as a 'supreme guide'. This chapter looks into the mechanism of Public Interest Litigations (PIL) instituted by the SC in the post-Emergency era to create a space for 'public-spirited' citizens to bring public issues to the Court. By creating this space, the SC has enabled the public to gather around issues that they find relevant which will then be brought to the Court's attention. Here, the public needs to be understood as public-spirited individuals who litigate in the Court on issues ranging from injustices to the poor to environmental concerns and probity in governance. It also enables financially capable citizens to represent the rights of the poor in the Court. These individuals might not necessarily work with grassroots organisations working in rural areas, but, the SC has given the right to any Indian citizen to litigate on issues that s/he feels associated with. Of course, the petition is first evaluated by the Court before it is accepted for Court proceedings. In this chapter, the arguments laid out by the petition filed against field trials of GMOs is analysed which was accepted for Court proceedings in 2005 and is currently an ongoing case in the SC.

This PIL is arguably the first event that specifically brought Bt Brinjal into the public imagination of India. The use of the word *arguably* is primarily to clarify that the debate on GMOs in India has a longer history, with a legislation on The Rules for Manufacture, Use, Import, Export and storage of Hazardous Micro-organisms and Genetically Engineered Organisms Or Cells passed in 1989 under the Environment Protection Act, 1986. These rules provided that no genetically modified organisms could be released to the environment by way of manufacture, import, etc., by any person without the specific permission of a Committee under the MoEF called the Genetic Engineering Approval Committee (GEAC). This legislation was followed up by continuous debates on the relevance of Bt Cotton in the agricultural landscape of India (Sahai, 2003; Shiva et. al., 2000; Visvanathan & Parmar, 2002) which was approved for commercialisation by GEAC in 2002.

The research on Bt Brinjal began in 2000 with transformation and greenhouse breeding for integration of cry1Ac gene into Brinjal hybrids and seed purification at Mahyco. Between 2000 and 2005, before the PIL was filed by Aruna Rodriguez and the others in the SC, Bt Brinjal may have appeared in the debates on GMOs, but it manifested itself as a point of critical

attention after the PIL. According to Krishnan, "The first time that anyone got to know about Bt Brinjal was in April, 2006. That was the time when news came out that large scale trials of Bt Brinjal were going to be approved" (Krishnan, Interview, June 22, 2011). These field trials of GMOs were one of the major issues around which the PIL petition was filed.

In terms of Dewey's analysis of the public, a scattered, mobile and manifold public expression around GMOs found the PIL to be the first avenue where special attention was given to Bt Brinjal. This does not mean that the public expression did not find other spaces for generating a larger critique; it simply attributes the origin of Bt Brinjal as a specific object of debate and contention to the PIL and its implications. Suman Sahai, Convener of Gene Campaign, a NGO dedicated to protecting farmers' rights, food and livelihood security, puts it succinctly on her blog. "Civil society concerns [around bio-safety of GMOs] found expression in a May 2005 Public Interest Litigation (PIL) petition filed by four activists, Aruna Rodrigues, Devinder Sharma, PV Satheesh, Rajeev Baruah (Writ Petition (Civil) No. 260 of 2005). The petition requested that field trials [of GMOs] should only be allowed once 'comprehensive, scientific, reliable and transparent bio-safety tests have been carried out' (Sreelata, 2006). This PIL eventually resulted in the Supreme Court issuing a ban on all GM field trials on September 22, 2006, pending scientific consensus on the risks involved with such field trials" (Sahai, 2010). This ban had a direct impact on the large scale field trials of Bt Brinjal and the GEAC had to present the recommendations of EC-I to the Court to get its approval for these trials.

Before delving into an analysis of the petition itself, I will explore the journey of public expression into the legal framework of PILs in India. This journey involves its own set of historical antecedents that are relevant to understanding the space that this particular PIL provided to civil society activists for dissent against appropriation of GM crops. Hence, this chapter will briefly explore the history of PILs in India and their specific focus on environmental issues before delving deep into the content of the petition filed by Aruna Rodriguez and others. Ultimately, it will theorize the emergence of public expression using PIL as a medium.

From the Supreme Court of India to the Supreme Court for Indians

The institution of the legal framework of PILs happened in the post-Emergency era. The reputation of Indian courts for innovation in jurisprudence and as guardians of public interest including the rights of the disadvantaged and rural poor is largely based on the mechanism of PIL which extends the access to justice. "PIL or 'social action litigation,' as some call it, originated in the late 1970s when the judiciary, aiming to recapture popular support after its complicity in Indira Gandhi's declaration of emergency rule, encouraged litigation concerning the interests of the poor and marginalized, and to do so loosened rules and traditions related to standing, case filing, the adversarial process, and judicial remedies" (Gauri, 2009, p. 2). The introduction of PIL and the subsequent phase of judicial activism have, in the words of Upendra Baxi, "transformed the Supreme Court OF INDIA into a Supreme Court FOR INDIANS" (Baxi, 1994, p. 143).

A look into the definition of the PIL within the legal framework upheld by the SC is necessary before exploring the historical significance of PILs. In *People's Union for Democratic Rights v. Union of India* (1982) case, the SC defined Public Interest Litigation and observed that the "Public interest litigation is a cooperative or collaborative effort by the petitioner, the State of

public authority and the judiciary to secure observance of constitutional or basic human rights, benefits and privileges upon poor, downtrodden and vulnerable sections of the society"(*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010). Though, since 1982, the SC has reiterated this definition in a number of cases, the overarching examination of the definition, origin, evolution and abuse of PIL was done by the SC in *State of Uttranchal v. Balwant Singh Chaufal and Others* (2010). Within the SC analysis of PIL, there are three important ideas that are relevant to this research:

1. The dilution of the rule of locus standi and the broadening of the traditional meaning of 'aggrieved person'
2. Reiteration of the basic nature of PIL wherein it "is not in the nature of adversary litigation but it is a challenge and an opportunity to the government and its officers to make basic human rights meaningful to the deprived and vulnerable sections of the community and to assure them social and economic justice which is the signature tune of [Indian] Constitution" (*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010).
3. The broad division of the origin and development of PIL into three distinct phases.

Dilution of the rule of Locus Standi

The primary problem that SC tackled with the broadening of the traditional meaning of 'aggrieved person' was the lack of adequate financial resources in large sections of Indian society that disabled them from approaching the Court for justice. "In *M. C. Mehta and Another v. Union of India and Others*, [... the] Court observed that Article 32 [of the Indian Constitution] does not merely confer power on [the] Court to issue direction, order or writ for the enforcement of fundamental rights. Instead, it also lays a constitutional obligation on [the] Court to protect the fundamental rights of the people." (*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010). This redefinition of locus standi enabled any 'public-spirited' citizen to move the courts on behalf of a person or persons who may not have the social or financial capacity to move the courts themselves, thereby, creating a space for a public to gather around issues that concern the vulnerable sections of the Indian society and represent them in Court.

The impact of this dilution, in a more democratic sense, not only increases the Court's jurisdiction over the nature of the cases that can be brought to it and hence, increase its influence over Executive and Legislative part of the government that make policies. It also provides a new platform for the scattered, mobile and manifold public expression to gather around issues that concern them via a PIL. It grants a certain amount of agency to the SC to influence the government by creating an agency for the citizen to approach the SC. With the dilution of locus standi, any member of the public can respond to a policy that s/he deems unjust and take up the issue to the Court where dissent is expressed in the courtyard of justice. In this context, the powers wielded by the SC and public expression inevitably co-produce each other within the legal framework of a PIL.

Typical examples of this co-production in cases concerning environmental issues could be seen in the development of environmental law since the 1990s where Indian judiciary has responded to "the complaints of its citizens against environmental degradation and administrative sloth" (Divan, 2000). Consequently, the role of the SC on environmental issues has expanded

from its constitutional mandate of provision of justice to the "pro-active role of public educator, policy-maker, super administrator, and more generally, *amicus* environment" (Divan, 2000). As public educator, in *M.C. Mehta v. Union of India* (1992), the court directed broadcast and telecast of ecology programmes on the electronic media and inclusion of environmental study in school and college curricula. As policy-maker, in *S. Jagannath v. Union of India* (1997), the court prohibited non-traditional aquaculture along the coastlines of India. As super administrator, in *T.N. Godavarman Thirumulpad v. Union of India* (1997) popularly known as the Forest Case, the court currently supervises the implementation of national forest laws (Rosencranz & Lélé, 2008).

The Nature of PIL

In defining the PIL as being non-adversary litigation, the SC created a new opening for discussions on the nature of governance. As the judgment of *State of Uttranchal v. Balwant Singh Chaufal and Others* (2010) puts it, "The Government and its officers must welcome public interest litigation because it would provide them an occasion to examine whether the poor and the down-trodden are getting their social and economic entitlements or whether they are continuing to remain victims of deception and exploitation at the hands of strong and powerful sections of the community and whether social and economic justice has become a meaningful reality for them or it has remained merely a teasing illusion and a promise of unreality, so that in case the complaint in the public interest litigation is found to be true, they can in discharge of their constitutional obligation to root out exploitation and injustice and ensure to the weaker sections their rights and entitlements." This observation, not only explores the nature of the PIL, but it also lays out the possible results that can be expected from a PIL. The public with the expression of their interests via a PIL could influence the Government to take constructive action through the judgments passed by the Court. These actions would implicitly have public interest as its supreme guide.

A dialogue between the government and citizens enabled by the SC as a medium gives agency to the mechanism of PIL. The primary question then centers around how do the three participants of this conversation use this platform and to what purpose. It is within this agency that negotiations on heirarchy and power emerge. The PIL, in this context, could be understood as a way by which the SC is trying to expand the realm of jurisprudence. It could be analysed as a method to check the executive and legislative powers of the government. On the other hand, while the PIL itself is a levelling field where the government and the citizen are equal participants in front of the Court, but the extent to which the SC can influence implementation of policy changes with its directives is questionable and sometimes completely unfruitful. The cases are usually stretched over decades. Even if a judgement is passed, the implementation of the judgement is the responsibility of the government who may follow it completely, or in parts or may even ignore it in extreme cases. The result is that the citizen has to move back to the court to file a case of contempt of Court, which again might be a long-drawn process. Historically in India, the PIL has only been useful in some cases and has not worked effectively in others.

Looking at this particular PIL, it could be interpreted as a platform for bringing attention to the issue of GMOs which, in time, has traveled from the public that litigates to the public outside the Court which gathered around the issue for a larger debate. The innovation in this case was that the issue of GMOs that was brought to the Court was eventually taken up by civil society activists to media and other outlets of formalizing public expression to gather a larger

public around Bt Brinjal. Ultimately, the cause of the PIL was appropriated by the MoSEF, Jairam Ramesh, for National Public Consultations on the issue. The case itself is still pending with the Supreme Court, but, the PIL seems to have served the purpose of bringing attention to Bt Brinjal as an issue that required a public to gather around it.

The Three Phases of PIL

The SC broadly divided the PIL into three phases (*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010):

1. Phase-I which initiated in the 1970s: It deals with cases of the SC where judgements were passed to protect fundamental rights of the marginalized groups and sections of the society who because of extreme poverty, illiteracy or ignorance cannot approach courts for justice.
2. Phase-II which was initiated in the 1980s: It deals with the cases relating to protection, preservation of ecology, environment, forests, marine life, wildlife, mountains, rivers, historical monuments etc.
3. Phase-III which was initiated in the 1990s: It deals with the directions issued by the Courts in maintaining the probity, transparency and integrity in governance.

Phase-I has been addressed under the previous heading *Dilution of the rule of Locus Standi*. Within, the Phase-II of PILs, the court reinterpreted Article 21 of the Indian Constitution, which states that no person shall be deprived of his life or personal liberty except according to procedure established by law. The SC observed that "any disturbance of the basic environment elements, namely air, water and soil, which are necessary for 'life', would be hazardous to 'life' within the meaning of Article 21. In the matter of enforcement of rights under Article 21, [the] Court [observed] that if those rights are violated by disturbing the environment, it can award damages not only for the restoration of the ecological balance, but also for the victims who have suffered due to that disturbance" (*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010). For Phase-III, the Court observed that "probity in governance is a sine qua non for an efficient system of administration and for the development of the country and an important requirement for ensuring probity in governance is the absence of corruption" (*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010). Phase-III is primarily devised to address the growing concerns around corruption with the executive and the legislative part of Indian government.

This PIL filed by Aruna Rodriguez and others categorically operates at the intersection of Phase-II and Phase-III of PILs. The re-interpretation of Right to Life encompassing the Right to a Safe Environment and a demand for a transparent GMO regulatory regime with a specific focus on public hearings creates the fundamental groundwork for the petition (Rodriguez et al., 2005). Combining this with the dilution of the rule of locus standi, Aruna Rodriguez, an economist and marketing management consultant currently based in Mhow, Madhya Pradesh along with Devinder Sharma, a policy analyst and a trained agricultural scientist based in New Delhi, P.V. Satheesh, developmental communication specialist from Hyderabad, and Rajeev Baruah, management specialist with expertise in organic farming from Mhow, could file a PIL at the SC around the bio-safety of GMOs.

It can be observed that all of these petitioners fall into a broadest definition of 'aggrieved person' wherein a group of citizens represent the concerns of environmentally conscious public. These four petitioners comprise a part of the public that use the PIL as a method to express their interests. In this particular context, they have gathered around the issue of GMO regulation and are expressing their interest on the topic on behalf of the Indian citizenry in front of the SC. As the petition itself proclaims, "the Petitioners are public spirited individuals who on account of their vocation have the expertise, and access to information that reveal a grave and hazardous situation with regard to Biosafety concerns, developing in India due to release of GMOs into the environment" (Rodriguez et al., 2005, p. 15). In this particular case, they are not representing the weaker sections of Indian Society; they are simply citizens or a part of the public (within Dewey's heuristics) using the forum provided by the SC to voice their concerns around the regulatory framework on GMOs. The SC taking the non-adversary nature of the PIL into consideration uses this petition to setup a space for conversations on the legitimacy of the biosafety tests done on GMOs and the transparency of GEAC in conducting their reviews of these tests.

Analysing the Petition

> "We should be on our guard not to overestimate science and scientific methods when it is a question of human problems; and we should not assume that experts are the only ones who have a right to express themselves on questions affecting the organisation of society. – Albert Einstein" (Rodriguez et al., 2005, p. 1)

A PIL is a middle-ground, somewhere between the existing norms of governance that are questioned by a public and the revision of these norms as per the Court's direction. This middle-ground not only acts as a point of critical reflection; it creates the space where justice is transformed into a problem-solving exercise. As non-adversary litigation, the questions are not centred on liability; they are centred on accountability of the Government to its citizens. In this sense, identification of problems that need to be tackled becomes imperative to justice. Petitioners come to the Court with a prayer which essentially establishes their point-of-view around an issue. A prayer is legally defined as "the part of the pleading (as a complaint) that specifies the relief sought" (Merriam-Webster Inc., 1996, p. 373). But, issues around PILs encompass three distinct world-views: first of the petitioners, second of the Government and third, of the Court.

While the forthcoming analysis only offers the world-view of the petitioners, it is important to note a problem-solving methodology is incomplete without understanding each of the various world-views that come together to solve a problem. Taking an example, in *T.N. Godavarman Thirumulpad v. Union of India* (1997), the initial prayer that the petitioner made to the Court was to protect a part of the Nilgiris forest, in South India, from deforestation by illegal timber felling. In its first major order on the case on December 12, 1996, the SC reinterpreted the meaning of 'forest' in the Forest Conservation Act (FCA) of 1980, to suspend tree felling across the entire country, and sought to radically re-orient the licensing and functioning of forest-based industries (Rosencranz & Lélé, 2008). The Court's world-view converted a contextual local problem into a national campaign against illegal deforestation.

The objective of this thesis is to understand the methods that enable social inquiry around Bt Brinjal controversy. Hence, I have focussed on the petitioners, their world-view and how it enables them to foster the gathering of a public around the issue of GM regulation using PIL as a method. An analysis of the petition reveals five major themes that will reappear in the context of this research through the following chapters but it serves as a good indication of the richness of the GM debate and the multiplicity of opinions that can be expressed around each of these themes. These five themes that will be discussed in detail are as follows:

1. The Science of GM Technology
2. The Impact of GM Crops on Environment
3. Regulation of GM Technology
4. Safety Concerns with GM food
5. The Right to Choice

Before delving deeper into each of these issues specifically, I will present the prayer with which the petitioners approached the SC. The prayer inevitably provides insights into the world-view of the petitioners and their construction of the problem at hand. The prayer requests the SC to issue appropriate writs or directions to:

A. "Direct the Union of India not to allow any release of GMOs into the environment by way of import, manufacture, use or any other manner unless the following precautions are taken.
    (a) a protocol for all the required bio-safety tests of the GMOs proposed to be released is prepared by the GEAC after processes of public notice and public hearing.
    (b) The GMO has been subjected to all the required bio-safety tests, prepared on the basis of the required biosafety tests on the basis of the above protocol, by agencies of independent expert bodies, and results of which have been made public.
B. Direct the Union of India to ban the import of any biological organism, food or animal feed unless they have been certified and labelled to be GM free, by the exporting country.
C. Direct the Union of India to put in place rules to ensure that it shall be compulsory for any dealer or grower selling GMOs to label them as such" (Rodriguez et al., 2005, p. 34).

Within the themes that the petitioners express their concerns, their overarching formulation of the problem can be broken into three parts: first, adequacy of bio-safety tests of the GMOs within Indian regulatory framework, second, India's questionable policy on the import of GMOs and third, the absence of mandatory laws for the labelling of the GMOs.

The Science of GM Technology

The petition starts with a timeline outlining various developments that have happened in India around GM technology in combination with the concerns that various scientists have expressed on biosafety of GMOs across the world. It's a subtle interplay of diachronic differences in the approach of Government of India towards GMOs with the commercialisation of Bt Cotton in 2002 and plans of importing GM soya from Argentina in 2005 placed against the research of Dr.

Arpad Pusztai, a nutritionist and toxicologist, around hazardous effects of GMOs on other organisms in 1999, an open statement, currently signed by 828 scientists from 84 countries demanding a moratorium on the release of GMOs into the environment presented at U.N. Convention on Biological Diversity Conference in 2000 and the Cartagena Protocol signed by India in 2003. These differences are important to the placement of the PIL. While, the represented Government world-view is reflective of a trust in technology by revamping the old policies around Green Revolution with the Gene Revolution policy paradigm to foster agricultural progress, the world-view of the petitioner is riddled with doubts around the viability of the technology. This difference forms the foundation on which the petition is filed.

The primary questions raised by the petition on the science of GM technology are centred on two major concerns. First, borrowing information from Dr. Arpad Pusztai's research (Pusztai, Bardocz, & S. W. B. Ewen, 2003) and the Open Letter by scientists at the U.N. Convention (World Scientists, 2000), the petition points out the scientific evidence to the hazards that the release of GMOs pose to biodiversity, food safety, and therefore human and animal health. It combines these two sources of information with the Independent Science Panel (ISP) report on GM (2003), to create an entire list of concerns ranging specific cases of side-effects of GM insulin and allergenicity of Cry proteins in Bt products to macro issues of transgenic contamination and unintended horizontal gene transfer. The list is an indication of the consequences of the implementation of a technology that is riddled with scientific uncertainties. While the petition does deal with the engineering part of GM technology, its major focus is on the behaviour of GMOs in natural environment and their ecological impact.

This focus, inevitably, brings out the second concern that the petition raises that despite the scientific evidence for such hazards; there is a lack of scientific knowledge on the subject and research done along these lines. Dealing with the engineering part of GM technology, the petition specifically uses the case of Horizontal Gene Transfer (HGT). HGT implies movement of "genetic material between organisms, which are asynchronous with the reproduction of the organism, so genes can also be transferred between distant species that would never interbreed in nature. For example, human genes are transferred into rice and those from pig, sheep, fish and bacteria are transferred into plants" (Rodriguez et al., 2005, p. 20). GMOs are created using HGT and several scientists have raised concerns around secondary, unintended HGT. The petition quotes Dr. Jack Heinemann, Director of the New Zealand Institute of Gene Ecology, who says that, "the question of HGT from transgenic plants to soil micro-organisms is not 'will it happen' but 'when and where will it happen' [and] it is very possible that the relevance of HGT to assessing the risk of genetically modified organisms will be more important than can be extrapolated from present data" (Rodriguez et al., 2005, p. 20). This lack of scientific knowledge lends itself into the argument for a slowdown of genetic modification till new approaches of monitoring ecological impacts emerge.

The Impact of GM Crops on Environment

The major ecological implications of GM crops have been comprehensively dealt with in the petition, ranging from the impact of GM crops on wildlife to the unintended consequences of widespread usage of GM seeds. The critique initiates with evidence for transgenic contamination in Mexico which has a moratorium placed on GM crops since 1998. Scientists have confirmed

that Mexican corn landraces (traditional maize crops from wild species) have been contaminated by transgenes, "varying from 1%-35%, averaging 10%-15%" (Rodriguez et al., 2005, p. 22). The conclusions of these findings assert that Mexican corn was contaminated by GM crops originating from USA. The petition uses the rapid rate at which it has happened only a few years after their first commercial use in the US to warn that transgenic contamination is a relevant threat to biodiversity and in an Indian context, the rich diversity of agricultural plants such as rice will be threatened by widespread commercialisation of GMOs for agriculture. Here, the petition re-invokes the ISP report to state that, "transgenic contamination is unavoidable and there can be no co existence between GM and Non-GM agriculture" (Rodriguez et al., 2005, p. 23). This concern when coupled with the evidence that the petition provides for the increase in the usage of herbicide in Argentina by GM soy growers (Branford, 2004) create a grim picture for the agricultural promises inherent to GM technology.

The petition, then, moves on to the impact of GM crops on wildlife where experiments done by the Royal Society for the Protection of Birds and the Centre for Ecology and Hydrology, Lancaster, UK (Connor, McCarthy, & Brown, 2005) confirm that "Bt proteins, incorporated into 25% of all transgenic crops worldwide, have been found harmful to a range of non-target insects, worms and amphibians" (Rodriguez et al., 2005, p. 23). Adding to this concern, the petition provides an article by Dr. Harash Narang (n.d.), a clinical virologist, to suggest that "DNA from GM material can persist in the environment and is not completely broken down by processing, decomposition or digestion" (Rodriguez et al., 2005, p. 20). This creates an additional threat of antibiotic resistance genes, used to track the insertion of new traits into a plant, escaping from both silage and manure to bacteria in the gut and in the environment creating new strains of antibiotic resistant bacteria.

Most of the arguments raised in the petition around GM technology are focused on the ecological impact of GMOs. While I can add to the list of these concerns by citing more examples from the petition, it is the implicit argument within the petition that needs to be brought to the foreground. The petition, in continuation of the premise of environmental concerns, provides a report published by WWF on GM crops (Thalmann & Küng, 2000) that sums up this implicit argument quite succinctly. The petition concludes that the report showcases how "the technology has been misrepresented in ways that suggest that genetic improvement can take the place of management and skill in solving pest problems. This may explain in part why farmers have so readily adopted the technology to the degree that they have" (Rodriguez et al., 2005, p. 23). This replacement of old skills with new technology, not only raises questions around the idea of deskilling, it questions that premise on which the technology is used and marketed. By providing evidence to argue the hazards of using GM technology, the petition not only legitimizes questions on the impact of GM crops on environment, it also brings out the lack of corporate responsibility in pushing a potentially hazardous product to its customers for profits.

Regulation of GM Technology

The petition develops the argument of the lack of corporate responsibility in a section dedicated to sabotage of regulatory structures by GM companies. It points to a complaint filed by U.S. Securities and Exchange Commission in January 2005 against Monsanto. The company bribed Government officials of Indonesia to get clearances for the release of GMOs in the amount of

$750,000 over a period of six years. Monsanto was subsequently fined $1.5 million by justice department, payable to the US Government (Fritsch & Mapes, 2005). In an Indian context, the petition moves to Andhra Pradesh where repeated failure of Bt cotton in the state in 2002-03 and 2003-04 caused the government to make Monsanto-Mahyco accountable to the farmers for losses in Bt cotton. It provides evidence procured by Greenpeace which indicates that Monsanto manipulated the data collected by the Government of Andhra Pradesh to reduce its compensation burden by nearly Rs. 2 Crores (Rodriguez et al., 2005, p. 27).

In questioning the regulation of GM technology, the petition does not restrict itself to the third world countries where GMOs are just being introduced, it questions the approach of FDA towards GM food by stating that "the provision of and process under GRAS [Generally Recognized As Safe] status through which GE products are cleared, is unacceptable and dangerous" (Rodriguez et al., 2005, p. 28). The FDA employs the method of voluntary consultation wherein the GM companies are obliged to provide the results of biosafety tests on their products themselves. The petition combines voluntary consultation with the evidence of sabotage of regulatory structures to question if these results provided by GM companies could be trusted and demands an independent biosafety evaluation of GMOs before their appropriation. Here, it is important to note the Indian GMO regulatory system headed by GEAC employs the same method to grant approvals to GMOs for commercialisation. In the context of Bt Brinjal, the inadequacy of biosafety tests required for this approval process in India was continuously criticized by civil society ultimately leading to the inclusion of new tests by GEAC.

The primary argument of the petition around regulation rests on a strong approach to interpreting the Precautionary Principle which states that if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action. The petition cites *A.P. Pollution Control Board v. M.V. Nayudu* (1999) where the SC notes that "if it is not possible to make a decision with 'some' confidence, then it makes sense to err on the side of caution and prevent activities that may cause serious or irreparable harm. An informed decision can be made at a later stage when additional data is available or resources permit further research."

Looking into the available literature on the Precautionary Principle in assessment of an uncertain activity, product or technology, the literature points to a difference in 'strong' and 'weak' approaches on the basis of differences in terms of the obligation to act and the nature of the measures to be taken. "Some make action [such as banning an uncertain activity, product or technology] a requirement; while others simply state that uncertainty regarding the existence of a causal relationship is not a valid reason for inactivity" (Health Council of the Netherlands, 2008, p. 33). The petition relies on a strong approach to the Precautionary Principle to demand a ban on GM technology until their safety is ascertained.

With the myriad of scientific evidence that the petition provides to at least doubt the biosafety of GMOs, it establishes the GM technology as a fit case for a strong application of the Precautionary Principle. This argument is further developed with India's obligation to international agreements such as the Cartagena Protocol on Biosafety for the Convention on Biodiversity, 2002 and The U.N. Convention on Biological Diversity (CBD), 1992 which deal

with ensuring adequate levels of protection in the field of safe transfer, handling and use of Living Modified Organisms (LMOs or GMOs) that may have adverse effects on the conservation and sustainable use of biodiversity encompassing the Precautionary Principle in its mandate.

Safety Concerns with GM food

While the first three sections construct the major argument that the petition raises, the next two sections not only add to the diversity of the argument, it also brings out concerns that will play a major role in the Bt Brinjal debate. Invoking Dr. Arpad Pusztai's research on the effect of diets containing genetically modified potatoes expressing *Galanthus nivalis* lectin on rat small intestine (S. Ewen & Pusztai, 1999), the petition points to scientific evidence that suggests that GM food might be harmful to human and animal health. It presents a letter written by Dr. Pusztai to the SC, in relation to the PIL, where he says that, "GM food is unlikely to be highly poisonous and instantaneously deadly. 'Toxicity' is therefore an unhelpful and loose concept and in contrast, nutritional studies in which GM crop-based diets are fed to young growing animals should reveal their possible harmful effects on metabolism, organ development, immune and endocrine systems and gut flora which together determine the safety of the GM crop are the most appropriate" (Rodriguez et al., 2005, p. 22). These recommendations by Pusztai and his research have been used to make a case for the need of rigorous biosafety testing of GMOs before their commercialisation.

Outside the Court, this biosafety concern plays itself out in a variety of ways, from a campaign which claimed that Bt Brinjal is a large scale experiment on the impact of GM food on humans where the Indian population will effectively become lab rats ("I Am No Lab Rat," 2008) to documentary films which claim Bt Brinjal to be poison on the platter (Kanchan, 2009). Beyond biodiversity, environmental issues and lack of transparency of regulatory regimes, the question simply boils down to consumption and the safety of the food that is consumed. This question becomes an important tool for inviting the Indian middle class into the debate, who may not be concerned with Bt Brinjal as a livelihood issue for Indian farmers or an environment issue, but they would be concerned with the safety of the food that they consume. This has been very effectively showcased in the documentary film *Poison on the Platter* (Kanchan, 2009). These interpretations around safety concerns of GM food have been further explored in *Chapter 5*.

The Right to Choice

The petition develops the argument of Right to Choice in two distinct paradigmatic notions. First, the Right to Seed, where a farmers' basic right to save seed for sowing in the next season is challenged under the patent-based regime of GM seeds, controlled by multi-national biotech corporations. The seed as memory of an age old agricultural tradition is threatened by the assembly lines of genetic modification. If one combines this right with the aforementioned claims of the petition around transgenic contamination, even if a farmer chooses to continue using his own seeds, the seeds will eventually contract transgenes into their genome. Second is the consumer's right to know what they are consuming, lending itself into the argument for labelling of GM imports. Seed within the paradigm of consumer rights also creates the argument that "farmers also have the right to respond to consumer choice and produce food according to what the market demands" (Rodriguez et al., 2005, p. 30). The petition goes on to make a case for

increasing demands for organic food and animal feed in global markets and the widespread commercialisation of GM crops in India will shut this economic opportunity and comparative advantage for Indian farmers.

The second notion of consumer's right to know is self-evident, but the first notion of farmer's right to seed leads into to considerable research being done on open pollinated varieties (OPV) of GM seeds, for example, in the Bt Brinjal case, the OPV varieties being developed by UAS, Dharwad, Karnataka and TNAU, Coimbatore. Though, superficially, one may point out that OPVs "are less commercially exploitable" (Shiva & Crompton, 1998, p. A-137) than their counterparts, it is important to understand the implicit nature of the Right to Seed that is being addressed here. Visvanathan in an Op-ed on the Moratorium on Bt Brinjal brings out this implicit nature when he writes that, "A seed could not be read as a mechanical artifact to be produced in a laboratory. A seed was the image of the future, a stored heritage, a form of competence, a circus of imaginations. Such a world could not be handed over to the MNC, for to hand over such knowledge was to hand over a way of life. It was to diminish a form of civilisation called agriculture" (Visvanathan, 2010b).

The argument of Right to Seed could be further elaborated by using the work of Vandana Shiva et al. (2000), where they create a distinct category of seeds called Farmers' varieties, "which have been developed by farmers over the years to suit their ecological, nutritional, taste, medicinal, fodder, fuel, and other needs. These have sometimes been called landraces to distance them from the contributions that farmers have made towards their evolution through selection. […] Farmers' varieties, like any other seed variety, are an embodiment of intellectual contribution" (Shiva et al., 2000, p. 2). Within this narrative, to encourage privatization of seed is to deny the right of the farmers to use their intellectual heritage. This argument is brought to the foreground to critique the long-term consequences of appropriation of GM crops where an entire knowledge system around seeds is threatened in the overarching discourse of genetic modification.

The Impact of the PIL

With respect to the Bt Brinjal controversy, the SC has played its own role in response to this PIL which has changed the nature of the controversy and significantly contributed to the amount of information that was generated on the issue. On 22nd September 2006, the SC directed the stoppage of all field trials of GM crops. At the same time, it deemed it appropriate to direct the GEAC to withhold the approvals of commercialisation of GM products till further directions are issued by it. Just before this directive, the GEAC responding to the pressure created by submissions from independent scientists, consumer groups, farmers' organisations and other NGOs created Expert Committee I (EC-I) to review these concerns in August 2006. It was only after the report of EC-I was submitted to the Court that it allowed large scale trails of Bt Brinjal. The report will be discussed in greater detail in *Chapter 4*.

On 13th February 2008, the SC directed MoEF to invite Dr. P.M. Bhargava, Molecular Biologist, Founder Director, Centre for Cellular and Molecular Biology, Hyderabad and Prof. M.S. Swaminathan, M.S. Swaminathan Research Foundation, Chennai, to GEAC's meetings when the applications are considered and before granting approval to these applicants. The said

two invitees to the meetings of GEAC were given the liberty to express their views before the Committee before final decision was taken. The GEAC was permitted to consider any application presented to it in accordance with law and take appropriate decisions after considering all aspects before the final decision was taken including bio-safety aspects. The SC noted the apprehension expressed by experts, which was brought to the foreground by the petitioners, that open field trials may cause serious damage to the environment and cause contamination to the cultivation of related species. It ruled that these apprehensions should also be considered by the GEAC while considering applications for approval. The response of these two scientists during the National Consultations on Bt Brinjal was taken with utmost importance. Their presence in the GEAC meetings and their response to the National Consultations has been controversial as well. According to C. Kameswara Rao, Executive Secretary of the Foundation for Biotechnology Awareness and Education (FBAE), Bangalore, "through this simplest of all letters [as response to Bt Brinjal controversy] received by the MoEF, Dr. Swaminathan dealt the hardest blow against Bt Brinjal" (2010, p. 38). These letters will be further discussed in *Chapter 6*.

The Public and its Interest in Litigation

It is important to realize while reading this chapter that approaching Indian Courts, whether for public interest or private, is a formidable task. Most of the cases go on for a very long period of time and apart from the inherent complications of financing such an endeavour, the task in itself is very tiring. A major part of a petitioner's life is spent on fighting for a single cause. These are years of perseverance that eventually might not even yield the desired results. In such circumstances, specifically in the case of a PIL, litigation needs to be combined with a strong public response outside the Court to create a sense of community around a cause. The understanding of this petition also needs to be placed in context of the SC observation in *Indian Council for Enviro-Legal Action v. Union of India* (1996), that "if the mere enactment of laws relating to the protection of environment was to ensure a clean and pollution free environment, then India would, perhaps, be the least polluted country in the world. But, this is not so. There are stated to be over 200 central and state statutes which have at least some concern with environmental protection, either directly or indirectly. The plethora of such enactments has, unfortunately, not resulted in preventing environmental degradation which, on the contrary, has increased over the years" (Divan, 2000). PIL, as a medium of public expression, can only find its raison d'être when the petitioners can make the government take constructive action upon the expression of their concerns in Court.

Revisiting the heuristics borrowed from Dewey's conceptualisation of the public, this PIL can be interpreted as a method that was used to affect association of people on the issue of GMOs. The method became successful because the consequences of the case rippled outside the Court generating conversations on the topic. The public in this specific context are the 'public-spirited' individuals who by making a petition take an issue to the Court. There are two publics in play here: first, a public that gathers around the issues that require litigation inside the Court and second, a public that gathered around the issue of Bt Brinjal outside the Court (refer *Chapter 4 and 6*). As events progressed, these 'public-spirited' individuals from the first public merged into the second public in voicing their concerns on the commercialisation of Bt Brinjal. Aruna Rodriguez played a crucial role in the scientific risk assessment of Bt Brinjal by inviting international

scientists such as David Andow (2010) to evaluate the recommendations of EC-II. Devinder Sharma, on the other hand, played an important role in the setup of the Coalition for GM-Free India.

The method of PIL does require rigour which can be assessed by looking at the level of details offered in the five different themes along which the petition documents the concerns around GMOs. It garners legitimacy through its approval by the SC for Court proceedings. Ultimately, this PIL on GMOs emanates from the context of the evolution of PILs in India and it is placed at the intersection of Phase-II and Phase-III of PILs. It has also served its larger purpose of generating conversations on the issue of GMOs, specifically Bt Brinjal, outside the Court, thereby, providing the means for the second public to gather around the issue of Bt Brinjal.

Reverting to the initial quote of Dewey with which the chapter began, one has to note that the introduction of the PIL was a change in existing democratic machinery of India with the interest of the public as a supreme guide. The mechanism of the PIL is flawed and the SC has noted its abuse (*State of Uttranchal v. Balwant Singh Chaufal and Others*, 2010), but it is an attempt to get closer to the ideal that deliberative democracy aspires to achieve. The 'public-spirited' individuals in a legal framework of India find a place for themselves within the mechanism of PIL, but as shown in the case of this petition, they have to move into other arenas of expression to create a larger foundation for moulding a scattered and fragmented public outside the Court. Otherwise, like many cases that are brought to the Courts in public interest, the best that they will achieve is a note in the newspaper. The rest of the chapters will elucidate on how the issue of Bt Brinjal travelled from litigation to these other arenas of expression.

3

The Informed Public: The Use of Right to Information from DBT

> "Drawing a typical multicoloured Rajasthani *ohrni* from her face, [Nevathi Bai] walked up to the microphone to demand *hamara paisa, hamara hisab* [Our Money, Our Accounts]. Raising her voice, she insisted that people had the right to see official records, to check how the money allotted for them was being spent" (Bhattacharjea, 2005).

This quote creates the image of a scene from the pages of history of a *Dharna* (the practice of exacting justice or compliance with a just demand by sitting and fasting at the doorstep of an offender until death or until the demand is granted) organized by Mazdoor Kisan Shakti Sangathan (MKSS; Organisation for the Empowerment of Workers and Peasants) in April 1996 in the middle of the busy market place at Chang Gate in Beawar, Rajasthan. It establishes the context within which Right to Information (RTI) Act was ultimately legislated in 2005 which was used by civil society activists to procure biosafety data submitted by Mahyco to GEAC. During this *Dharna*, details of the official records of public funds used for construction and repair of schools, roads, irrigation channels and other local development projects were being read out. "Local villagers got up to complain that the works were incomplete or not done at all. The degree of misappropriation emerged most obviously when muster rolls bearing the names of those paid for their daily labour were read out. Nearly half proved to have been faked, with the assembled villagers pointing out that many of those named had died, moved elsewhere or were not known to exist in the area" (Bhattacharjea, 2005).

This *Dharna* was organized against rampant corruption prevalent in the execution of local development projects organized by the Government in rural areas of Rajasthan and it is just an example of the variety of activities organized by MKSS. MKSS is a grassroots organisation that was formed in 1990, working in rural Rajasthan. Its objective was to use modes of struggle and constructive action for changing the lives of its primary constituents – the rural poor. In the period leading up to its formation it had taken up issues of re-distribution of land and minimum wages as the two basic concerns that had direct impact on the quality of life of the rural poor in Rajasthan. What started as a demand for a transparent system of accountability in the execution of local development projects ultimately became the National Campaign for People's Right to Information (NCPRI) across India for the legislative establishment of Right to Information (RTI). Ultimately the movement led up to the formulation and execution of the RTI Act in 2005.

On a line parallel to PILs, the RTI is intrinsically an extension of the fundamental rights of citizens. This "legal position with regard to the right to information has developed through several Supreme Court decisions […] specifically in the context of the Right to Freedom of Speech and Expression, which has been said to be the obverse side of the Right to Know, and one cannot be exercised without the other" (Mander & Joshi, 1998, p. 34). In a landmark case in

1975, the Supreme Court observed that, "The people of this country have a right to know every public act, everything, that is done in a public way, by their public functionaries. […] The right to know, which is derived from the concept of freedom of speech, though not absolute, is a factor which should make one wary, when secrecy is claimed for transactions which can, at any rate, have no repercussion on public security. […] The responsibility of officials to explain and to justify their acts is the chief safeguard against oppression and corruption" (*State Of Uttar Pradesh vs Raj Narain & Others*, 1975). Within Dewey's heuristics, this observation is a reminder that a public can only gather around issues that it has information about. The success of the aforementioned *Dharna* lies in the fact that the information about misappropriation of public funds was disseminated in a public forum to spread awareness about the corruption rampant in public institutions of Rural Rajasthan.

The story of the RTI Act (Mander & Joshi, 1998; Sivakumar & Kerbart, 2005) is a long struggle for ethics in democracy (Roy, 2000) that still continues (Skoch Consultancy Services, 2009) to exist wherein the mere legislation of an Act does not guarantee its appropriate use. The questions around awareness relating to RTI and knowing the appropriate channels to exercise it by the rural poor is still debated and worked upon by a variety of civil society activists. But, the nature of the Act and the way it has been legislated opens up another space for public to gather around issues of governance. As per its specifications, every citizen has a right to:

1. Request any information (as defined in Section 2(f) of the Act).
2. Inspect work, documents, and records.
3. Take notes, extracts or certified copies of documents or records.
4. Take certified samples of material.
5. Obtain information in the form of diskettes, floppies, tapes, video cassettes or in any other electronic mode or through printouts where such information is stored in a computer or in any other device (Government of India, 2005).

In terms of the Section 2(f) of the Act, information has been defined as "any material in any form, including records, documents, memos, e-mails, opinions, advices, press releases, circulars, orders, logbooks, contracts, reports, papers, samples, models, data material held in any electronic form and information relating to any private body which can be accessed by a public authority under any other law for the time being in force" (Government of India, 2005, p. 2-3).

While the RTI Act has become a vantage point for understanding the struggle against corruption and insurance of probity in governance, it has also been used very effectively by civil society activists to problematise the regulation of GMOs in India. There are quite a few examples that one can cite to look at this arena created by the Act with respect to GMOs, but, this chapter focuses on one RTI application filed by Divya Raghunandan, Greenpeace GE-free India campaigner, to the Department of Biotechnology (DBT), under the Ministry of Science and Technology in 2006. The application, in conjunction with a series of events around it, was used by Civil Society to publicize the risks in the science of GMOs and bring out the inadequacy of the regulatory regime in ensuring strict biosafety standards. As Aruna Roy, one of the founder member of MKSS and NCPRI, puts it, "this exceptional case […] has paved the way for the RTI act to establish the right of citizens to access information regarding industry and its impacts. The

people have a right to analyse the information and see the nature of its impacts on their lives. [It] will force the government to strike a balance between ensuring corporate accountability and fostering business" (Greenpeace Press Release, 2007).

The Approach to Using RTI

Theorizing on the process of using an RTI application to create a public forum, Mander and Joshi (1998) offer the following steps under the premise that people "who are victims of corrupt, arbitrary or unaccountable exercise of state power would be better equipped to ensure accountability, probity and performance of public authorities if they are equipped with the necessary information" (p. 17):

> **Step 1:** Identify norms, rules, procedures and laws governing the discharge of responsibilities and exercise of power by the public authorities in question.
> **Step 2:** Identify the information that would make a citizen better equipped to effectively address the problems with which they are confronted when they interact with the government.
> **Step 3:** Identify within the bureaucratic system whether and where, and in what form, are these categories of information being generated, recorded and stored.
> **Step 4:** Identify the rules, procedures and precedents, if any, for public access to or retrieval of such documents.
> **Step 5:** File an application to access that information and in case, the Right to Information is denied, one may resort to relief prescribed under the same Act, such as appeal to a designated authority.
> **Step 6:** Systematic and focused inspection of documents, to zero in on those particular documents, which may be relevant for the subsequent social audit. This should be followed up by obtaining certified copies of the documents, along with organisation and collation of information for easy comprehension.
> **Step 7:** Grievance redressal in a situation in which an individual or a group has *prima-facie* evidence, including certified copies of relevant documents, of corruption or misuse of official power. The course of action would be either to address conventional grievance mechanisms of public authorities, mainly applying to supervisory or corruption control authorities with copies of relevant documents or a *Jan Sunwai* that is, organizing a public hearing for social audit of the information procured.

One has to note that in the case being discussed here, the primary issue is not corruption within DBT; it is the approach with which DBT addresses biosafety of GMOs, specifically the adequacy of biosafety tests done on GMOs and the process with which their limited field trials are approved and supervised. The case being studied offers a complete picture of this theoretical framework for the use of RTI and one could understand the development of the case diachronically by following the prescribed steps as elicited above. The major argument against GMOs being built here is to establish the uncertainty of the scientific risk assessments prescribed by the regulatory authorities on GMOs. Hence, the attempt is to make a case for prudent precaution (Health Council of the Netherlands, 2008) wherein the role of the non-expert such as a Civil Society activist is "to make observations and pose critical questions in order to test and

thus contribute to the quality of the experts' [(regulatory regime on GMOs)] arguments" (Health Council of the Netherlands, 2008, p. 17) in testing as well as commercialisation of GMOs.

From Step 1 to 4: Why Department of Biotechnology?

Regulation of GM crops in India happens mainly through the Environment Protection Act (1986) 1989 Rules. These Rules are called the 'Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organisms, Genetically Engineered Organisms or Cells' and "deal with modern biotechnology use in agriculture (environmental release) as well as [pharmaceutical] sectors. The two main agencies responsible for implementation of the rules are the Ministry of Environment and Forests (MoEF) and the Department of Biotechnology (DBT), Government of India" (CEE, 2010b, p. 60). While MoEF "holds the Secretariat of [GEAC], the apex body that gives approval for manufacture, sale, import and export of all GMOs and products thereof including foodstuff, ingredients in foodstuff and additives using genetically modified organisms or cells" (CEE, 2010b, p. 63), DBT "holds the Secretariat of the Review Committee on Genetic Manipulation [(RCGM)] that gives approval for research and small-scale field trials involving GMOs and products thereof" (CEE, 2010b, p. 63). Hence, an applicant interested in development of GMOs needs to first approach the regulatory institutions under the control of DBT for approval of research and small-scale trials before going to GEAC for approval of the GMO for commercialisation after the biosafety tests have been verified by RCGM.

In conjunction with the above-mentioned regulatory hierarchy, DBT has the responsibility to validate the preliminary biosafety tests being done in the laboratory on GMOs such as toxicity and allergenicity before approving them for limited field trials. An individual interested in posing questions on the reliability of these biosafety tests needs access to the test protocols prescribed by DBT and detailed results of these tests conducted by companies interested in GMO development submitted to DBT. This data falls under the definition of information under the RTI Act because in accordance with Section 2(f) of the Act, it is "information relating to any private body [GM companies] which can be accessed by a public authority [DBT] under any other law [Environment Protection Act] for the time being in force" (Government of India, 2005, p. 3). Since this data is legally accessible to a citizen under RTI Act, Divya Raghunandan, on 23rd February 2006, wrote an application to DBT requesting information for the following:

1. "A list of field trial locations (villages and districts) of genetically engineered brinjal, okra, mustard and rice approved by the RCGM for the multi location trials.
2. Toxicity, allergenicity and any other relevant data on transgenic brinjal, okra, mustard and rice approved by the RCGM for the multi location trials.
3. Minutes of the RCGM meetings held on the 4th Tuesday of every month for the months between: February 2005 to February 2006" (Murlidharan, 2007).

Step 5: Recourse in case of Denial of Information

On 29th March, 2006, Divya Raghunandan received a response to her application with a list of field trial locations (villages and districts) of genetically engineered brinjal, okra, mustard and rice approved by the RCGM for the multi location trials, but the details sought in points 2 and 3 of her application were denied on grounds that the required information falls under the category of Section 8(1)(d) of RTI Act which inter-alia states that "information, including commercial confidence, trade secrets or intellectual property, the disclosure of which would harm the competitive position of a third party" (Government of India, 2005, p. 8) falls outside the purview of the Act and hence, cannot be accessed by a citizen. Revisiting the text of RTI Act, the complete text of Section 8(1)(d) states that "there shall be no obligation to give any citizen […] information including commercial confidence, trade secrets or intellectual property, the disclosure of which would harm the competitive position of a third party, unless the competent authority is satisfied that larger public interest warrants the disclosure of such information" (Government of India, 2005, p. 7-8). This establishes the contours of conflict that ensued over the next two years, wherein *larger public interest* was placed against the *private commercial interests* of GM companies, specifically Mahyco in the case of Bt Brinjal, and was fought over in the Central Information Commission (CIC), the apex body for listening to RTI related complaints and the Delhi High Court.

In the first round of complaints made to the Appellate Authority within DBT to reconsider the larger public interest, the Appellate Authority decided that information regarding toxicity and allergenicity of Bt Brinjal should be released no later than 15th June, 2006 and the rest of the information requested regarding other transgenic plants such as okra, mustard and rice, in the application were deemed confidential on the grounds that they were yet to evaluated by RCGM. Subsequently, the data released publicly on the MoEF website under the authority of GEAC contained summary of the test results in addition to the protocols for various biosafety studies on Bt Brinjal (Warrier, 2006a) and submissions from independent scientists and civil society were invited before the 17th of July, 2006. In addition to this, Public/NGOs were permitted to examine the detailed biosafety reports in the MoEF in the presence of a GEAC representative (Warrier, 2006a).

The struggle of information went from Appellate Authority within DBT to Central Information Commission (CIC) on 17th August, 2006. Even after a judgment in favour of Divya Raghunandan by CIC on 31st January, 2007, the response of DBT was the same as the one earlier. The data on the rest of the crops were under consideration by RCGM and hence, they were outside the purview of RTI and since the minutes of the meeting held critical information about GMOs still under development, they cannot be made public to protect the commercial interests of GM companies (CIC, 2007a). Responding to this denial of information, Divya Raghunandan filed a detailed rejoinder to the CIC which stated that, in relation to information presented regarding Bt Brinjal in the MoEF website, "dossiers should be complete documents (not only summary of toxicological/allergenicity studies) that contain all information required for a full risk assessment [and] unless raw data is examined and the full report is examined, it is not possible to arrive at meaningful conclusions" (CIC, 2007a, p. 6).

CIC passed another decision on 13th April, 2007 and observed that if data on Bt Brinjal could be made publicly available, that in effect, implies that commercial interests of GM companies are not the driving force for denial of information. If information can be provided for Bt Brinjal, information on other crops should follow a similar rationale and in case the information available on them is incomplete, it should be mentioned to be so when it is released publicly. Hence, "any further grounds for non-disclosure are invalid even if the information was still in the process of development. [DBT] is, therefore, directed to provide the information held or controlled by [it] or to which [it] has access to appellant Ms Raghunandan within ten working days of the date of issue of this Decision Notice" (CIC, 2007a, p. 7). This 'information' also included complete documents on Bt Brinjal instead of just the summaries of test results. As for the minutes of the meetings of RCGM, the CIC observed they are not experts in this particular area and hence, the competent authority to resolve the conflict between private interest and larger public interest should be best decided at the level of the Government.

This decision did not change anything for Raghunandan in the context of Bt Brinjal. DBT produced a letter from Mahyco requesting as third party that "no further information (other than the summary reports pertaining to the allergenicity and toxicity studies on Bt Brinjal which are available on the website of GEAC) may be provided in this regard to the applicant" (CIC, 2007b, p. 3). In combination, DBT claimed that they don't retain copies of biosafety data and it is presently with MoEF. Since, the data runs into thousands of pages, it can only be inspected in MoEF in the presence of a GEAC representative. In another letter, seeking exemption from disclosure, Mahyco also stated that, "Lives and property may be put to grave danger, apart from providing incitement for offences, if such information is revealed to third parties" (CIC, 2007b, p. 3).

In response, Raghunandan filed another complaint to CIC on 7th May, 2007, restricting it to request for information on "toxicity, allergenicity and any other relevant data on transgenic brinjal, rice, mustard and okra" (CIC, 2007b, p. 4) and relinquishing the request for minutes of the RCGM meetings. The appeal was finally heard on 12th November, 2007. On that day, the appellant offered a Supreme Court judgment on 1st August, 2007 in *Aruna Rodriguez and Others vs. Union of India and Others*, where the SC directed toxicity and allergenicity tests conducted on Bt Cotton to be put on the website of GEAC. Using Bt Cotton as an example, they made a case for Bt Brinjal to follow the same logic. They also disputed the statement of DBT that "they retain no copy of the data, which they have evaluated and recommended to the GEAC as it's unusual for any function of a department of the government" (CIC, 2007b, p. 5). They went on to provide an elaborate timeline starting from 23rd February, 2006 to 18th June, 2007 of communication between DBT and the appellant in which data on transgenic rice, mustard and okra remains in the process of development without any progress. The appellant found this argument to be untenable and in clear violation of RTI Act (CIC, 2007b, p. 6-7).

The decision of CIC, issued on 22nd November, 2007, was again in favour of the appellant stating that, "From a perusal of [Rules on GMOs within Environment Protection Act] it is quite clear that genetically engineered organism or cells are recognized by government as an item potentially hazardous to public health. It automatically follows that full compliance with these

rules is a matter of public interest. In light of this we cannot agree that inspection of this information can be provided only in a restricted environment to members representing Civil Society. [… Hence], the information sought is best downloaded from the computer on which it is stored onto a CD by the [DBT] and supplied to appellant on payment of the usual fee" " (CIC, 2007b, p. 13). The CIC also observed a clear case on non-compliance with regard to information on other transgenic crops of mustard, okra and rice. It directed DBT to either provide the information requested or provide a demand of a time frame to provide the information within ten days of the decision notice. Subsequently, it also refused to implead Mahyco as third party to the case because the issue of safeguarding private commercial interests had already been discussed in the previous decision notice issued by CIC on 13th April, 2007.

In response, Mahyco moved to Delhi High Court "to keep the data from being put out in the public domain. In its petition, it […] said that the Central Information Commission's order violates the obligations of India under the Trade-Related Intellectual Property Rights Agreement of the World Trade Organisation" (Mathew, 2008). The Delhi High Court passed an interim order in December 2007 staying CIC's order up till the next hearing of the case on April 23, 2008. The case continued in the court till its last hearing on 20th August, 2008 and until then, there was no mention of the data being available on the GEAC website. Then, on 25th August, 2008, GEAC ultimately released the data on biosafety studies of Bt Brinjal on its official website. "The data in eight volumes ran into more than 1,100 pages" (Menon, 2008). This effectively concluded the conflict and the case in Delhi High Court.

From Step 6 to 7: Making use of Data

The absence of detailed test results for an approximate duration of two and a half years (between February, 2006 and August, 2008) did not impede the civil society activists from evaluating biosafety of Bt Brinjal. Even summary of test results and information of protocols was enough for civil society activists to create their first critiques. Centre for Sustainable Agriculture (CSA) released a *Briefing Paper on Bt Brinjal* in June 2006 that coincides with the struggle for information. It raised awareness around Bt Brinjal as the new forthcoming GM crop after commercialisation of Bt Cotton that needs critical attention (CSA, 2006). CSA is professional resource organisation engaged in promoting sustainable agricultural technologies that are based on farmers' knowledge and skills (CSA, 2010). In conjunction with the release of information on test protocols and test result summaries, CSA also established an Independent Expert Committee to review this data. The Committee comprised of a soil scientist, toxicologist, plant physiologist, biochemist, entomologist and social scientist (The Independent Expert Committee, 2006, p. 1).

Among its major observations, "the Committee […] found that research guidelines that DBT has evolved […] related to biosafety assessment of transgenic crops, have not been adhered to by the developers of Bt Brinjal. Further, the Committee [noted] that with the existing data, 'it is not possible to arrive at any meaningful conclusions regarding the safety of the product' or 'its efficacy'" (Kuruganti, 2006). After commenting on the data that was made available, the Committee went on to note that "Civil Society has carried out an admirable job in bringing out awareness on various aspects of Bt Brinjal to the notice of the GEAC and the general public. It has meticulously collected the literature, scrutinized the data generated and sent feedback to the

regulators. [Ultimately, it] also brought to the notice of GEAC various aspects of Bt Brinjal that need to be re-examined such as pollen flow studies, agronomic trials, soil impact studies, toxicity and allergenicity tests, food cooking & protein estimation studies, biodiversity issues, socio-economic impact assessments, rights of the farmers and consumers etc, and, finally, whether India needs a Bt brinjal, when other alternatives are available" (The Independent Expert Committee, 2006, p. 8-9).

Reverting back to MKSS, in its efforts of establishing inconsistencies in the data on muster rolls to unveil corruption at grassroots level, it follows a meticulous approach of going to each of the villages from which people have been hired for local development projects and cross-checking data on paper with people (Singh & Jhaveri, 1999). The work, though arduous and time-consuming, is still possible without the requirement of a certain kind of expertise in evaluating the data procured. The biosafety data released on the GEAC website in August, 2008 required expertise in biotechnology to gauge the potential hazards that have been overlooked and to present a comprehensive scientific critique of the protocols and the test results. Hence, the civil society activists apart from engaging Indian scientists in evaluation processes as mentioned above, went international and sought support from the international scientific community that produced scientific papers evaluating this data.

All the reports and letters generated by these scientists specifically reference the dossier submitted by Mahyco on the biosafety of Bt Brinjal and comment on the inadequacies of testing and research results. Their responses will be analysed in *Chapter 4*. A closer look at the dossier on National Consultations on Bt Brinjal (CEE, 2010b) reveals that "out of 18 scientists from abroad – several of them well-known in their field – made submissions to MoEF, only 8 supported Bt Brinjal and the rest were critical. There were 26 submissions from scientists in India, 16 supported and 10 opposed" (Shah, Forthcoming). These scientists and the institutions that they are affiliated to, have also been referred to by civil society activists in media (Express news service, 2010; Misra, 2009; Rodriguez, 2009; Special Correspondent, 2009) to gather a public around the issue of GM technology and the stop the commercialisation of Bt Brinjal. This commentary did not go unnoticed as Jairam Ramesh, MoSEF, took the criticism to its ultimate conclusion as specified in Step 7 mentioned above, with organisation of a nation-wide *Jan Sunvai* or public hearing for social audit of risk-assessment data generated by Mahyco and approved by GEAC. This social audit became the mandate of the National Consultations on Bt Brinjal. It will be discussed in *Chapter 6*.

Locating Activism in Information

This chapter offered insights into the process by which the simple act of demanding information about government activities could be used to create a forum for activism. In this context, the legislation of the RTI Act could be seen as a stepping stone for an Information Revolution that enables a call for accountability by demanding information. India, post-liberalization of its economy in 1991, has now been globally recognized as having a growing Information Technology (IT) industry and in the Indian popular culture; this is treated as The Information Revolution.

There has been criticism of this idea emphasizing that "IT certainly contributes in growing measure to the Indian economy, but it remains an 'island' phenomenon. [...] There are three reasons for saying this. First, the computer software business remains extremely (80 percent-plus) export-dependent. This is even truer of information technology-enabled services (ITES) like call centres and medical transcription, and business process outsourcing (BPO), which are now growing at twice the speed of software exports. […] Second, despite their meteoric rise, most IT companies are puny even by Indian corporate standards, with their sales turnover usually within some hundreds of crores of rupees, or in the top range, a few thousand crores – as compared to tens of thousands for manufacturing sector majors. […] And third, the geographical distribution of India's IT business is extremely uneven" (Bidwai, 2003). Moving away from the popular culture, I will interpret the legislation of the RTI Act to be an Information Revolution of a different kind that enables a public to gather around issues that are brought to light by exposing the bureaucratic machinery to public inspection.

Since 1990 when MKSS was created, a time that coincides with liberalization of Indian economy, there has been a parallel grassroots level movement emphasizing the power that a citizen can yield if s/he has access to the right information and knows how to make use of it. This organisation having humble roots in Rural Rajasthan reinvents the meaning of the adage 'Knowledge is power' by claiming that one can only be knowledgable and hence powerful, when one has access to information. It reinterprets information as a vital constituent of subsistence economy of food, clothing and shelter. Access to information, even when demanded by an illiterate citizen, adds a notion of accountability in governance wherein a public authority is liable to provide a certified copy of the demanded information which the citizen can take with him/her. The options for survival in a subsistence economy become plural as one has access to information that widens the scope of constructive action. It not only empowers a citizen to question their quality of life and governance of their local areas but it enables them to create their own critiques around development and hence, participate in the process of governance.

Revisiting Dewey's heuristics, the RTI application filed by Raghunandan could be interpreted as a method that has been used to generate conversations on the nature of the information contained in the biosafety test results of Bt Brinjal. While this information was treated as private by GEAC to protect the commercial interests of Mahyco, the nature of the information has a direct impact on the risk assessment of the biosafety of Bt Brinjal. By making this risk assessment a public issue, Raghunandan, not only questioned the policies of GEAC to maintain this secrecy of data, she also enabled a public to gather around this data when it was finally released in 2008. There are again two publics that can be observed in this context. The first public comprises of people who gather around RTI as an issue by making applications for disclosure of information and the second public that gather around issues that are brought to the foreground by following Step 7 of grievance redressal in Mander and Joshi's (1998) theoretical framework for the use of RTI. Raghunandan belongs to the first public who used RTI application as a method to enable the second public to gather around the issue of risk assessment of Bt Brinjal.

This method became successful because the consequences of the RTI application led to contributions of Indian as well as international scientists towards an assessment of the biosafety of Bt Brinjal. This method as illustrated by the progression of events for this specific RTI application requires rigour in assessing the nature of the information demanded and the subsequent evaluation of it. In this specific case, it required three re-appeals for information procurement. Taking the example of MKSS, their RTI applications are followed up by door-to-door canvassing to assess whether the information on paper matches to information gathered from the field. It garners legitimacy through the grievance redressal mechanism of *Jan Sunwai* (Public Hearings) of data. This RTI application emanates from the context of the NCPRI and without organisations that played a crucial role in this campaign such as MKSS, this application would not have been possible. Ultimately, it generated a larger conversation on risk assessment of Bt Brinjal, thereby enabling the second public to gather around the issue of Bt Brinjal.

Before the true impact of Right to Information can be acknowledged, I should point out that the process of procuring information from government authorities is not easy. As it can be observed in the case of Raghunandan vs. DBT, the struggle took approximately 26 months to obtain detailed biosafety test results on Bt Brinjal. The information for the rest of the transgenic plants is still not completely available. Similarly, looking at Gene Campaign, a NGO dedicated to protecting farmers' rights, food and livelihood security, and its experience with the RTI Act for information on GMOs from GEAC, "the government's response has been obstructive rather than helpful and the attitude has been to provide as little information as possible" (Gene Campaign, 2008). Despite the response of the public authorities, it should be noted that the first public has used Right to Information as a tool to construct a new critique on governance and this marks the initiation of the 'information and ethics' (Roy, 2000) discourse within Indian democracy.

Nevathi Bai offered a new adage to the discourse of the struggle for information. She simply said, "*Hamara Paisa, Hamara Hisaab* [Our Money, Our Accounts]." In her adage, there is a realization that the government spends public money in public interest and hence, a citizen has a right to look at government accounts and question the expenditure. To be able to see government accounts is being powerful in a democracy. In this sense, knowledge is power and citizen can exercise this power to ensure probity in governance. Ragunandan transformed this adage and applied it to regulation of risk assessment of GMOs. To be able to see the biosafety test results of Bt Brinjal is to be able to know the nature of the GMO that will be consumed after its commercialisation. The government regulates the release of GMOs into the environment in public interest and hence, a citizen has a right to look at the biosafety results on which the government's decision to release a GMO is based. To be able to see those biosafety results is to be powerful and knowledgeable about the food that one is consuming. In this sense, a citizen can exercise this power to ensure probity in regulation of GMOs. Both these examples illustrate how the simple act of demanding information could turn a citizen into an activist with a cause.

4

Locating Public in Scientific Risk Assessment: GEAC and the Expert Committees

> "The human understanding is of its own nature prone to suppose the existence of more regularity in the world than it finds. And though there be many things in nature which are singular and unmatched, yet it devises further parallels and conjugates and relatives which do not exist" (Bacon, 1620, p. 51).

With this quote, "Francis Bacon (1561-1626), who is often referred to as one of the founding fathers of modern experimental science, warns us of the human tendency to interpret the world as more familiar than is warranted" (Dommelen, 1998, p. 222). This tendency is not simply relevant in understanding the nature of scientific risk assessment of GMOs in the context of this chapter, but is also relevant to understand the critiques of this scientific risk assessment. For example, "in arguments about supposed familiarity with GMO releases, the cited 'empirical evidence' from 'previous experiences' may in fact not be very informative" (Dommelen, 1998, p. 228). While the scientific risk assessment of cry1Ac gene (which has been inserted into Bt Brinjal) has concluded that the gene is generally innocuous, it has now also been shown that the Cry1Ac protein (which it creates) is a potent systemic and mucosal adjuvant as potent as the cholera toxin which enhances mostly serum and intestinal IgG antibody responses specifically at the large intestine (Vázquez et. al., 1999). On the other hand, the usage of the experience of DDT's oestrogenic effects or CFCs that have played a significant role in the depletion of ozone layer (Rodriguez et. al., 2005) in critiquing the nature of scientific risk assessment of GMOs is equally uninformative in assessing the impact of GMOs on biodiversity. Apart from a call for caution, these experiences in and of themselves provide no reason to question the scientific risk assessment of GMOs.

Every scientific risk assessment is based on the scientific model that is a "schematized attempt to reduce the complexity of the world whilst retaining essential elements and characteristics. […] Without simplification they would be useless; too much simplification (or the wrong kind of simplification) renders them useless again." (Dommelen, 1998, p. 225). In this chapter, I will look at the variations in this scientific model in terms of the mandatory biosafety tests done on Bt Brinjal as they were initially prescribed by GEAC, the subsequent revisions of these tests by the Expert Committees and finally the adequacy of this scientific model in terms of the responses given to the MoSEF by scientists during National Consultations. This scientific model is created around the prescribed tests determined by GEAC in response to the market for GMO production wherein private companies such as Mahyco need to commercialize their product for a return on investment. The changes in this scientific model are evaluated by looking at the revisions orchestrated by GEAC in response to the growing civil society concerns around biosafety of GMOs and the directives issues by the Supreme Court.

Dewey's public as a fragmented entity that gathers around issues is different in each of three cases depending upon the context within which this scientific model is evaluated. With respect to the market of GMO production, the private companies as well as the public institutions engaged in GMO production constitute the public with respect to GEAC. In relation to the formation of Expert Committees, the context of their setup is borne out of the concerns raised by civil society activists and hence, the public in this case comprises primarily of civil society activists. With respect to the concerns raised on the adequacy of this scientific model, the context of these concerns requires a certain amount of scientific expertise on part of the public. While the public that engaged in National Consultations comprised of a multiplicity of stakeholders, these concerns came from a small part of it. Hence, while looking at the adequacy of this scientific model, the public is constituted by scientists who responded to the National Consultations.

This changing interpretation of the scope of the public has to be understood within Dewey's conceptualization of public. Explaining the creation of public, he wrote that, "tools and implements determine occupations, and occupations determine the consequences of associated activity. In determining consequences, they institute publics with different interests, which exact different types of political behaviour to care for them" (Dewey, 1927, p. 44-45). The technology of genetic modification determines the occupation of companies such as Mahyco to produce GMOs for agricultural purposes. The appropriation of these GMOs by farmers could potentially have long-term consequences on the environment. In determining these consequences and their nature, publics with different interests are instituted:

1. A public that is interested in the usage of these technologies as they find the risk assessment to be adequate, e.g., GM companies. In representing this interest, their position can be interpreted to fall into the stereotype of *technological optimism* as explained by Strand (2001), when he writes that within this stereotype "modern biotechnology is to be seen as means for benefit and progress such as increased global food production, environmental benefit by reducing the need for polluting chemicals in agriculture, and improvement of human health by medical biotechnology. Potential negative impacts are seen as minor compared to the benefits, and believed to be manageable" (Strand, 2001, p. 188). They argue that the quality of risk assessment of modern biotechnology is at par with the quality of risk assessment of other emerging technologies.
2. A public that is interested in stopping the current usage of these technologies as they find the risk assessment to be currently inadequate, e.g., civil society activists. In representing this interest, their position can be interpreted to fall into the stereotype of *shallow ecology movement* (Næss, 1973), wherein the consideration is that "technological development [is] a double-edged sword, especially when it encourages or resonates with short-term economic rationality at the expense of equity across the world or between present and future generations" (Strand, 2001, p. 188-189). They offer the following two major arguments to support their critique: (a) The complexity of ecosystems and the current inadequacy of ecological science makes the risks of modern biotechnology difficult to assess. (b) The claims of benefits to poor people would fall short if the use of modern biotechnology is not combined with social or political reform, since this industry is dominated by multi-national companies with profit agendas.

3. A public that is interested in looking at the characteristics of the scientific model of risk assessment to determine whether they are adequate or not, e.g., scientists engaged with GMO research. In representing this interest, their position can be interpreted to fall into the era of *post-normal science* (Funtowicz & Ravetz, 1993) wherein "two attributes of systems uncertainties and decision stakes" (p. 739) are used to distinguish between post-normal science and traditional problem-solving strategies "including core science, applied science, and professional consultancy. […] Post-normal science is appropriate when either attribute is high; then the traditional methodologies are ineffective" (p. 739). In such a situation, a need for an 'extended peer community' arises, consisting of all the stakeholders in an issue, for quality assurance of scientific inputs to the policy process.

And they exact different types of political behaviour to care for their interests. While the GM companies comply with the regulatory regime and follow the protocols of the tests prescribed by them, the civil society activists question the regulatory regime using various methods such as a PIL in SC or an RTI appeal to DBT or approaching media. The scientists have shown two different kinds of political behaviour. On one hand, there are scientists that form a part of the regulatory regime and justify the adequacy of the biosafety tests. On the other hand, there are scientists that question this notion of adequacy by changing the scientific model of evaluating risks. For example, one of the prescribed tests on Bt Brinjal is to confirm substantial equivalence, which is "not a safety assessment in itself; rather it represents the starting point which is used to structure the safety assessment of a new food relative [Bt Brinjal] to its conventional counterpart [traditional variety of Brinjal from which the Bt version was created]. This concept is used to identify similarities and differences between the new food and its conventional counterpart" (Codex Alimentarius Commission, 2008). It helps in the identification of potential biosafety and nutritional issues and is currently considered to be the most appropriate strategy for safety assessment of GM foods. The critiques of this method basically originate from the claim that "more sophisticated and deep analytical approaches may reveal chemical compounds hither to unexpected and unknown, which may make the GE products unsafe for human consumption" (C. K. Rao, 2009). This need for more sophisticated and deep analytical approach symbolizes the change in the scientific model of risk assessment advocated by these scientists.

In the context of these different publics, the role of the GEAC becomes an object of inquiry. When Dewey explains the role of the state with respect to a pluralistic conception of public, he writes that the "doctrine of plural forms is a statement of a fact: that there exists a plurality of social groupings, good, bad and indifferent. It is not a doctrine which prescribes inherent limits to state action. It does not intimate that the function of the state is limited to settling conflicts among other groups, as if each one of them had a fixed scope of action of its own. […] Our hypothesis is neutral as to any general, sweeping implications as to how far state activity may extend" (Dewey, 1927, p. 73). By avoiding any general and sweeping implications of state activity, Dewey provides space for a context-driven state action.

So, when the consequences of the conjoint behaviour of some persons (such as a biotech company) may be such that a large public interest is generated (on the issue of biosafety of GMOs), the state action could lay down conditions (such as regulatory procedures) which will

inevitably involve a large measure of reconstruction within that group (such as the implied changes in the process of GMO production as per regulatory requirements). At other times, state action may follow "a policy of quiescence and *laissez-faire*" (Dewey, 1927, p. 74). The value of the actions of the state is also measured by their consequences. "Just as publics and states vary with conditions of time and place, so do the concrete functions which should be carried out by states" (Dewey, 1927, p. 74). The function of the state changes depending upon the political behaviour of publics that gather around an issue. Hence, this chapter considers GEAC as a representative of the state in determining the regulations on the release of GMOs in India and elaborates on the actions of GEAC as it caters to different publics.

Different concrete functions carried out by GEAC can be observed in its responses to different publics. In responding to Mahyco, the GEAC played the role of the apex regulatory authority ensuring the conduct of appropriate biosafety tests prior to commercialisation. In responding to civil society activists , the GEAC set up Expert Committees to look into the concerns that were raised and revised its mandate around biosafety tests by including additional toxicity, allergenicity and nutritional studies and socio-economic studies on the impact of Bt Brinjal (Choudhary & Gaur, 2009). With respect to the scientists who have questioned that scientific model of risk assessment, the GEAC represented the scientific expertise that has expressed faith in the current strategies of risk-assessment of GMOs. This can be observed in its evaluation that the pre-commercialisation biosafety testing of Bt Brinjal is adequate (Dhar, 2009).

After this evaluation, the GEAC left the final decision for the approval of Bt Brinjal for commercialisation to the MoEF following a policy of quiescence in the midst of a controversy. Post National Consultations, the MoSEF "asked the GEAC to consult scientists to draw up fresh protocol for the specific tests that will have to be conducted in order to generate public confidence" (C. K. Rao, 2010, p. 3). Thus, ultimately the scientific expertise of GEAC in determining the biosafety of GMOs was questioned and its function was reset to determining a new set of protocols for regulation of GMOs. The next three sections of this chapter evaluate the positions of each of these publics with respect to GEAC and the variations in the functioning of GEAC in response to each of them.

GEAC's response to *Technologically Optimistic* public

MoEF and DBT closely follow the international regulatory developments on GMOs. Keeping in view of these developments, the DBT has been updating guidelines from time to time. In 1998, the DBT published a set of revised guidelines which included 'Revised Guidelines for Research in Transgenic Plants' and 'Guidelines for Toxicity and Allergenicity Evaluation of Transgenic Seeds, Plants and Plant Parts'. "These guidelines provide instructions to the applicants on various levels of approval for conducting research on transgenic plants, category of experiments and testing procedures for toxicity and allergenicity" (Choudhary & Gaur, 2009, p. 50). After the setup of these guidelines, the Review Committee on Genetic Manipulation (RCGM), a statutory body housed under DBT, revised the guidelines for toxicity and allergenicity evaluation again in 2008 to create 'Guidelines for the safety assessment of food derived from genetically engineered plants'. These guidelines and protocols have been prepared to address key elements of the safety assessment of food and livestock feeds that may be derived from GM crops (Indian Biosafety Rules and Regulations, 2008).

Owing to the lack of space, this section will not offer a detailed analysis of the testing of Bt Brinjal which can be accessed at the MoEF website (Mahyco, 2008) and can be reviewed by looking at ISAAA Brief no. 38 (Choudhary & Gaur, 2009). This section interprets the concrete function of GEAC in relation to the public that was associated with the stereotype of *technological optimism*. For Strand (2001), the standard conception of risk assessments for the stereotype of *technological optimism* "appears to be an investigation as to whether specific adverse effects can be identified and known causal laws (deterministic or probabilistic) apply to the case of concern" (p. 193).

Hence, while evaluating the impact of Bt Brinjal, GEAC looks into the knowledge of scientific causal laws that can be applied to predict specific or probabilistic outcomes. It will look into whether there is scientific evidence by which a case could be made that commercialisation of Bt Brinjal will have adverse consequences, apart from looking at the results of the biosafety tests that it prescribed. "If there are none (and that is frequently the case), it is concluded that there is no evidence to indicate that the GM product [Bt Brinjal in this case] is likely to cause adverse effects to health or the environment" (Strand, 2001, p. 193). Now, there is no historical precedent for a Bt variety of Brinjal in the world. Also, Bt Brinjal is the first biotech food crop that was evaluated for commercialisation in India. Hence, there cannot be a straight-forward analysis of such scientific evidence to causal laws in literature in the context of Bt Brinjal. So, GEAC changed the lens of its evaluation by looking into scientific evidence for the safety of the Bt protein expressed by Bt Brinjal. "The safety testing for Bt protein was based on the presumption that there is unlikely to be a problem as a number of Bt proteins have been widely used for many years in microbial sprays and in other biotech crops without any incidence of human toxicity" (Choudhary & Gaur, 2009, p. 57). By changing the lens of evaluation, GEAC could certify that Bt Brinjal is safe based on the precedence of causal laws of safety of Bt protein.

Looking specifically at the summary of the toxicity and allergenicity assessment and nutritional studies done between 2003 and 2008 (Choudhary & Gaur, 2009, p. 59-61), "all these studies concluded that Bt protein expressed by cry1Ac gene in brinjal causes no adverse effect when consumed by domestic and wild animals, non-target organisms and beneficial insects" (p. 58). Similarly, looking at the summary of environmental impact studies done between 2001 and 2008 (Choudhary & Gaur, 2009, p. 66-67) and looking at summarized results of agronomic performance in the different field trials conducted by Mahyco and IIVR between 2004 and 2009 (Choudhary & Gaur, 2009, p. 74-75), the study results also show positive outcomes. The reason for the involvement of IIVR was because "GEAC also [assigned] parallel multi-location and large-scale field trials under the All India Coordinated Program of the Indian Council of Agricultural Research (ICAR) […] to compare and validate field trials data submitted by the technology developer" (Choudhary & Gaur, 2009, p. 62). In the absence of negative test outcomes and a positive interpretation of historical precedence of scientific evidence with respect to appropriation of GM crops, the GEAC approved the commercialisation of Bt Brinjal following its mandate as the apex regulatory authority on the release of GMOs in response to the demands from *technologically optimistic* public. But, it relegated the final decision on commercialisation to MoEF.

GEAC's Response to *Shallow Ecologist* Public

This section looks at the progression of events between 2006 and 2009 based on the activities of GEAC in response to the resistance offered by civil society activists to Bt Brinjal. It does not focus on the activities orchestrated by civil society because they will be dealt with in *Chapter 5*. It simply looks at the way GEAC responded to these activities and brings out its way of legitimizing its position as the apex regulatory authority. Hence, along the lines of the previous section, it interprets the concrete function of GEAC in relation to the public that was associated with the stereotype of *shallow ecology movement*. For Strand (2001), the standard conception of risk assessments for the stereotype of *shallow ecology movement* appears to be "an investigation as to whether specific adverse effects can be identified and an evaluation of their likelihood on the basis of the content, reliability and validity of current knowledge" (p. 194).

Before delving into the activities of GEAC, I will illustrate the nature of the responses originating from the civil society. One of the first documents released by civil society activists on the Bt Brinjal issue was the *Briefing Paper on Bt Brinjal* by the CSA in June, 2006. This was after the testing phase of Bt Brinjal had reached the stage of large scale trials pending GEAC approval. The document starts on the pretext that, the importance of large scale trials of Bt Brinjal can be gauged from the fact that no Bt Brinjal has been released for large-scale open field trials anywhere in the world. It will be the first time that GEAC will give permission for large-scale open trials for a food crop in India, "a country which has repeatedly proven itself incapable of regulating GM technology and has allowed contamination as a routine affair. The proliferation of illegal Bt Cotton in the country is a good testimony to serious irreversible lapses that could happen at the trials stage" (CSA, 2006, p. 1). The paper warns that the current safety assessments are inadequate in determining the adverse consequences of GM crops.

It goes on to create a list of concerns regarding Bt Brinjal and evaluating the summary results released on GEAC website on the biosafety tests of Bt Brinjal. For example, it reanalysed the ICAR-supervised, Mahyco-commissioned multi-locational trials in their second year (2005-06) for five hybrids and in their first year for three other hybrids, that have been compared to their traditional Brinjal counterparts. The paper points out that "the data presented by ICAR on Bt Brinjal was not statistically analysed. For instance, the yields across hybrids in the Hyderabad test centre were only 12.04 quintals per hectare. However, the average marketable yield from all locations (231.69 q/ha) conceals this figure. From six centres, the yields were lower than this average, which got skewed by high yield reported from one centre" (CSA, 2006, p. 6). With the list of concerns put together coupled with CSA's experience of practicing Non-Pesticide Management (NPM) of crops, the paper argues that "pest management in Brinjal does not need either pesticides or GM seeds when safer, cheaper alternatives in the control of farmers are available" (CSA, 2006, p. 6). This example of ICAR supervised study is relevant to understand the nature of their dissent. The response has a scientific tenor to it and poses questions on the regulatory processes followed by GEAC. It questions the validity of the analysis of test results and later, through the support of the scientific community, questions the adequacy of the tests themselves.

A Greenpeace briefing on Bt Brinjal states that on 17th July, 2006 as "submissions from independent scientists, consumer groups, farmers organisations and other NGOs pour in stating

their concerns on GE brinjal, the GEAC decides to set up [the first 13 member] expert committee [EC-I] comprising of entomologists, geneticists, nutritionists, [toxicologists, biotechnologists, plant breeding experts] and social scientists to review all the submissions" (Greenpeace, 2007, p. 1). The decision to set-up EC-I was taken in the GEAC meeting on 1st June, 2006, but the committee was finally constituted by a memorandum released on 24th August, 2006 (Warrier, 2006b). "The terms of reference of the Committee were to review literature from studies conducted by various national and international institutions; to evaluate comments received from various stakeholders vis-à-vis biosafety data generated by the technology developer; to suggest additional studies to be conducted; to evaluate adequacy of the protocol proposed for large-scale field trials; to recommend additional safeguards and protocols for socio-economic studies and any other recommendation on the related aspects" (Choudhary & Gaur, 2009, p. 54).

After two meetings held on 25th September, 2006 and 3rd July, 2007 respectively, EC-I offered the following recommendations:

- "Biosafety data generated by Mahyco is in accordance with the protocol and procedures stipulated by the regulatory agency. […] While the data generated by Mahyco demonstrated that Bt brinjal is safe and equivalent to its non Bt counterpart, more studies may be required to re-affirm the findings made in the earlier studies. […] The short term data generated on the environmental safety and socio economic aspects needs to be further substantiated with additional trials/tests to explicitly conclude the benefits from Bt brinjal and superiority of the technology with respect to existing technologies especially the available methods for pest management and pesticide reduction
- The large scale field trials may be allowed subject to certain conditions" (Expert Committee II, 2009, p. 18).

In accordance with the recommendations of the EC-I, the GEAC permitted the conduct of large scale trials at 10 to 11 locations within the institutional research farms of IIVR/state agricultural universities (SAUs)/ICAR under the direct supervision of Director, IIVR for generating additional biosafety data. A review of the compliance to the permit letter issued by GEAC to Mahyco (Expert Committee II, 2009, p. 19-21) reveals that the additional tests recommended by EC-I were carried out by Mahyco and the results were positive.

In parallel to the setup of EC-I, the Civil society activists setup their own 6-member Independent Expert Committee on Bt Brinjal which met in two sessions on 27th and 28th of September, 2006, and 20th of October, 2006, at Centre for Sustainable Agriculture, Hyderabad (The Independent Expert Committee, 2006). It comprised of a soil scientist, toxicologist, plant physiologist, biochemist, entomologist and social scientist. The terms of reference for the Committee were "to evaluate the data presented by Mahyco on Bt Brinjal and its biosafety. On the biosafety tests, specifically compare the protocols used for various tests with the official DBT guidelines" (The Independent Expert Committee, 2006, p. 2). This was coupled with evaluating the feedback sent to the GEAC from civil society; looking at issues beyond biosafety, including the need for Bt Brinjal and suggesting a future course of action to GEAC. This evaluation as established *Chapter 3* was based on the summary of test results published on MoEF website in

June 2006. Their evaluation, as also mentioned in *Chapter 3,* claims that Mahyco did not adhere to DBT research guidelines in conducting their tests on Bt Brinjal (Kuruganti, 2006).

In the beginning of 2009, GEAC received the final reports from IIVR and Mahyco on the additional tests as well as the large-scale trials of Bt Brinjal. Meanwhile in the period between 2006 and 2009, it also received several representations on civil society concerns to human health and environment from Bt Brinjal. These representations of issues raised by NGOs and other stakeholders were related to "safety of the protein, environmental safety and food and feed safety" (Expert Committee II, 2009, p. 54). In response to these developments, GEAC constituted the second 16-member 'Expert Committee' (EC-II) on 29th May 2009 in accordance with the decision taken on 14th January, 2009. This committee comprised of geneticists, toxicologists, nutritionists, biomedical researchers, cellular biologists and biotechnologists among others.

The terms of reference for the Committee were revised from their original mandate of suggesting "further studies, if any, based on the review of the international practices in biosafety assessment and representations received by the GEAC" to finally reviewing "the biosafety data of Bt brinjal in light of the available scientific evidence, reports from international / national experts and representations from NGOs and other stakeholders" (Sharma, 2009). The Committee, in their report presented in 14th October 2009 to GEAC, ultimately recommended that "Bt brinjal […] is safe for environmental release in India [and it] has been extensively tested for its biosafety and no additional studies/review are necessary" (Expert Committee II, 2009, p. 64).

Section V of the EC-II report deals specifically with the issues raised by Civil Society and the submissions made by the scientific community to GEAC (Expert Committee II, 2009, p. 54-61). These issues have been documented and tabulated in *Table 1: Conflicting Views on the Scientific Risk-Assessment of Bt Brinjal between Responses of EC-II and Responses to EC-II* in the next section because their analysis and interpretation, at times, requires a change in the scientific model used to assess Bt Brinjal. The civil society activists did not simply dissent at the way risk-assessment was being carried out. They also objected to other related concerns: First, "the large scale trials' findings along with findings from pollen flow, soil impacts and crossability studies were put in the public domain only on November 16th 2009, a full month after the Expert Committee [EC-II] came up with its recommendation and this did not go through any independent analysis or review" (Sharma, 2009). Secondly, they pointed out the need to change the mandate of EC-II and change in its constitution to ensure that there are no conflicts of interest.

This issue of conflicting interests was dealt with in detail by civil society activists, wherein they systematically looked at all the 16 members of EC-II and brought out that most of these members have either been a part of the development of Bt Brinjal or a part of Monsanto/Mahyco-sponsored studies or they did not take part in the deliberations of the meetings at all (Kuruganti, 2010a). Ultimately claiming, in the words of Bhargava, one of the two scientists appointed by SC to be present in all GEAC meetings, that the GEAC approved commercialisation of Bt brinjal "under pressure. […] He said the chairperson of the committee, Dr Arjula Reddy, called him up two weeks ago and said he was under 'tremendous pressure' to

clear Bt brinjal. He had also received calls from the 'agriculture minister, GEAC and the industry' to give the clearance, Dr Bhargava quoted Dr Reddy as saying" (Express News Service, 2010).

An analysis of this claim around pressure on EC-II to approve Bt Brinjal is subjective and cannot be determined by simply looking at newspaper articles. Hence, the next section operates on the assumption that the response of EC-II to civil society represents the viewpoint of GEAC, which has endorsed the EC-II report. The major difference in the two conceptions of risk-assessment in response to the two stereotypes is a shift from current knowledge of causality to reliability and validity of current knowledge. Within a framework of knowledge of causality, the presumption that "there is unlikely to be a problem [in biosafety testing of Bt protein] as a number of Bt proteins have been widely used for many years in microbial sprays and in other biotech crops without any incidence of human toxicity" (Choudhary & Gaur, 2009, p. 57) holds true. But, as soon as the focus becomes reliability and validity of this knowledge, a study that proves Cry1Ac protein is a potent systemic and mucosal adjuvant as potent as the cholera toxin (Vázquez et al., 1999) puts a question mark on this presumption. The GEAC tried to incorporate the concerns of *shallow ecologist* public by the setup of EC-I and EC-II and did answer quite a few concerns through their expertise, but the results were not positive. The *shallow ecologists* remained doubtful and ultimately requested international community of scientists to provide a third perspective on this dialogue. These responses (Andow, 2010; Gurian-Sherman, 2010a; Seralini, 2009) among others will be discussed in the next section.

GEAC in the era of *Post-Normal Science*

The placement of GEAC in the era of *post-normal science* is borne out of the criticism that has been succinctly summarized by David Andow (2010), an entomologist from University of Minnesota. His report is "the outcome of a series of discussions with several scientists, at the request of Aruna Rodriguez" (p. ii). It is built on the claim that, "the GEAC set too narrow a scope for environmental risk assessment (ERA) of hybrid Bt Brinjal, and it is because of this overly narrow scope that the EC-II is not an adequate ERA" (p. 1). The difference in the opinion of the GEAC and the public that emanates from the era of *post-normal science* is basically based on the different interpretations of the scope of an ERA and the absence of a consensus on defining this scope.

Within this setting, the issue of Bt Brinjal could not have been resolved simply by the setup of an Expert Committee. As Funtowicz and Ravetz (1993) observe, "When problems lack neat solutions, when environmental and ethical aspects of the issues are prominent, when the phenomena themselves are ambiguous, and when all research techniques are open to methodological criticism, then the debates on quality are not enhanced by the exclusion of all but the specialist researchers and official experts. The extension of the peer community is then not merely an ethical or political act; it can positively enrich the processes of scientific investigation" (p. 752-753). This extension of the peer community was brought about the MoEF in the organisation of National Consultations on Bt Brinjal. This very act of organisation lends a character of post-normal science to the process of resolving the Bt Brinjal controversy.

Post-normal science as defined by Funtowicz and Ravetz (1993) is characterized by two notions. First is the notion of 'system uncertainties' which "conveys the principle that the problem is concerned not with the discovery of a particular fact, but with the comprehension or

management of an inherently complex reality" (p. 744). Second is the notion of 'decision stakes' which implies "all the various costs, benefits, and value commitments that are involved in the issue through the various stakeholders" (p. 744). The factors that characterize an issue within post-normal science are the uncertainty of facts, dispute in values, high stakes and the requirement of urgent decisions. If an issue is marred with these factors, "the term 'problem', with its connotations of an exercise where a defined methodology is likely to lead to a clear solution, is less appropriate. We would be misled if we retained the image of a process where true scientific facts simply determine the correct policy conclusions" (p. 744). This uncertainty around scientific facts results from a change in the way of looking at the scientific model that determines that validity of a scientific observation.

Table 1 showcases the resolution of the issues that EC-II considered and how they were problematised by changing the nature of the questions that were asked. The table not only showcases the various issues raised by the community of scientists who participated in the Bt Brinjal debate, it also provides an insight into differing opinions on risk-assessment as showcased in the approach of EC-II in answering these concerns and the response given to the resolution offered by EC-II.

Issues addressed by EC-II	Response of EC-II to the issues	Response to EC-II
Bt brinjal has been modified to produce an unknown chimeric insecticide toxin containing cry1Ab and cry1Ac modified sequences. In the toxicity tests on target and non-target insects, this chimeric toxin has not been used but instead, an improper cry1Ac toxin was used because this control was easier. This could also make these tests not valid (Seralini, 2009, p. 6).	The resultant protein by combining cry1Ac and cry1Ab encoded by this gene is 99.4% identical to native Cry1Ac. This difference is due to one amino acid change. The argument that this protein is unknown is incorrect as detailed characterization has been undertaken and is based on wrong presumption that this protein is a combination of two proteins.	Contrary to EC-II's assertion that this difference is due to a single amino acid change, it is easy to see that for a protein of the size of Cry1Ab-Cry1Ac, this would involve 6 or 7 amino acid differences. Multiple amino acid differences are capable of causing significant alterations in protein structure (Manjrekar, 2010).
Two unnecessary antibiotic marker genes have been used in Bt brinjal. Antibiotic resistance is recognized to be a major health problem and the commercialisation of such a food is not advisable (Seralini, 2009, p. 6).	Though, the antibiotic resistance genes produce enzymes that can degrade antibiotics, it has been proven that the enzymes from these genes are produced at such low levels that is absolutely ineffective on the antibiotic. The two genes used in Bt brinjal have already been accepted for use by regulatory authorities around the world and the crops containing the same have a history of safe use for more than two decades.	The expression level of the marker genes is assumed to be low. This should be demonstrated empirically (Andow, 2010). Reviews by regulatory authorities worldwide will not be readily applicable here – one, because of antibiotic resistance as a prevalent problem in India; two, consumption patterns of food are different in India where highly processed foods are not consumed and in the case of Bt Brinjal, it could be consumed in numerous ways that more or less involve direct consumption (Kuruganti, 2010d).

Limited data on gene flow distance cannot substitute risk assessment of potential harm from gene flow and is wholly inadequate to predict gene flow. Since India is the centre for domestication and genetic diversity of brinjal, it is recommended that gene flow from Bt Brinjal should be seriously considered and evaluated pre-commercialisation (Gurian-Sherman, 2010b).	The impact of gene flow to wild relatives of cultivated brinjal has been considered. It has been reported that there is no natural crossing among cultivated and wild species of brinjal (N. Rao, 1979). Under forced crossing situations, even if crossing was possible, the viability and subsequent development of stable crosses was unsuccessful. These crossability studies have been repeated by IIVR with the same result.	The focus shifts from crossability-analysis to genetic contamination of wild species. There is insufficient evidence that 1) wild or weedy relatives of brinjal would not obtain a fitness benefit (greater survival capabilities) from a Bt transgene should gene flow occur; 2) wild relatives of brinjal will not suffer reduced genetic diversity from the introgression of the Bt transgene; and 3) non-GM brinjal will remain uncontaminated by Bt brinjal. All of these risks need to be evaluated (Andow, 2010, p. 3).
Field trials are an inadequate basis to assess impacts on the agrosystem: • Studies of long term effects are lacking • Studies on beneficial insects and secondary pests are lacking	Mahyco has conducted extensive field trial across various agro-climatic zones to assess the effect of Bt brinjal on a variety of non target organisms as well as beneficial organisms. The protocols followed in these studies field evaluations are consistent with the internationally accepted procedures.	Only 1 of the 7 species tested in the laboratory to assess environmental risk occurs in brinjal fields in India. These laboratory tests provide little relevant information about the potential impact of Bt brinjal on species in India. The multi-site field trials (MST) do report data on the risk of potential non target pests. EC-II overstates conclusions based on the limited and highly variable data (Andow, 2010, p. 4).
Limited environmental studies of Bt brinjal risks have been performed on an extremely little part of soil microflora, collembola, nematodes and earthworms (Seralini, 2009, p. 10).	While it is correct that it is not possible to culture many soil fungi and bacteria, indicator species measured provide a framework for evaluation of soil effects. Hypothetical "evolutions and reactions" are not justifications for invalidating the studies conducted. Soil microflora studies have been carried out in almost every growing season since 2003 in more than 50 locations in India and no evidence of any impact on soil microflora has been noticed.	EC-I had recommended to record the impacts on the next crop planted after Bt Brinjal and this was not done. The reports suggest that there is no Bt toxin identified in the soil where as earlier studies on Bt cotton in India by IARI show that Bt toxins were found in the soils for significant time (more than 45 days). For Bt Brinjal, if the reports say that no Bt toxin was detected, the methodologies need to be rechecked. Data shows variations between microbial profiles between soils growing Bt Brinjal and non-brinjal but no statistical analysis was done to ascertain whether it is significant (Ramanjaneyulu et. al., 2010).
Cooked forms of Bt brinjal are supposed not to contain Cry1Ac although the specificity and sensitivity of the assay does not form a part of the dossier. Thus this cannot be accepted as proof that the Bt toxin is not present in cooked Bt Brinjal.	All cooked forms of Bt brinjal have been tested using ELISA method, which is an established and accepted method for testing the presence of protein. Further it has been shown that Cry1Ac protein is heat labile and is not expected to be present in any cooked form of Bt Brinjal. ELISA results have confirmed the same.	This does not address the fact that further metabolites have not been tested and that there could be other forms of consumption of Bt Brinjal, which do not require cooking. The response also only looks at Cry1Ac. It also does not explore whether the harm from a GM food like Bt Brinjal is limited to Cry1Ac or newer unpredictable proteins too (Kuruganti, 2010d).

It is also expected that cooking degrades at least in part the Bt toxin. However there is no information on toxicity and allergenicity of the resulting products.	Bt protein breaks down into common amino acids in the digestive system, which are part of the normal diet and are neither toxic nor allergic. The Cry1Ac protein has been extensively tested internationally in various digestive assays and found to be safe.	In studying the fate of a protein after ingestion, it would be necessary not only to look at the stability of the entire protein, but also to examine the degree of degradation that occurs, and whether these degraded products might have effects distinct from the intact protein (for instance, their ability to evoke immune responses). None of these issues have been addressed in the study beyond the cursory in vitro examination of Cry1Ac 'digestibility' (Manjrekar, 2010).
Studies for toxicity assessment and nutritional effects in mammals have been limited to a maximum of 90 days period or less, which is not adequate and there is a need for long term studies for assessment of chronic effects (Seralini, 2009, p. 9).	The studies undertaken in Bt brinjal so far comply with the international guidelines as well as ICMR Guidelines accepted by GEAC. No long term studies are required because the Cry1Ac has been extensively studied for its safety.	This approach of individual genes and citing safety studies around them is completely inadequate since several studies with GM foods with these genes incorporated into them have shown numerous adverse impacts (Kuruganti, 2010c). The over-reliance of the GEAC risk assessment on the specificity of the Cry1Ac protein is not scientifically justified, and the risk assessment is considerably more uncertain than presently indicated (Andow, 2010, p. 31).
Variation in the observations regarding the response of animals during the toxicity studies have been ignored and not been taken into consideration while drawing inference on the safety of Bt brinjal (Seralini, 2009, p. 2).	In the animal feeding studies conducted with Bt brinjal, no statistically significant changes have been observed in the parameters tested. All values are within the normal physiological ranges, and are not associated with any histopathological changes.	The small numbers of rats used in the toxicity studies and the small numbers of brinjals used in the "compositional analysis" severely confound any attempts at statistical analysis of the results to the extent that only large, gross effects would appear as statistically significant in the data. In other words, the study has little sensitivity to uncover effects which might have manifested as statistically significant in larger samples (Manjrekar, 2010).

Table 1: Conflicting Views on the Scientific Risk-Assessment of Bt Brinjal between Responses of EC-II and Responses to EC-II

Table 1 incorporates the issues addressed by EC-II in Section V of their report (Expert Committee II, 2009, p. 54-61). I have tracked back most of the *Issues Addressed by EC-II* to the sources (Gurian-Sherman, 2010b; Seralini, 2009) from which they emanate, while for a few of them I could not locate the original documents. The *Response of EC-II* has been borrowed from their report (Expert Committee II, 2009) and the *Response to EC-II* has been documented from the responses given by the community of scientists during the National Consultations on Bt Brinjal. A discernable pattern that can be observed in EC-II responses is the adherence to the present international standards of regulation of GMOs. It establishes faith in the present evaluation system of GMOs and renders all doubts to be accounted for within the regulatory

regime. The pattern in the opposition to these responses comes from an ecological understanding of the release of GMOs into the environment which cannot be accounted for in the present regulatory evaluations of GMOs which gives them a GRAS status.

This brings out the traditional fact/value distinction in resolving a controversy. "Post-normal science has the paradoxical feature that in its problem-solving activity [that] the traditional domination of 'hard facts' over 'soft values' has been inverted" (Funtowicz & Ravetz, 1993, p. 750). Because of the high level of uncertainty, approaching sheer ignorance in some cases, and the extreme decision stakes, facts lose their distinctive 'hardness' and become subject to questioning based on the 'values' expressed by a variety of stakeholders. Hence, even the presumption of the "safety of Cry1Ac protein which has been extensively tested internationally in various digestive assays" (Expert Committee II, 2009) is questioned within a different ecological value system of evaluation. Within this system, the approach of looking at "individual genes and citing safety studies around them [becomes] completely inadequate since several studies with GM foods with these genes incorporated into them have shown numerous adverse impacts" (Kuruganti, 2010c). There is an acknowledgement of the difference in the ecology of GM food as compared to the ecology of the Bt protein. While the protein may be safe, the food crop containing the protein is not.

Before concluding this section, I will look at the responses of the two scientists who were asked by the Supreme Court to be invited to all GEAC meetings, when the applications regarding GMO production were considered and before granting approval to applicants. These two scientists, Bhargava and Swaminathan played a pivotal role in MoSEF's decision on the moratorium (C. K. Rao, 2010). Bhargava who had already created a list of tests that need to be done before granting approval to GMOs (Bhargava, 2002) found the tests to be wholly inadequate and vested with corporate interests of Monsanto (Bhargava, 2010). It has to be noted here that EC-II took the tests recommended by Bhargava (2002) into account and commented that, "several studies recommended by Dr. Bhargava are neither relevant nor applicable in the instant case. [… The] guidelines and protocols prescribed by RCGM and GEAC are in line with the internationally accepted norms by FAO, WHO, OECD, and Codex Alimentarius" (Expert Committee II, 2009, p. 61). On the other hand, Swaminathan (2010) had two requests before the release of Bt Brinjal for commercial cultivation: (a) the collection, cataloguing and conservation of the existing variability of Brinjal by ICAR and (b) careful study of the chronic effects of Bt Brinjal on human health by NIN and CFTRI.

In Table 1, I only offer a glimpse of the variety of scientific inputs that were a part of the controversy over the years. While the scientific inputs will require a greater amount of detailing, this section brings out how the GEAC is placed within a public belonging to the era of *post-normal science*. The GEAC represents the current regulatory regime whose focus is to ensure the conduct of biosafety tests considered appropriate in accordance with international standards. It has to represent a faith in its evaluation and protect the *technologically optimistic* public because they provide legitimacy to its operation. In playing this role, it refused to give out detailed information on the biosafety tests as requested by Raghunandan to protect the commercial interests of Mahyco (refer *Chapter 3*). It also took up the stand of protecting its evaluation of Bt Brinjal by showcasing an adherence to international regulatory standards. In the words of Dewey, it carried

out its occupation and in turn determined the 'consequences of associated activity' of its occupation.

It is this lack of foresight as to the consequences of their associated activity that created the Bt Brinjal controversy. In protecting its evaluation and the commercial interests of Mahyco, it lost the trust of other publics with different interests that emanated from these consequences. This could be interpreted as a theoretical explanation of their decision to leave the final approval of commercialisation of Bt Brinjal to MoEF. By losing the trust of different publics, the GEAC no longer represented the state and became a stakeholder in the controversy, leaving the concrete function of the state to MoEF. The MoEF, in response, took the safest route out of the controversy by imposing a moratorium on the commercialisation of Bt Brinjal and reinstating GEAC as a representative of the state that needs to come up with new regulatory protocols with a larger base of public trust (C.K. Rao, 2010).

The Citizen in a Scientist

This chapter offers a further exploration into Dewey's conceptualisation on the nature of publics that gather around an issue. The first two chapters elaborated on Dewey's conceptualisation of methods that enable social inquiry leading to the creation of public. This chapter looked into how issues themselves could lead to creation of different publics that exact different types of political behaviour to care for them. The context, within which different publics gather around an issue, will change depending on the interests that these publics showcase with regard to the issue's resolution.

This chapter showcased three different publics with different expectations from the scientific risk assessment of Bt Brinjal. Among these three, the expectations of the first two publics that have been interpreted to represent *technological optimism* and *shallow ecology movement* could be understood from the context within which they participate in the controversy. While the *technological optimists* are the ones who produce GMOs, the *shallow ecologists* are civil society activists who want to promote alternatives to GM technologies. Hence, in order to explain the context of the third public, the conclusion of this chapter will focus on the public interpreted to represent the era of *post-normal science*. It specifically focuses on the idea of the citizen in a scientist which implies that while carrying out the occupation of scientific practice, this public are also citizens that participate in the construction of Bt Brinjal as a political object. They specifically use their scientific expertise to make this political object and add to the controversy.

Funtowicz & Ravetz (1993), in their elaboration of post-normal science specifically address the changes in the nature of scientific practice in present times and how scientific issues have become similar to political issues. Scientific practice now incorporates the management of irreducible uncertainties in knowledge and in ethics, and should recognise different legitimate perspectives and ways of knowing. "In this way, its practice is becoming more akin to the workings of a democratic society, characterized by extensive participation and toleration of diversity. As the political process now recognizes our obligations to future generations, to other species and indeed to the global environment, science also expands the scope of its concerns" (p. 754). This is commensurate with the idea of co-production (Jasanoff, 2004) of scientific practice between scientists and the society within the idea of post-normal science.

The inversion of the fact-value hierarchy and the inclusion of an extended peer community lend a greater understanding of how the practice of science around uncertain issues requires a greater participation of publics with different interests. Previously the assumptions around scientific practice have been that these interests are external to the work of science or technology; and society will automatically respond to the problems of uncertainty as and when they emerge. "Now, the task is to see what sorts of changes in the practice of science, and in its institutions, will be entailed by the recognition of uncertainty, complexity and quality within policy-relevant research" (Funtowicz & Ravetz, 1993, p. 754). This task enables a scientist to prioritize his/her role as a citizen in determining the consequences of scientific practice within research that leads to policy formulation.

Thus, this change in perspective in understanding the practice of science and technology has repercussions on the way citizenship is envisioned and practiced. As Jasanoff puts it, "The dynamics of politics and power, like those of culture, seem impossible to tease apart from the broad currents of scientific and technological change. It is through systematic engagement with the natural world and the manufactured physical environment that modern polities define and refine the meanings of citizenship and civic responsibility, the solidarities of nationhood and interest groups, the boundaries of the public and the private, the possibilities of freedom, and the necessity for control" (Jasanoff, 2004, p. 14). By locating these publics in scientific risk assessment within the Bt Brinjal controversy, this chapter aims to refine the meaning of citizenship for the public that is interpreted to represent the era of *post-normal science* and civic responsibility of GEAC.

The concrete function of GEAC as a representative of the state is to ensure a trust within the citizenry of the state around its competence. While its occupation may revolve around regulating GMO production and release, its accountability ranges beyond its occupation to every citizen. It is within this pretext of accountability that the *shallow ecologists* found the GEAC to be lacking. As citizens seeking to ascertain facts about the natural world, the civil society activists "are confronted, necessarily and perpetually, by problems of social authority and credibility. Whose testimony should be trusted, and on what basis, [then] become central issues [as they seek] reliable information about the state of a world in which all the relevant facts can never be at any single person's fingertips" (Jasanoff, 2004, p. 29). This makes a citizen like Aruna Rodriguez go to David Andow for answers as she finds the GEAC to be untrustworthy. This example illustrates the failure of GEAC in carrying out its function as the representative of the state.

The practice of science is not independent of the state and it is also an occupation with consequences of associated activity. It is the difference in the understanding of these consequences that divide the scientists into two factions. There are scientists who support the GEAC and believe in the current regulatory regime. And then there are others who question the scope of ERA within the regulatory regime and hence, question GEAC. The differences in their approach to ERA is not simply a difference in scientific opinion, it also has repercussions on the activities of the state, in particular, GEAC in the present context. While the moratorium does not resolve this difference, it provides space as well as time to these scientists to evaluate the regulatory regime with a focus on its consequences for the future generations.

It is easier to claim familiarity with *un*safety of an application, for example, with known pathogens; it is easy to justify the claim of harmful effects with no need for further assessment, because there is an obvious possibility of harmful effects. However, it is not so easy to claim familiarity with safety of an application. "For those who rely on the notion of familiarity as a possible avenue for claiming safety, the burden of proof is upon them to argue that suggested hazard mechanisms need not be included in the well-defined system that is used for hazard identification" (Dommelen, 1998, p. 233). The GEAC is currently facing this burden of proof and as a scientist, who participated in the debate, whether for or against Bt Brinjal, it should be a part of their civic responsibility to scientifically establish a well-defined scientific model for hazard identification which is acceptable to entities engaged in GMO production in India.

There is a recognition of bias within different stakeholders in the conceptualization of post-normal science. But, its objective is to maintain a certain sense of quality in policy decision-making that ensures public trust. Without the extension of scientific practice of regulation akin to the workings of a democratic society, characterized by extensive participation and tolerance of diversity, these issues cannot be resolved beyond the moratorium. In the absence of continuous constructive advice in the future around reformulation of the regulatory procedures, the comments made by scientists who opposed Bt Brinjal become more of a rhetoric than a critique. The moratorium is not the end of the debate on Bt Brinjal in India; it is a new starting point. This starting point could be seen as the future of citizenry in science.

5

The Communitas of Anti-GM Civil Society: Coalition for GM-Free India

Until now, the previous chapters have explored two methods that have been used to gather a public around the issue of Bt Brinjal that is the PIL petition and the RTI application. After that, the different publics that had gathered around the issue of scientific risk assessment of Bt Brinjal were studied to illustrate how the consequences emanating from an issue institute publics with different interests. This chapter will now zoom into the activities of the public that was interpreted to represent the stereotype of *shallow ecology movement* in *Chapter 4*. These activities are important because they played an important role in the decision of GEAC to refer the final decision on commercialisation of Bt Brinjal to MoEF and in the decision of MoSEF to organize the National Consultations on Bt Brinjal. These activities were organized under the banner of Coalition of GM-Free India. This Coalition is not structured as an organisation. "There is nothing like one registers in as a member and then subscribes out. There is a common issue and anyone who works on that issue, at any point of time, is a part of the Coalition" (Krishnan, Interview, June 22, 2011). The issue that Krishnan is referring to here is the possible adverse consequences of the usage of GMOs in agriculture. This makes the Coalition inclusive and enables public to gather under its banner.

Before elaborating on the activities of the Coalition, I will provide a theoretical construct to explain its origin. This theoretical construct not only enables a better understanding of their activities; it is also useful in understanding the circumstances that led to the setup of the Coalition. In this chapter, the structure of the Coalition has been explained using Victor Turner's (1964) conceptualization of the idea of Communitas. Communitas in anthropology is "the sense of sharing and intimacy that develops among persons who experience liminality as a group" (Stinmetz, 1998). Turner (1964) adapted the word 'communitas' from Paul Goodman's (1947) original usage that implied town planning on community line. Turner used 'communitas' extensively in anthropology "to mean a relational quality of full, unmediated communication, […], between people of definite and determinate identity, which arises spontaneously in all kinds of groups, situations, and circumstances. […] Furthermore he recognized it in many different societies among those in betwixt-and-between circumstances, those going through some threshold or limen in life together, that is, in a time of liminality." (Salamone, 2004, p. 97).

Turner's conceptualization of communitas has been criticized to be oversimplified and idealized (Eade & Sallnow, 1991), but for the purpose of this chapter, his conceptualization offers a vantage point to understand the activities of Coalition. There are three ideas that are important to the conceptualization of Communitas. First, that communitas is a specialized form of a community that exists between people who experience the same *liminality* together. Second, it is embedded in a space where there is *full, unmediated communication* between these people. And third, these people have a *definite and determinate identity*.

The persistent notions of science governance in India, as explained in the *Chapter 1*, are important in understanding the liminality that is experienced by people who formed the Coalition. Some NGOs and other consumer groups that believe in organic farming, non-pesticide management of crops, integrated pest management of crops, sustainable agriculture and awareness groups that do not accept the ideology of genetic modification as the future of agriculture are in a betwixt-and-between situation. The old Green Revolution policy paradigm allowed for a mutual co-existence of its own hybrid varieties for crops and methods of yield growth using fertilizers and pesticides with the farming methods advocated or practiced by these groups. On the other hand, this new Gene Revolution policy paradigm could be interpreted as a threat to the way of operating of these groups because of reasons, ranging from the fear of genetic contamination if they continue their farming practices to the fear of changes in the agricultural ecosystems that would make their farming practices unviable. Hence, these groups are stuck in an intermediate phase, where they find the new policy paradigm to be unacceptable and since the policy paradigm has moved forward, they cannot simply make a case for a return to the old paradigm.

This intermediate phase is filled with a sense of ambiguity and indeterminacy because it could be interpreted and experienced in a multiplicity of ways. Turner (1964) used the word 'liminality' to express this condition. Liminality is derived from the Latin word 'limen' which means a threshold ("Liminality," n d). As an idea liminality exists between two individual concepts, outside their individual realms but still connecting them together. A communitas is formed by people experiencing such liminality. Turner (1964) used rites of passage to illustrate liminality. For him, rites of passage form an intermediate phase in time that exists between two different phases of life as a child and as an adult and people who experience this liminality together develop intense community spirit, the feeling of great social equality, solidarity, and togetherness. This sense of togetherness is then expressed in their activities as a group. In the context of the organisations that formed the Coalition, this experience of *liminality* is borne out of the changes within the Indian agricultural policy paradigm.

To interpret the activities of the Coalition to be simply a direct opposition to GM proponents in India would be an overt simplification. While a few members of the Coalition have an anti-GM mandate such as Greenpeace India and Gene Campaign, there are others who also propose a different ideology for agriculture such as the CSA, Hyderabad with their non-pesticide management strategies (Quartz, 2011). "In the genesis and central tendency of communitas, communitas is universalistic. [...] Communitas [... is] open and unspecialized, a spring of pure possibility [...] giving release from day-to-day structural role-playing, and it seeks oneness. This does not involve a withdrawal from multiplicity but [it] eliminates divisiveness" (Salamone, 2004, p. 98). The Coalition in its mandate for GM-Free India envisions a multiplicity of strategies by which this could be achieved. The implications of GM-free differ with respect to different ideologies of the member groups. Whether it is organic farming or integrated pest management of crops; the underlying ideologies of different member groups does not divide the Coalition in its anti-GM stand. In this sense, the opposition to GM crops is the 'oneness' for the Coalition (their *definite and determinate identity*) that lets its members move beyond their individual ideologies within their own institutional setups. While the central mandate of the Coalition remains anti-GM, it still remains 'open and unspecialized' as to how this could be achieved.

In a conversation with Kavitha Kuruganti, she pointed out that the activities of the Coalition focused on outreach to spread information and awareness about uncertainties of GM technology. This focus created the space for *full, unmediated communication* that enables the formation of a Communitas. The outreach programs were designed with a realization that "people are unable to visualize the kind of sweeping changes that the GM crops have the potential to make with respect to Indian agriculture" (K. Kuruganti, Interview, March 11, 2011). This required the Coalition to "bring everyone together – the farmer unions, some consumer groups working on sustainable agriculture – because more than anyone else, the ones who have already analyzed and found a problem in the current paradigm of farming and have painstakingly set up alternatives, whether it is certified organic or any other kind of organic, are the most suited to spread this information. [They believed] that unless everyone comes together, [they] would not be able to stop GM crops from coming into India" (K. Kuruganti, Interview, March 11, 2011). The presence of all the three factors that lead to the formation of a communitas can be observed with this analysis. Hence, I have interpreted the Coalition to be a communitas.

The objective of this chapter is to provide a picture of the activities of this communitas called Coalition for GM-Free India which was formed in 2006, "representing organisations and individuals from more than 15 states of India. The Coalition has been active since then in raising awareness among civil society groups, media and the general public, and in creating an informed debate on GMOs" (Kuruganti, 2008). It would specifically look at the outreach programs devised by the group to involve a larger public into the discussion and to spread awareness around the "technical implications [of GM crops] on health and environment, [their] socio-political implications and trade issues [related to them]" (K. Kuruganti, Interview, March 11, 2011). The chapter does not offer comprehensive details on their activities, but offers a collection of these activities to qualitatively bring out the nature of their critique.

Their critique follows two trajectories. First is the opposition to GM crops and the second being the future of Indian agriculture beyond GM crops. This chapter establishes that the Coalition has a stronger focus on the opposition to GM crops as compared to the future of Indian agriculture without GM crops. The differences in the ideologies of different groups that came together to form the Coalition could be interpreted as one of the reasons that the critique on the opposition to GM crops is stronger.

A Historical Note on Coalition for GM-Free India

The Coalition took shape and formalized its activities in 2006. There is a lack of available sources of information as to how the Coalition was setup. Even the website that they setup to collate and publicize information about GM technologies (http://www.indiagminfo.org/) is not completely functional anymore. Hence, this section can only offer a sketch of how the Coalition came to be by joining parts of different narratives of people who were active within the Coalition. Two interviews were conducted to ascertain the history of the formation of the Coalition with Kavitha Kuruganti and Rajesh Krishnan. The other sources of information are snippets from newspaper articles and the blog authored by Devinder Sharma who was one of the petitioners in the PIL and actively supported the work of the Coalition. The rest of the members of the Coalition could not be interviewed because of the restricted timeframe for this research and hence, a complete oral history account of the setup of the Coalition has also not been possible.

Talking for the formation of the Coalition, Sharma wrote on his blog that, "The journey [of the setup of the Coalition] actually began […], on Jan 26, 2006. I had gone to deliver a public lecture on WTO and agriculture at Thiruvanthapuram in Kerala. It was there that I suggested to Jayakumar, head of a local NGO – Thanal – that we need to bring some like-minded groups and people together on the issue of agriculture. We need to form a national alliance of people who are striving to work for sustainable agriculture, which in our thinking is the surest way to ameliorate poverty and hunger. In the next few months we were able to identify a few NGOs/groups across the country, who we thought had the same wave length. Picking one, then other, and another, a movement had slowly but steadily taken roots. [...] I don't know at what stage the alliance thought of formalising its activities under the banner of a Coalition for GM-Free India, but I remember that we were concerned at the way the agricultural universities were engaged in developing transgenic seeds, and knew that it was probably the biggest threat the country was likely to be faced with in the years to come. With the government facilitating the takeover of agriculture by the private companies, there was no other way than to educate the people of the dangers ahead" (Sharma, 2010). This note establishes the framing of the policy paradigm for the members of the Coalition. For them, within the Gene Revolution policy paradigm, the government is encouraging corporatization of agriculture and sustainable agriculture practices are threatened in these circumstances.

Sharma did play a pivotal role in the setup of the Coalition as ascertained in the interview with Kuruganti. "In 2006, several of us, mainly me and my colleague at CSA, Dr. Ramanjaneyulu, and Dr. Devinder Sharma got talking about how there is not enough information or debate around GM crops in the country. So, in May 2006, about 22 groups from, I think, 12 states, eight or 12, I don't remember, we sat in Bapu Kutir, Sevagram [close to Nagpur, Maharashtra] and that is where the coalition was named, that is where it began. In that meeting, we not only named ourselves as the Coalition for a GM Free India, we listed down all the reasons, for the purpose of telling others also why is it that we don't want GM crops coming into India." (K. Kuruganti, Interview, March 11, 2011).

By July, 2006, the Coalition had increased in size to the extent that during the time when GEAC invited responses on Bt Brinjal for the first time, the list of signatories to the response from the Coalition had 120 names and most of them were affiliated to different grass-roots organisations (Coalition for GM-Free India, 2006). According to Sharma who wrote his blog entry in 10th February, 2010, "the Coalition today spans across the country, and has a huge reach through the farmer organisations, women groups and movements, NGOs, civil society groups, doctors, nutritionists, scientists, actors and film makers, consumers, students, teachers and even spiritual leaders" (Sharma, 2010). As the Coalition increased in size because of its outreach programmes, its impact on the Bt Brinjal controversy also kept increasing.

Looking into the activities of the Coalition, the group continuously organized outreach programmes along with ensuring a steady feedback to the GEAC. Reporting on important activities of the Coalition, Kuruganti wrote for Institute of Science in Society, that "On 8 April 2008, [the Coalition] undertook concerted direct actions to highlight the dangers of GM crops in general and Bt Brinjal in particular. They targeted the state governments, which have a constitutional responsibility and authority with regard to agriculture-related issues. This [was] a

prelude to a national level protest in Delhi on 6 May 2008 where hundreds of concerned citizens – farmers and consumers – [joined] the protest from around 15 states" (Kuruganti, 2008). In the same report, the activities on 8th April, 2008 were posed to be "at a crucial time when ecological farming is spreading rapidly all over India, supported by civil society groups including those in the Coalition for GM-Free India. It should convince the government that safer and much more sustainable alternatives do exist, and there is really no need for GM crops in the country" (Kuruganti, 2008). The solution offered by the Coalition is placed within a broader framework of ecological farming. The methods incorporated within this framework are diverse and it accommodates the multiplicity of organisational ideologies that made the Coalition.

Their activities could be divided into three categories. First, feedback to GEAC, second, education and outreach programmes and third, critique on the accountability of public officials engaged with GM regulation. To provide feedback to GEAC, the Coalition setup an Independent Expert Committee on Bt Brinjal (The Independent Expert Committee, 2006) in 2006 and responded to EC-I and EC-II recommendations on Bt Brinjal. Within their outreach and awareness programmes, the "I am no lab rat" campaign in 2008 and documentary films made on genetic engineering and GM crops in India such as So Shall You Reap (Bhardwaj, 2007) and Poison on the Platter (Kanchan, 2009) standout out as important examples. "Unlike […], Poison on the Platter, […], Bhardwaj's film [So Shall You Reap] talks about realistic alternatives [that] farmers are already opting for in many Indian villages, for instance, in Punjab, Andhra Pradesh and Kerala. […] Many farmers have completely stopped usage of chemicals in their fields and are doing much better by turning back to traditional, organic, self-dependent agricultural practices, including seed preservation" (HardNews, 2010). There are suggestions of this alternative narrative with respect to the new policy paradigm of Gene Revolution in their outreach programmes, but again the focus remains on publicity of the harmful effects of GM crops. Finally, to criticize public officials on accountability, the Coalition analysed the letter authored by Prithviraj Chauhan, Minister of State in the PMO, as an official letter to the health minister allaying public fears over Bt Brinjal. This letter was openly criticized in media as being excerpted from the biotech industry's promotional materials (Chaudhury, 2010). Along similar lines, the Coalition also questioned the constitution of EC-II (Kuruganti, 2010a).

This chapter will focus on their outreach programmes, specifically the 'I am no lab rat' campaign launched in 2008 and the two documentary films. It will also look into the media response generated on Prithviraj Chauhan's letter. The Independent Expert Committee and the responses to EC-I and EC-II have already been discussed in *Chapter 3* and *Chapter 5*. The three case studies have been chosen to balance the analysis of the activities of the Coalition in all three aforementioned categories. They showcase the diversity of subjects along which the critiques on GMOs were developed. While the 'I am no lab rat' campaign was focused on the consumption of GM food and the commercialisation and biosafety of GM crops; the two documentary films together present perspectives on consumer and farmer issues relating to GM crops. The third case study gives the controversy a political edge by questioning the policy paradigm on GM crops.

By keeping the scope of the critique to be as wide as possible by taking different issues to different publics, their activities are commensurate to Dewey's thesis on scattered, mobile and

manifold public gathering around issues (Dewey, 1927). As Dewey writes, "There can be no public without full publicity in respect to all consequences which concern it" (Dewey, 1927, p. 146). All of these efforts are focused on achieving *full publicity in respect to all consequences* that the GM crops would entail, thereby enabling the public around to gather around it.

Locating Public in Consumption: 'I am no Lab Rat' Campaign

The 'I am no Lab Rat' Campaign was specifically designed to address the concerns around GM food. The issue created here is focused on the consumption of GM food which is indistinguishable from normal everyday food. If enough doubt is created around whether they are safe, a public would gather around this issue to manifest this concern and demand accountability. The campaign addresses the Indian middle class, who may not be concerned with Bt Brinjal as a livelihood issue for Indian farmers or an environment issue, but they would be concerned with the safety of the food that they consume. It problematises the biosafety of GM food and suggests that commercialisation of Bt Brinjal is a large-scale experiment on Indians to test the biosafety of GM food. These conversations enabled by the campaign on the safety of GM food travel into its regulation and create doubts around the biosafety testing of these crops, ultimately leading to the questioning of the science behind it.

The tenor in which the information was presented during the campaign had an anti-GM bias and this can be observed by looking at 'A Hand Book on Genetically Modified Food' (Coalition for GM-Free India, 2008) available in the download page of the website http://iamnolabrat.com. The handbook starts by establishing a threat that, "In India, we are standing at the verge of the first GM food/crop from being allowed into the country on a commercial basis – Bt Brinjal. This is our last chance to prevent it from crawling into our plates. This is the time to act. Say no to genetically modified food" (p. 2). This handbook goes on to explain the nature of GM food and answer questions around how they are made, whether it is safe and how they are marketed. Their explanation to each of these questions raises doubts on the efficacy of GM technology, their biosafety and corporate interests vested in its appropriation respectively.

The campaign was launched on the 13th October, 2008 in Bhubaneswar, Orissa by Living Farms, an NGO that works with indigenous communities, landless, marginal and small farmers and consumers in Orissa and is an active member of the Coalition. The Launch was followed by a Road Show from 16th October, 2008 to 22nd October 2008 where a specially designed truck was taken around important educational institutions. The truck was also taken around the city and stationed in front of big malls. "There was an overwhelming response to the Road Show with around 3000 people flocking to the truck to know about GM food and its scientifically proven hazards from the handouts. More than a 1000 people signed the petition to the Health Minister, Dr. Anbumani Ramadoss, asking for a total ban […] Though the city of Bhubaneswar was targeted, the campaign could reach out to people from all over the State and also scientists and doctors from the entire country as strategic workshops and seminars were targeted" (Living Farms, 2008a). Elaborating on the campaign, Krishnan said in an interview that, "The Coalition wanted to bring out the issue that the Health Ministry was not involved in this entire debate at all, when the issue of GM crops is a serious health issue as well. So, we decided that the Health Ministry should be made to come out and explain what their position on this issue is. So 'I am no

Lab Rat' campaign, aimed at targeting the Health Ministry, was started as a pan-Indian movement. Living Farms worked continuously to bring visibility to the campaign" (Krishnan, Interview, June 22, 2011).

To establish the context of the campaign, Living Farms raised "a few fundamental questions that remain unanswered:

- Who has decided, how, where and on what basis that GE is needed for Indian farming?
- Why GE is being preferred to safer, ecological alternatives that are more sustainable, that give more incomes to farmers, that promote self-reliance/esteem" (Living Farms, 2008b)?

The first question indicates the liminality experienced by the members of the Coalition. The presence of a larger policy narrative that 'GE is needed for Indian farming', makes the farming practices that they advocate vulnerable. This vulnerability is expressed in the second question that they raise. The alternatives that they offer are vulnerable within this larger policy narrative and the only way they could resist this narrative is to highlight the biosafety concerns in appropriating GM technology. The Handbook points to the presence of scientific evidence from controlled animal studies carried out in many countries and by different parties (government, academic, independent and company studies) which demonstrates that "GMOs could cause a wide range of serious unexpected health impacts. During studies with Lab rats fed on GM, evidence linked GM with many adverse health impacts like stunted growth, impaired immune systems, bleeding stomachs, misshapen cell structures in different organs, liver and kidney lesions, reduced digestive enzymes, inflamed lung tissue, higher offspring mortality etc" (Coalition for GM-Free India, 2008, p. 9). A listing of the biosafety risks of GM food is made as an argument for a greater attention to safer alternatives.

The handbook looks at the process of GMO creation by explaining that scientists take genes from one organism and insert them into the genome of another organism during the process of genetic modification. It ridicules this process by stating that, "There are two ways in which they go about inserting a foreign gene into a plants cell. The first method is more in the style of the cowboys. They take a Gene Gun with golden pellets and shoot the gene from an unrelated organism into the cell of the plant, although without the accuracy of Cowboys. The second method is more in the spirit of the viruses. They insert the foreign gene into a bacteria or a virus and use it to infect the plant's cell to enter it" (Coalition for GM-Free India, 2008, p. 7). While this does resonate crudely with the initiation of the process of GMO creation, the major part of time in the process of GMO creation is spent on selection wherein a selectable marker gene (such as antibiotic marker genes in case of Bt Brinjal) is used to differentiate transformed from untransformed cells. If a cell has been successfully transformed with the foreign DNA, it will also contain the marker gene. By growing the cells in the presence of an antibiotic or chemical that selects or marks the cells expressing that gene, it is possible to separate the transgenic events from the non-transgenic. The GMO is then grown through the use of tissue cultures. Though it could very well be observed how this whole process of selection makes the technology open to Coalition's criticism that the GE technology is imprecise in its current state.

Another major concern that they raise is centred on how this technology is marketed. More than the text of the Handbook, one of the images used, as shown in Figure 1, poignantly

establishes their opinion on who does the technology actually benefit. In the Coalition's opinion, by advocating that GM food is safe and it is beneficial to the farmer, the biotech companies are marketing an imperfect product to their consumers to make money. In creating this image of profit-minded scientists working for multi-national companies (see Figure 1), the campaign aims to discredit not only GMOs as a product but also the science behind it. Ultimately pointing out that, "the irony is that it is the same business players who have made and who continue to make profits out of chemical pesticides that talk about GM seeds today without closing down their chemical business which has already proved extremely damaging" (I am no LAB RAT, 2009). This evaluation ends with a prayer to the reader, to "resist the conspiracy to turn all Indians [into] laboratory rats of the multinational corporations. Protect the food, the seeds and ecology" (I am no LAB RAT, 2009).

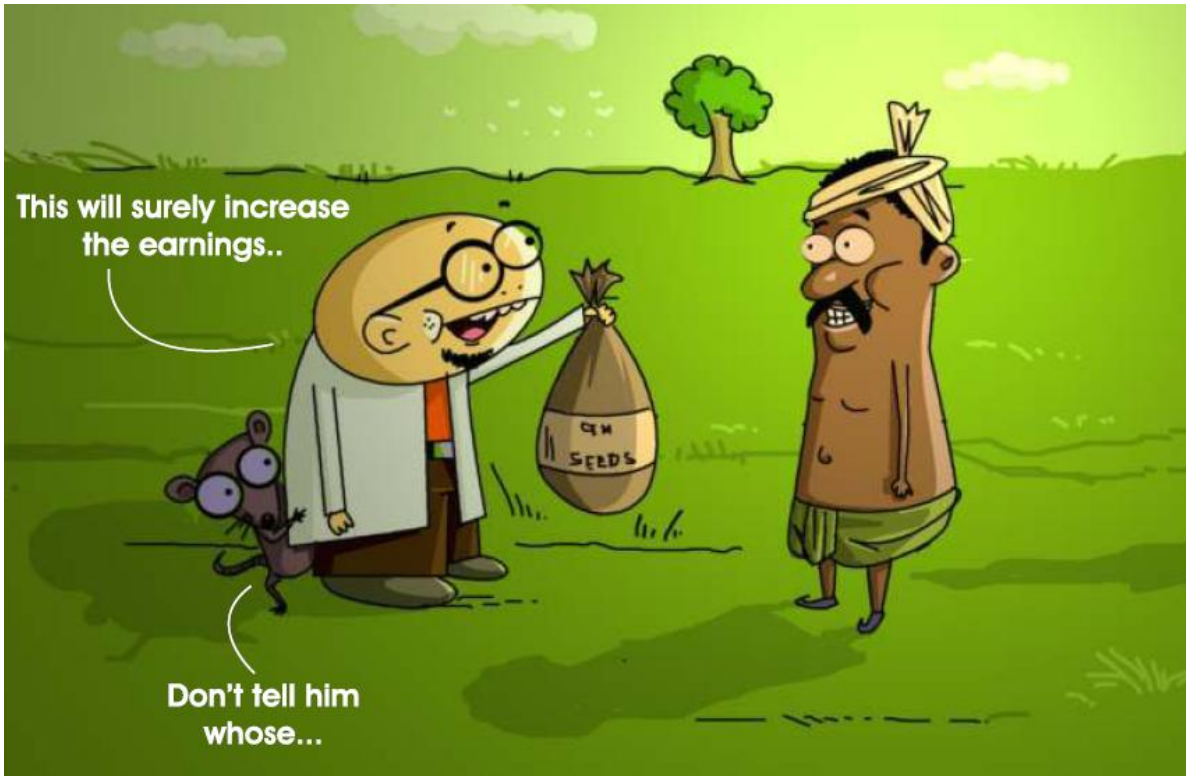

Figure 1: Is GM technology good for the farmer (Coalition for GM-Free India, 2008, p. 12)?

The campaign had a considerable impact on gathering a public around the issue of GMOs. "The campaign created awareness about GE hazards amongst students, academicians, writers, bureaucrats, politicians, doctors, scientists, health officials and members of the public. More than 1000 petition signatures [were] collected from the public against GE. The petitions [were] regularly faxed to the Health Ministry" (Living Farms, 2008a). Apart from this, the activities of the campaign were featured regularly in the media, newspapers, television and other sources of information dissemination, expanding its mandate from the state where it originated into a national campaign. The impact of this campaign is within the simplicity with which scientific narratives are presented to be consumed by a layman. There is a recognition of a bias, right from the beginning of the campaign, wherein the focus is on bringing out the cons of GMO commercialisation. It could be argued that the narrative created by the campaign is only partially

scientific, but the concerns that they raise indicate the uncertainty in the scientific evaluation of GMO biosafety.

By publicizing that GM food in unsafe, the Coalition was able to generate conversations on the health risks in consuming Bt Brinjal. This enabled them to make GM food an everyday concern in the context of consumption of food. The attempt was to make opposition of GM crops a personal mandate of every citizen who wants to ensure that the food that s/he consumes is safe. Within Dewey's heuristics, the public was located in the issue of consumption wherein an everyday activity of consuming food was problematised. This not only helped the Coalition to involve the Indian Middle Class into the debate, it also enabled them to involve the Health Ministry as a stakeholder in the commercialisation of Bt Brinjal.

Locating the Activist in Public: Documentary Films on GM Crops

This section specifically addresses the politics of representation in the narrative of the two documentary films, *Poison on the Platter* (Kanchan, 2009) and *So Shall You Reap* (Bhardwaj, 2007). While the first film directly addresses Bt Brinjal as GM food which is treated as poison on the platter, the second film looks into the consequences of the adoption of GM crops by farmers. *So Shall You Reap* does not directly address Bt Brinjal as a GM crop, but it addresses issues with the cultivation of Bt Cotton that points to a bleak future of Indian farmers who have appropriated it. It addresses issues relating to the inability of GEAC to regulate the testing of new GMOs and points out the alternatives to the so-called 'Gene Revolution.' While there are other documentary films that have been made on the topic of GM crops in India over the years, the release of these two films could be placed at critical times, when awareness around these issues became a critical mandate for the Coalition.

The implicit assumption in the creation of such documentaries is that if "people become aware of the way things 'really are', they will take steps to correct injustices and inequities. The advocacy of a specific program of change is not the filmmaker's task; it is enough to reveal the 'truth' of a social situation to the viewer" (Allen & Gomery, 1985, p. 234). The representation of how things 'really are' and the 'truth' of a social situation is embedded within the politics of the filmmaker wherein even the presentation of 'scientific facts' could be directed in way that it represents a certain ideology. Both the films have an anti-GM mandate and they represent a worldview that is hinged on the adverse consequences of GM technology. But, the implicit assumptions in making them still hold, wherein the objective is to bring out the activist in public, such that questions around GM crops travel and grip the imagination of a larger group of people.

Looking into how social situations are represented in a documentary film, Chapman's (2009) work on documentaries offers valuable insights. He writes that, "representation [in documentary films] can be construed in three different ways: as a photographic or aural likeness of something; as a way of standing for the views of organisations, groups or agencies; and as making a case or proposition for some aspect of the real world. A documentary can do all three, and there will be some overlap between them. […] On the content side, factual films offer representations that communicate a subject matter by three means:

- *Testimony*, which offers a first-person perspective on experiences.

- *Implication*, where the viewer becomes involved in the process of a lived experience through specific social actors, in a way similar to that of a Hollywood fiction.
- *Exposition*, where a third-person narration explains the situation, behavior or experiences of other third persons. This will tend to create empathy rather than direct identification on the part of the viewer, although audiences may well ask themselves how they would have felt or acted in such a situation" (Chapman, 2009, p. 29).

While representation in *Poison on the Platter* focuses mostly on exposition with hints of implication in between, *So Shall You Reap* is a collage of testimonies interspersed with expositions. *Poison on the Platter* has an explicit focus on the consumer. As Mahesh Bhatt, an Indian film director and also the narrator of the film, points out after the film showcases the death of livestock after eating Bt Cotton feed, "If you think that the problem caused by Bt Cotton are confined to farmers and the animals only, you need to think again, because the gene that has been used in Bt Cotton is the same that is now being used in Bt Brinjal" (Kanchan, 2009). On the other hand, *So Shall You Reap* presents testimonies of Indian farmers narrating the impact of Bt Cotton on their lives and the inadequacy in regulation of field trials wherein biotech companies have made farmers a part of field trials without their informed consent.

In *So Shall You Reap*, when one of the farmers in Andhra Pradesh is asked whether he planted the Bt Okra crop in his field, said, "No, company people came and did this" (Bhardwaj, 2007). When he was asked which company, he responded, "Mahyco. But, we don't know which city they came from. Hyderabad probably." Indicating a blatant disregard of regulation of field testing of GMOs, he said that, "We are eating [this crop]. Initially they told this is not for eating. We should dump it. But, we are eating it and they are also taking it from here. We do not know whether those officers are eating it or not. But the assistant who comes here is taking it. He is selling it in the local market." This not only brings out the lack of information that these farmers have about the crops that are standing in their fields, it also indicates the lapses in the process of voluntary consultation with biotech companies in regulating the field trials of GMOs.

Both the documentaries focus on corporatisation of Indian agriculture. *Poison on the Platter* claims that this corporatisation is possible because of the ignorance of Indian public around GM crops. As Mahesh Bhatt says in the documentary that, "At a time when countries across the world are shutting their doors to GM food, dozens of crops and vegetables in India are undergoing various stages of trial simply because people in the country are largely ignorant about what GM foods are and what impact they would have on their health" (Kanchan, 2009). The documentary goes on to suggest that biotech companies are taking advantage of this ignorance and "a corrupt and incompetent" regulatory mechanism to corporatize Indian agriculture and test poisonous GM food crops on Indians.

On the other hand, *So Shall You Reap* builds up on this claim of corporatisation from a farmer's perspective, wherein the narrator argues that, "Farmers are accusing biotech companies of making false claims. […] Farmers are blaming GM crops for reduction of yield of subsequent crops. […] Farmers hold GM crops responsible for the death of their livestock. […] Farmers are bitter with GM crops as minor pests are turning into major ones" (Bhardwaj, 2007). All of these arguments are broken between individual testimonies of farmers from the villages of Punjab and Andhra Pradesh. Higher yields and efficient pest management are claims on which GM seeds are

sold in India. By discrediting these claims, the documentary aims to question the promises made by biotech companies to enter into the market of Indian agriculture.

As a corollary to critiquing corporatization of Indian agriculture, both documentaries question the regulation of GMOs. *Poison on the Platter* presents a consumer perspective wherein there are no laws to requisite mandatory labelling of GM food in India and that there is no rigor in the biosafety testing of GM crops in India. As Devinder Sharma puts it, in the documentary, "GEAC is more or less a rubber stamp for the Industry. That is the way it has behaved over the years. Interestingly, if we were to introduce just one clause that if something goes wrong with genetically modified food, the chairman of GEAC should be put behind bars, you will see everything will stop" (Kanchan, 2009).

On the other hand, *So Shall You Reap* builds up on this argument by questioning that "RCGM is housed in a department [DBT] which actively funds biotech crop development and therefore it is not clear how they can regulate trials and approval of biotech crops" (Bhardwaj, 2007). It focuses on the uncertain nature of the technology and its approval process to discredit the possibility of fair regulation. As Yudhvir Singh, Coordinator and Member Secretary of Indian Coordination Committee of Farmers' Movement, puts it in the documentary, "This genetic farming […] is a technology that is being debated worldwide. No country can claim that this technology benefits humans, environment or the soil. There is no research that can substantiate this claim. The seed companies themselves have carried out all studies. The [Indian] government has introduced these seeds without adequate testing. As a classic example of a thief being asked to guard a property, these companies have been asked to check and report any adverse impacts of these seeds. Can a thief be trusted to guard the house?"

After laying out these problems, both the documentaries suggest constructive actions that can be taken by the public as activists. These constructive actions differ with the context of the documentary's subject. *Poison on the Platter* threatens that "there is only one definite outcome of genetic engineering of food: the end of choice" (Kanchan, 2009). The solution to this problem is offered by Dr. PM Bhargava, "What the public should ask for […] is a moratorium on the release of any GM crop, sale of any GM seed, for a period of five to seven years, during which an appropriate risk assessment system should be setup." On the other hand, *So Shall You Reap*, operates within the pretext that, "It is high time [that] more and more farmers gave a serious thought to what they sow in their fields. Because as you sow, so shall you reap" (Bhardwaj, 2007). The solution to the problem of GM crops is offered within organic farming and the non-pesticide management of crops which is again illustrated by testimonies of the farmers who have successfully adopted these techniques of farming. They are shown to be less vulnerable in their present situation as compared to their past experiences with GM crops.

These documentaries mostly show people who either belong to the member organisations of the Coalition or they support the ideology of the Coalition. The questions that these documentaries raise deserve critical attention and they need to be understood as a critique of the bureaucratic setup of regulating GMOs. The opposition to appropriation of GMOs is presented in different contexts and the narrative travels through these contexts to reach the same conclusion. These documentaries showcase the level of detail with which these issues have been thought about and expressed by the Coalition. Their outreach programs not only targeted the

Indian middle-class as a consumer, they also spoke for Indian farmers and the everydayness of agriculture as a way of life.

Within the plurality of their dissent, the formulation of different problems can be seen within the same overarching critique. The Coalition has successfully made the notion of GM technologies travel across food safety issues, livelihood issues, corporatization of seeds issue and regulation issues, apart from bringing out the scientific issues. All of these transform the debate on scientific uncertainty of GMOs into a controversy. The public as an audience is given a compelling argument to gather around the issue of GM crops and turn into activists demanding accountability. They present this gamut of problems emanating from the appropriation of GM crops and attempt to gather a public that will be inclined to take constructive action for social change in the way GM technology is treated in India. They question the generic social acceptance of technology as a tool for progress in India and pave the way for a more critical reflection on whether GM technology is required for Indian agriculture or not.

Locating Public in Policy: The Case of Prithviraj Chauhan

This section shows how the Coalition as *shallow ecologist* public responded to the policy paradigm of biotech-led Second Green Revolution. It illustrates their way of dealing with the liminality that they experience. In July 2009, Dr Anbumani Ramadoss received a formal reply to his letter dated 2nd February 2009, from Prithviraj Chauhan, Minister of State in the PMO. Ramadoss had addressed his letter to the Prime Minister when he was Minister of Health and Family Welfare in the context of the 'I am no Lab Rat' campaign, to request clarification on the health impact of GM crops. The letter written by Chauhan entitled, *Concern on Introduction of Genetically Engineered Crops and Food*, was the official government response to Ramadoss's letter. Explaining how did the Coalition get access to this letter, Krishnan said that, "By the time this letter was received, Dr. Ramadoss was no longer the health minister, but, he was always a part of this organisation called Pasumai Thaayagam [Green Motherland] in Tamil Nadu. It is a non-governmental organisation working for environmental protection, sustainable development and people's right to governance. He started his political career with this organisation. Pasumai Thaayagam was also a part of the struggle against GM crops. So, they actually gave this letter out to many of us in the Coalition" (Krishnan, Interview, June 22, 2011).

The response to the letter by Chauhan was made on two fronts. First, scientists across the globe wrote a collective response to the letter, addressing the Prime Minister, reporting on the factual scientific errors in it. Second, the Coalition as citizens wrote to the Prime Minister expressing their distrust in the present model of governance and regulation of GM crops. The scientists wrote that, "From the content of this letter and its phraseology, it is apparent that much of it was excerpted directly from promotional materials of the agricultural biotechnology industry, in particular the International Service for the Acquisition of Agri-Biotech Applications (ISAAA), an organisation that at best can be described as pseudo-scientific, funded primarily by Monsanto and other biotechnology multinational companies and whose purpose is to promote and facilitate the commercial introduction of genetically modified (GM) crops in the developing world. Inaccurate information has led to erroneous policy on GM crops and Bt Brinjal in particular" (Eminent Scientists, 2010). The letter goes on to dissect Chauhan's letter paragraph by paragraph by representing the scientific flaws in the claims made in the letter. Taking an example, Chauhan,

as quoted in the letter by the scientists, wrote that, "The concerns conveyed by you that the technology may induce instability in genetic level and have adverse health impact is not supported by scientific evidence" (Eminent Scientists, 2010). The scientists responded to this statement by pointing out that, "This is a scientifically indefensible statement because:

- GM transformation can produce novel biochemical processes that are unpredictable and for which there is no natural history to assume [that they] are safe (Jiao et. al., 2010; Wilson et. al., 2006; Zolla et. al., 2008) […]
- It is not a question of if there are disturbances to gene function and biochemistry but to what degree they will be present within any given GM plant. For example, the levels of more than 40 proteins are altered significantly in the commercialized GM MON810 corn compared to equivalent non-GM corn, which included production of a new allergenic protein (Zolla et al., 2008)" (Eminent Scientists, 2010).

The letter from the Coalition, on other hand, uses the letter from the scientists to prove to the Prime Minister that, "significantly erroneous views are formally held by the PMO and several of your Cabinet colleagues about the supposed benefits of GM crops. These views have driven successive government policy, including the Congress Party [current government] policy on agriculture and the role of genetically engineered food crops. We therefore, must conclude that there has been a purposeful and systematic intent by the Regulators (GEAC, RCGM and DBT), to mislead you and former prime ministers about the truth of GM crops. We are furthermore, convinced by the evidence on record, of a blatant conflict of interest within the regulators and the committee charged with the appraisal of Bt Brinjal called the Bt Brinjal Expert Committee II (EC-II). The evidence also shows that the appraisal process, minimal guidelines used and subsequent approval are fraudulent. [...] The greatest single danger India faces today is the massive disinformation on GM crops. Wrong briefs and erroneous facts cannot produce sound public policy. Nor may we accept hurried approvals unsupported by the most comprehensive, stringent and rigorous adherence to safety protocols, in their processes & procedures. Independent testing in labs working to accredited international standards is the sine qua non of bio-safety regulation to address the unique risks that GM crops pose. Unfortunately, none of this is in place" (Eminent Citizens, 2010).

Both of these letters written to the Prime Minister were widely publicized and re-printed in magazines such as Outlook and Tehelka. Analysing the content of letter written by the Coalition, a strong critique of the government policy around GM crops can be observed. By establishing that the current policy paradigm is riddled with corporate interests and is scientifically uncertain, the Coalition turns this policy paradigm into an issue. The attempt is to create a public that gathers around probity in governance of GMOs and the scientific uncertainty that inflicts the Gene Revolution policy paradigm. This public is expected to take constructive action for political change wherein the policy paradigm around GMOs is questioned and is subsequently replaced by the alternative of sustainable farming practices advocated by the Coalition.

As established in *Chapter 1*, GM technologies fall into a larger vision of Indian progress with science and development. An opposition to GM technologies is deemed to be anti-Science

within the policy context of India. This not only makes the position of the Coalition to be liminal within the changes in the policy paradigm, it also necessitates the need for a scientific tenor of dissent wherein this vision of Science and development is questioned with scientific evaluations of uncertainty. In this sense, the Coalition has "behaved like professional scientists, assembling data, coordinating arguments [and recognized that] cantankerousness is no match for organized scepticism" (Visvanathan, 2011). This idea of a scientist in a citizen would be the focus of the conclusion of this chapter.

The Scientist in a Citizen

This chapter with a few illustrations of the activities of Coalition for GM-Free India provides an explanation as to how the scientific uncertainty around GMOs travels from the domain of facts and objectivity to subjectivity, cultures of food and livelihood and the politics of GM regulation. I have interpreted the Coalition as a communitas which enables an understanding of their activities that express their identity as an opposition to the proliferation of GM technology in India. The expression of this identity demands a greater focus on opposition to GM instead of the agrarian future beyond GM. To legitimize this position, the members of the Coalition have used a scientific rationale for their opposition. In this sense, they have efficiently played the role of the non-expert "to make observations and pose critical questions in order to test and thus contribute to the quality of the experts' [(regulatory regime on GMOs)] arguments" (Health Council of the Netherlands, 2008, p. 17) in testing as well as commercialisation of GMOs. In playing this role, the Coalition members bring out the role of the scientist that a citizen can play in midst of a controversy around policy making on scientific issues.

Beyond the discernable patterns in the activities of the Coalition that mostly focused on problematising the appropriation of GM crops in a multiplicity of arenas such as biodiversity, human health, livelihood and regulation, it is imperative to understand the liminality in their situation. As established earlier, within the new policy paradigm of biotech-led Second Green Revolution, this liminality has been catered to by creating a scientific critique of the paradigm. This critique, in combination with the National Consultations, eventually led to the imposition of a moratorium on the commercialisation of Bt Brinjal until satisfactory evidence of its biosafety has been established. "Moratoriums are a kind of stop-time one needs to get used to. They reflect a decision to accept the liminal, to state that truth is difficult to decide. One then isolates the issues discussed and creates a middle world, a betwixt and between, where the subject waits for acceptance or rejection" (Visvanathan, 2010a). The subject, in this particular case, is Bt Brinjal and the imposition of the moratorium on its commercial release brings the entire policy paradigm of Second Green Revolution into a liminal state.

This liminality can be observed in the impact of the moratorium. "The moratorium on Bt brinjal has created a regulatory uncertainty. No research and development of GE crops is possible without the shadow cast by the moratorium dampening the spirit. No investor, Indian or foreign, will feel secure in pursuing even the existing projects, let alone initiating new ones" (Rao, 2010, p. 6). The continuance of some transgenic vegetable projects that are in advanced stages, such as the Bt Cabbage, is being reconsidered. The testing of OPVs of Bt Brinjal developed by UAS, Dharwad has been put on hold. There are also reports that IIVR has been unable to get permission from RCGM to carry out any multi-location studies under confined conditions for

the OPVs of Bt Brinjal they have developed (Rao, 2010). Currently, India is facing a liminal period around regulation of GMOs and their appropriation for agricultural purposes.

Liminality in large-scale societies differs significantly from liminality found in ritual passages in small-scale societies. One primary characteristic of liminality in small-scale societies within Turner's conceptualization (1974) is that there is certainty about the future. In ritual passages, "members of the society are themselves aware of the liminal state: they know that they will leave it sooner or later, and have 'ceremony masters' to guide them through the rituals" (Thomassen, 2009, p. 21). However, in those liminal periods that affect a large-scale society as a whole, the future is unknown, and there is no 'ceremony master' who has gone through the process before and can lead people out of it (Thomassen, 2009, p. 22). The 'ceremony master' in the case of GM regulation in India could be equated to the position of GEAC. With the MoEF directing the GEAC "to consult scientists to draw up fresh protocol for the specific tests that will have to be conducted in order to generate public confidence" (Rao, 2010, p. 3), the entire domain of GM regulation in India seems to be in a betwixt-and-between situation. But, within this state of liminality that has travelled from the Coalition into the domain of GM regulation, there is an opportunity for an intense public debate, wherein the scientist in citizens is invited to participate and contribute to the debate on the appropriation of GM crops.

This role of a scientist that can be played by every citizen can be interpreted from Visvanathan's (2010a) critique of the way Bt Brinjal controversy is being treated as an unwarranted intrusion into the technicalities of the world of scientists. The scientists had argued during the National Consultations that, Bt Brinjal was a scientific issue and one should have a closed-door meeting with the concerned scientists and decide the course of action to take (refer *Chapter 6*). Critiquing this attitude, he wrote that, Indian scientists need "to recognize that many of the critiques of science and technology come from the cultural and political domain. To expect that they will be domesticated into a scientific paper is naïve and exclusionary" (Visvanathan, 2010a). This critique can be understood within the co-productionist idiom as well, but it is also creating a space for a citizen to be an economist, a scientist, a bureaucrat, a lawyer and a politician in the very act of questioning the institutions of the market, science, the bureaucracy, law and politics.

The Coalition and its group of activists belong to this space where citizenship does not require legitimacy to question institutions. The very nature of the question that they raise determines the legitimacy of their opinion. Their activities that have been illustrated in this thesis enable them to play all the roles of an economist, a scientist, a bureaucrat, a lawyer and a politician. This "is the new canvas of democracy. It demands the drama of a new reciprocity where citizens need to be trustees and critics of science, while sciences in turn need to recognize the power of the social" (Visvanathan, 2010a). Pushing Dewey's analysis of public within this new canvas of democracy, the public can not only "exact political behaviour to care for them" (Dewey, 1927, p. 45), they can also exact scientific behaviour to cater to their interests.

6

Locating Public in Participation: National Consultations on Bt Brinjal and the Moratorium

> "There can be no public without full publicity in respect to all consequences which concern it. Whatever obstructs and restricts publicity, limits and distorts public opinion and checks and distorts thinking on social affairs. Without freedom of expression, not even methods of social inquiry can be developed. For tools can be evolved and perfected only in operation; in application to observing, reporting and organizing actual subject-matter; this application cannot occur save through free and systematic communication." (Dewey, 1927, p. 167).

Dewey, in this quote, is exploring one of the necessary conditions for the occurrence of an orchestrated social inquiry. A social inquiry cannot be fruitful unless the public is aware of all the consequences that an issue entails. This awareness requires 'free and systematic communication'. As established in *Chapter 5*, the activities of the Coalition were directed towards this free and systematic communication. This chapter focuses on the public that gathered around the issue of Bt Brinjal because of the methods that have enabled social inquiry on Bt Brinjal illustrated in *Chapter 2 and 3*, the debate between different publics on scientific risk assessment of Bt Brinjal in *Chapter 4* and the activities of the Communitas of Anti-GM Civil Society in *Chapter 5*. It explores the nature of the conversations that happened during the National Consultations on Bt Brinjal organized by CEE on the request of Jairam Ramesh, the MoSEF.

To begin this exploration, I will interpret the method used in organization of National Consultations as a part of the methods that enable social inquiry within Dewey's heuristics. The multiplicity of stakeholders that participated in the National Consultations is an indication of Dewey's fragmented public gathering around the issue of Bt Brinjal. All the events highlighted in the previous chapters have been interpreted as the foundation stones for this public to manifest itself during the Consultations. This chapter looks at this method of social inquiry employed by CEE for MoEF to organize national-level consultations with public on Bt Brinjal across seven cities between 13th January, 2010 and 6th February, 2010. The public, in this particular context, was constituted by "farmers, scientists, agricultural experts, farmers' organisations, consumer groups, citizens' forums, NGOs/CBOs, government officials, media, seed suppliers, traders, doctors, lawyers, etc. These diverse groups helped each consultation gain a distinct sense of the local and regional viewpoints on the issues of Bt Brinjal" (CEE, 2010b, p. 8). It employed face-to-face interaction between Jairam Ramesh, the MoSEF and participants representing public as the method to rationalize the need for the commercialisation of Bt Brinjal in the context of Indian agriculture. The following sections would detail out the method employed and critically analyze the documentation of the debate to filter out the essential argument for and against commercialisation of Bt Brinjal.

But, before looking into the details of this method, I will present a theoretical analysis of social inquiry as public discussion. Looking at public discussion simply as a method, the problem that arises is the difference in opinion around how it should be organized. Every democratic culture has their own interpretation around how these public discussions could be held. For example, the *Jan Sunvai* (public hearing) model of a social audit followed by MKSS in Rural Rajasthan where accounts are read out in front of local residents of a village to bring out misappropriation of government resources is different from the *Van Panchayat* (forest commons) model in the Kumaon District of Uttarakhand, where forests are governed and sustained by local communities and forest matters are discussed communally. A public discussion is an open invitation for debate, but it is within the notion of openness that critiques of the method emerge. Who can offer an opinion? Does the variety of opinions offered provide an adequate representation to the entire gamut of issues that concern the public discussion? What is the politics of representation within the expression of an opinion? How is the process of public discussion redesigned when the number of participants is large? What kind of conclusions can be achieved through the process and do these conclusions truly reflect the opinion of the public?

The solution to this problem is offered by Dewey, when he writes that, "Tools can be evolved and perfected only in operation; in application to observing, reporting and organizing actual subject-matter" (Dewey, 1927, p. 167). The National Consultations, in this sense, was a novel way of approaching the process of policy making; it was the first public hearing of such a large scale around the issue of GMOs in India. It was very successful in generating a public response and it can only be assumed that the method would get better upon application in the future. Commenting on his experience of the National Consultations, Krishnan mentioned that, "While the Consultations were quite comprehensive and novel, I don't think it was an effort to listen to everyone. It's also because of the way it was structured. You have two hours and you have 2,000 people sitting there. The Minister picks up who needs to speak. So, it was quite random. I found it interesting, but I don't think that it is the way to do a Consultation. Probably it should have taken more time... and it should have listened to more number of people" (Krishnan, Interview, June 22, 2011). Any method that entails a conversation between large numbers of people would inevitably face the problems that Krishnan has listed out. But he also acknowledged that, "Bringing people together was good because there were different points being raised and then, there were counter-points being raised. It also makes the process transparent because if you call groups separately, there would always be doubts among groups which were not present about what actually transpired and what was the final outcome" (Krishnan, Interview, June 22, 2011). The process of organizing a public discussion is messy, but if enough attention is paid to make it as transparent as possible, it gains legitimacy and public trust.

National Consultations on Bt Brinjal: The Methodology

The objectives that MoEF wanted to pursue through this endeavour and CEE's evaluation of the controversy being discussed are essential in establishing the context of the methodology used to organise National Consultations. Before finalization of the logistics for National Consultations, CEE came up with an information pamphlet called *National Consultations on Bt Brinjal: A Primer on concerns, issues and prospects* (CEE, 2010a) that was created to provide "an unbiased account of

reported results of the studies conducted and concerns expressed by multiple stakeholders [and] to acquaint the representative stakeholders with the current situation in India" (CEE, 2010a, p. 9). The pamphlet addressed the nature of the controversy by stating that, "Bt Brinjal has generated much debate in India. The promoters say that Bt Brinjal will be beneficial to small farmers because it is insect resistant, increases yields, is more cost-effective and will have minimal environmental impact. On the other hand, concerns about Bt Brinjal relate to its possible adverse impact on human health and bio-safety, livelihoods and biodiversity" (CEE, 2010a, p. 1). Then, the Primer goes on to create four trajectories on which the conversations on Bt Brinjal in the National Consultations were expected to follow: *Pest Management*, *Biosafety*, *Biodiversity and Environmental Impact* and finally, *Livelihood and Economic Considerations*.

As for the objective of the National Consultations, the Primer states that, "The main objectives of the consultation are to:

- Provide a forum to various stakeholders to express their views and concerns related to Bt Brinjal at venues across the country;
- Provide appropriate inputs to the Minister before a final decision is taken" (CEE, 2010a, p. 2).

Since the Primer was prepared by CEE for MoEF, it can be safely assumed to represent the official government document on the placement of the controversy before the National Consultations. It presents the logic of the consultations in combination with the placement of Brinjal and GM technology in the Indian agricultural landscape. It documents the history of the development of Bt Brinjal and delves into arguments for and against the commercialisation of Bt Brinjal. It uses the four trajectories mentioned above to create the canvas for the controversy in the form of a table and interestingly, in the trajectory of *Biosafety*, it has one page (p. 17) which is mostly empty in the arguments for Bt Brinjal while the arguments against Bt Brinjal overflow into the row for the next trajectory. While the idea of the table is to place the arguments on similar issues against each other, the asymmetry in this documentation inevitably lends itself into the presence of an unbalanced equation. Numerically, the document has, in total, 23 arguments for Bt Brinjal and 28 arguments against Bt Brinjal. Quantitatively the difference is not sizeable, but qualitatively the representation of this difference lends a bias in the document against Bt Brinjal.

One of first things that need to be accomplished to ensure successful public participation is to promote awareness around the issue of contention. The Primer was published in 11 major languages, namely, English, Hindi, Gujarati, Marathi, Kannada, Telegu, Oriya, Bengali, Punjabi, Tamil, and Malayalam. The National Consultations were advertised English and local newspapers in the state of each consultation and a webpage (http://www.ceeindia.org/cee/bt_brinjal.html) was created to make all the information and reading materials on Bt Brinjal available to the public (CEE, 2010b). Ultimately, seven states were finalized and the consultations were held in the order as shown in Table 1.

No.	Location	Date
1	Kolkata, West Bengal (East)	13th Jan, 2010
2	Bhubaneswar, Orissa (East)	16th Jan, 2010

3	Ahmedabad, Gujarat (West)	19th Jan, 2010
4	Nagpur, Maharashtra (West)	27th Jan, 2010
5	Chandigarh, Punjab/Haryana (North)	29th Jan, 2010
6	Hyderabad, Andhra Pradesh (South)	31st Jan, 2010
7	Bangalore, Karnataka (South)	6th Feb, 2010

Table 1: Location and Dates of National Consultations on Bt Brinjal

The choice of states in which the public consultations were to be held was also an important criterion to assess. "Kolkata and Bhubaneswar are both located in states that are leading producers of brinjals. Hyderabad and Bangalore are representative of centres of science and research in agriculture and biotechnology. Nagpur and Ahmedabad are in states that have extensive experience with Bt Cotton, the first GM crop commercialized in India. Finally Chandigarh was included to represent a state which has been at the centre of the green revolution" (CEE, 2010b, p. 8). The next issue at hand was ensuring adequate representation of all the different publics. Hence, during registration of participants at the venues, "attending participants were identified by the interest groups they represented; each group was distinguished by a color code. A large registration counter at each consultation was meant for farmers; a second counter was for business people, traders, individuals, representatives of industry and citizen groups; the third counter for people from non-governmental organisations, activists, consumer group representatives and farmer group representatives; the fourth counter was for scientists and experts; the fifth counter was for researchers and students; and the sixth counter was for active and retired government officials and members of public trusts. Each registered participant was given a colored sheet with a printed number" (CEE, 2010b, p. 10). Table 2 presents the break-down of the public in terms of the interest groups they represented after combining all the seven venues.

No.	Interest Group	Representative Percentage
1	Farmers/Farmer Organisations	48.2%
2	NGOs/Consumer Forum/Environmentalists	19.6%
3	Scientists, Experts	10.6%
4	Students, Researchers	8.4%
5	Government Officials, Politicians/Elected Bodies	3.6%
6	Individuals, Citizen Groups, Business, Traders, Industries	9.6%

Table 2: Breakdown of Participants in terms of Interest Groups represented.

The names of the interest groups have been borrowed from the categorization offered in the pie-charts demonstrating the break-up of the participant at each individual venue (CEE, 2010b, p. 12). Table 2 offers a combined overview of participant break-up across the seven venues by combining these pie charts. As it can be observed, the consultations had an overwhelming participation of farmers which not only showcases the success of the consultations

in bringing out grassroots level response to Bt Brinjal, but it is also evidence of the success of various civil society activists who have been active in creating awareness among farmers as illustrated in *Chapter 5*. It is not a surprise that they are also the second most represented interest group in the consultations.

The consultations were held in the format of public hearings. After a brief introduction to the issue at hand, the forum was opened up for discussions which were presided over by Jairam Ramesh. "Using the color coded number sheets, the Minister addressed participants from the different stakeholder groups. CEE staff ensured that translation was available for the Minister for comments made in a local language and for stakeholders comments raised in English were translated into the local language. Each consultation concluded with a brief address from the Minister" (CEE, 2010b, p. 11). It is in the very nature of dialogue that stakes and position of individual participants can be evaluated. "At times the Minister had to even remind scientists that 'they should speak as scientists and not as NGOs'. To some scientists it seemed like an unwarranted intrusion into the technicalities of their world. After all, they argued, this was a 'scientific' issue and one should have a closed-door meeting with the concerned scientists and decide. For others it was an economic and commercial issue. So it was 'Let the farmer decide', or 'if someone does not want the Bt seeds they don't have to sow them' [and] to yet others this was a consumer issue." (CEE, 2010b, p. 3). These conversations are indicative of the rich diversity of arguments that came out of the Consultations.

Within the variety of issues addressed and positions that were taken, the National Consultations offer a vantage point to understand all the different elements of the controversy. These views were recorded and submissions were collected. "Nearly 6,000 participants registered for the seven consultations and an estimated 2,000 more attended or demonstrated outside the venues. More than 9,000 written submissions [...] were presented to the Minister. Shri Jairam Ramesh [...] chaired over 25 hours of heated consultations. What emerged was a rich array of concerns, comments, insights and opinions. Many of these can be further investigated to check their validity. While some are based on research, many are observations or are based on related experiences" (CEE, 2010b, p. 3). The rest of this chapter explores the documented nuggets of these conversations. It will capture the expanse of issues addressed in arguing for or against Bt Brinjal under the four trajectories as established by the Primer in combination with two more that came out of the consultations, which are: *Consumer Concerns* and *Bt Brinjal Approval Process*.

Studying Conversations from the Consultations

Conversations are fluid; they lack a sense of textuality unless they are documented and presented in the format of a text that eases interpretation. Social inquiry as methods of enabling conversations would ultimately analyse this textuality to observe, report and organise the actual subject-matter of the conversations. When it comes to studying 25 hours of a discussion spread over an approximate duration of a month, all that remains of those ephemeral conversations is the textuality of their documentation. This section analyses this textuality and presents them as results of this social inquiry. It provides a rich diversity of argumentation, both for and against, on the commercialisation of Bt Brinjal and ultimately examines its result in the moratorium on Bt Brinjal. These conversations as a text and as a discourse have been broken up into six distinct trajectories, which are as follows:

1. Pest Management
2. Bio-safety
3. Biodiversity and Environmental Impact
4. Livelihood and Economic Considerations
5. Consumer Concerns
6. Bt Brinjal Approval Process

I have chosen these trajectories because of their implications on the controversy. Commercialisation of Bt Brinjal as a technological product is closely connected not only with the domain of agriculture which it addresses as a technological solution, but being a food crop, it also becomes closely connected to the domain of the nature of food that is consumed. The conversation on food inevitably travels into a conversation in the domain of health and bio-safety. Since, agriculture as a practice has considerable impact on the biodiversity of an area because any crop within itself acts as an ecosystem, Bt Brinjal becomes connected to conversations on ecology. Again, agriculture as a practice is a source of livelihood to millions of Indians; hence the commercialisation of Bt Brinjal becomes connected to conversations on livelihood. Ultimately, approval for commercialisation itself originates from a need of a regulatory regime that controls such approvals and hence, the approval process becomes a topic of conversation. Bt Brinjal is being represented as a technology which has six distinct trajectories of impact.

Pest Management

The major argument for the introduction of Bt Brinjal is that it provides resistance against lepidopteron insects, in particular the Brinjal Fruit and Shoot Borer (*Leucinodes orbonalis*) (FSB). This resistance becomes important because "Brinjal cultivation involves usage of huge amounts of pesticide. 60% of plant protection cost is for controlling fruit and shoot borer" (CEE, 2010a, p. 13). Hence, "with Bt, the use of systemic and contact insecticides against FSB (25-80 in number) will reduce by 70%, and thus will also reduce insecticide residues significantly" (CEE, 2010b, p. 24). This decrease would financially benefit farmers and would be beneficial for the environment. "Chemical pesticides fail to prevent pest caterpillars from entering brinjal fruits. Only the Bt technology is found to reduce fruit damage effectively" (CEE, 2010b, p. 23).

This leads into a re-examination of traditional practices of cultivating Brinjal; the proponents for commercialisation of Bt Brinjal claim that, "traditionally available methodologies are inadequate for the control of pest infestation in brinjal" (CEE, 2010b, p. 23). "The fact that farmers continue to use insecticides in large quantities implies that non-pesticide practices are not preferred by majority of the farmers" (CEE, 2010b, p. 24). Hence, since pesticides "not only degrade the soil quality but may also contaminate water bodies, associated organisms and the ecosystem as a whole" (CEE, 2010b, p. 23), "Bt is a better alternative to conventional pesticides which pollute the environment" (CEE, 2010b, p. 24). For people who support Bt Brinjal, the reasons for the opposition to this technology is accounted for by stating that, "the potential application of GM crops in developing countries is limited because of a lack of knowledge about GM crops. The technology is not to be blamed" (CEE, 2010b, p. 24).

The opposition to Bt Brinjal comes from an ecological understanding of agriculture wherein "[the learning] over a period of time [has been that] all pests should not be killed but managed or controlled. […] Controlling pests with single toxic molecules either produced in factory or plant cell is an unscientific way of managing pests" (CEE, 2010b, p. 27). "Bt is being promoted as alternative to pesticide-based pest control. But there are several non-chemical alternatives available for this. Bt controls only fruit and shoot borer but there are other pests like whitefly and [their] infestation will increase in the absence of the fruit and shoot borer. Again, one has to depend on pesticides for controlling this phenomenon. This will increase the cost when the seed cost itself is high" (CEE, 2010b, p. 26).

This claim for the reduction of pesticide usage is further countered by arguing that, "official data from major producer countries US, Argentina and Brazil confirm that pesticide (both insecticides and herbicides) use increases with GM crops, including the use of toxic chemicals banned in some European countries." (CEE, 2010b, p. 27). Ultimately, "development of resistance is a fact of evolution and this is definitely going to happen in Bt over time" (CEE, 2010b, p. 26) which will only reboot the cycle of developing yet another technological solution to counter it. For people who didn't support Bt Brinjal, it "is not needed when safer, affordable, sustainable and farmer-controlled alternatives exist for pest management. Integrated Pest Management (IPM) and Non-Pesticidal Management (NPM) work well for pest management in brinjal cultivation" (CEE, 2010b, p. 25).

Simplistically, within the domain of pest management the argument for Bt Brinjal is that traditional use of pesticides has not been very successful in pest management while the argument against Bt Brinjal is that eventually it will also be unsuccessful because the pest will develop resistance. This question of pests developing resistance is currently answered by the addition of non-Bt seeds in a packet of Bt seeds that is sold, which acts as refuge for pests to delay the development of pest resistance to the Bt toxins. The U.S. Environmental Protection Agency has established guidelines for the use of Bt plant to address resistance concerns and preserve its efficacy as a reduced risk pesticide (U.S. Environmental Protection Agency, 1998). But, these are again stop-gap measures just like the traditional use of pesticides for pest management. The question then becomes of social acceptability of one method over the other in agriculture and it is within this notion of social acceptability that the use of Bt Brinjal for cultivation is contested.

Biosafety

When it comes to biosafety, the camp that supports Bt Brinjal reverts to the "rigorous biosafety tests [that] have been done as required by the Indian regulatory system. This includes acute toxicity tests in laboratory rats, sub-chronic oral toxicity studies, allergenicity studies on rats and rabbits and feeding studies in fish, chicken, goats, and milking cows" (CEE, 2010b, p. 37). Within these tests, "it has been reported that 90 -110 days of age (mating age) of rats is considered equivalent to 21-25 years age of humans" (CEE, 2010b, p. 39) and hence, they represent testing of long-term impact of Bt protein consumption. The simplest proof of bio-safety of the technology is "that in USA, people are eating GM crops for the past 13 years and no adverse effects have been observed" (CEE, 2010b, p. 37). In India itself, "Bt Brinjal is not the first GM crop entering the food chain. Bt Cotton-seed oil and cotton-seed cake are used in significant volumes and are already in the food chain since 2002" (CEE, 2010b, p. 37).

To take the argument further, it is pointed out that, "organic farming also sprays Bt bacteria and even after thorough washing, the bacteria enter through food into our system. If that is safe for us, Bt Brinjal is also safe" (CEE, 2010b, p. 38). Moreover, "the Bt gene breaks down during digestion into common amino acids, which are part of the normal diet and are neither toxic nor allergic" (CEE, 2010b, p. 38). "Apart from the fact that Cry1Ac is rapidly digested in gastric fluid, studies with Bt Brinjal showed that the Cry1Ac protein is not detectable within 1 minute of cooking by any of the various methods" (CEE, 2010b, p. 38). These methods "include deep frying, shallow frying, roasting and boiling" (CEE, 2010b, p. 38) which are practiced regularly in India for cooking brinjal. The supporters go on to point out that "the health problems that occur in India are an outcome of the very high pesticide residue on food" (CEE, 2010b, p. 39). So ultimately, they raise the question that, "the US regulatory agencies have released as many as 14 food items produced with GM techniques. Why not try to understand about their health impacts if any? We have experimented with only one and why are we scared of just the second GM crop in India" (CEE, 2010b, p. 39)?

The critique of Bt Brinjal starts with the claim that "long-term studies on allergenicity and toxicity have not been carried out prior to getting the approval for commercialisation of Bt Brinjal" (CEE, 2010b, p. 40). This is combined with the argument that "the small numbers of rats used in the toxicity studies and the small numbers of brinjals used in the 'compositional analysis' by Mahyco severely confound any attempts at statistical analysis of the results to the extent that only large, gross effects would appear as statistically significant in the data" (CEE, 2010b, p. 40). Commenting on the digestion process, the Bt protein "has been observed experimentally to survive and indeed bind to mammalian gut. Additional 'in vivo' studies are required not only to look at the stability of the entire protein, but also to examine the degree of degradation that occurs, what kind of peptide fragments are generated on what time scale, and whether these breakdown products might have effects distinct from the intact protein" (CEE, 2010b, p. 40). Furthermore, "it has been said that cooked brinjal is safe but the temperature at which the toxin will be neutralized is not given. The traditional cooked dishes include half-cooked brinjal in fries and pickles" (CEE, 2010b, p. 45).

The concern raised were not limited to the Bt protein, the presence of the antibiotic resistance markers was also questioned in a claim that "horizontal gene transfer to human gut bacteria is a proven fact and hence poses the threat of antibiotics resistance among human beings who consume Bt Brinjal" (CEE, 2010b, p. 41). Examining the impact of Bt Cotton, the critics argue that "Bt impact is observed among cotton growers and workers in Warangal. Problems like allergies, swelling of body parts; cattle deaths etc. have been observed. The technology is not benefitting people, but it is benefitting the multinational companies" (CEE, 2010b, p. 46). The research of Seralini (2009) is quoted to argue that "Bt Brinjal might lead to liver dysfunction, disrupt hormonal balance, cause diarrhoea etc" (CEE, 2010b, p. 46). Ultimately the question that they raise is that "when modified Cry protein can kill the pest, is it not possible that it can also harm the normal flora in our guts and do unforeseen DNA damage which is beyond our control" (CEE, 2010b, p. 42)?

While the rigor of the bio-safety tests conducted by Mahyco would remain contested as the process of voluntary consultation itself is debatable, one of the reanalysis by Seralini et al.

(2007) of a 90-day study conducted by Monsanto in support of the safety of a Genetically Modified Corn variety (MON 863) has been rejected by another panel of experts (Doull et al., 2007). They pointed out that "among other things, that if toxic effects were Bt related, they should have shown a dose-response relationship – higher doses of Bt consumption should also have shown more damage. No such dose response relationship was seen making it unlikely that Seralini et al had uncovered any significant problem" (Purkayastha & Rath, 2010). While, this does not prove that Seralini's work on Bt Brinjal should also be rejected, but it does imply that there is a definitive scientific uncertainty around GMOs that needs to be addressed.

On the other hand, there is a growing body of evidence to suggest that antibiotic-resistance genes can spread to bacteria living in the guts of humans (Bonner, 1997; Chee-Sanford et al., 2001). But, a number of alternatives to antibiotic-resistance marker genes are available which include reporter genes, genes that confer resistance to cytotoxic agents, and genes that confer an ability to utilize compounds that are normally inaccessible (Nottingham, 2002, p. 108). The usage of these genes is still under research, but the future is bright. As for the current state of the GM debate, it lies riddled with uncertainties of scientific risk assessment and this can also be observed within the Consultations on Bt Brinjal.

Biodiversity and Environmental Impact

The three major points raised in favour of Bt Brinjal are as follows:

1. "The impact of gene flow to wild relatives of cultivated brinjal (*S.melongena*) has been considered. It has been reported that there is no natural crossing among cultivated and wild species of brinjal including *S. incanum* and *S. insanum* (N. Rao, 1979). Under forced crossing situations, even if crossing was possible, the viability and subsequent development of fertile seeds have not been successful. Hence the perception about destruction of brinjal diversity in India due to introduction of Bt Brinjal is unfounded in science. [...] The various species of Solanum have co-existed for millennia with no loss of biodiversity inspite of *S. melongena* being widely cultivated" (CEE, 2010b, p. 18).
2. "Isolation distance in brinjal or other crops is required for seed production purposes, and farmers are used to maintaining such stipulated distances when they are undertaking such activity. Therefore, it is not correct to say that farmers cannot maintain isolation distance required in case of Bt Brinjal cultivation" (CEE, 2010b, p. 28).
3. "The origin of cultivated brinjal is uncertain, with differing views put forward by scientists. South America and Indo-China are thought to be the areas of origin. India is considered a centre of diversity" (CEE, 2010b, p. 19).

Critics of Bt Brinjal initiate their arguments by stating that, "Brinjal is a crop with 2- 48% cross-pollination (refer All India Coordinated Vegetable Improvement Project of ICAR). [The data could also be accessed from Ministry report on Brinjal (DBT & MoEF, 2010, p. 5)]. Bt Brinjal will pollute our vegetable germplasm. Transgene cross-pollination is an irreversible risk, as evident from Bt cotton experiences in Gujarat. The brinjal belongs to the family Solanaceae the same as that of potato, chillies, tomato and tobacco. The mutation of the transgene and horizontal gene transfer may create long term and far reaching adverse consequences" (CEE, 2010b, p. 19). Building on this argument, a need for isolation distance is established between Bt-

crops and non-Bt crops and then it is problematised by pointing out that "small and marginal farmers have very small land holdings and cannot maintain isolation distance to check transgene out-pollination" (CEE, 2010b, p. 21). The ecological argument is further explored with arguing that there is a lack of research on the impact of Bt Brinjal on non-target species such as honey-bees, other insects and actinomycetes which break down soil to form humus.

Reverting back to the Bt Cotton experience, it is argued that "Bt cotton may have used less pesticides than non-Bt cotton but it requires far more fertilizers, which has serious implications regarding soil pollution" (CEE, 2010b, p. 22). The argument then moves into local cultures of diversity in brinjal cultivation. "Local traditional varieties have been developed by farmers over a long period of time based on the climatic and edaphic conditions of the area. These varieties are very important for combating the menace of climate change. […] Sustainable agriculture depends on a functional and supportive soil-food web, which determines the fertility of the soil. The introduction of Bt toxin may badly disturb this soil-food web due to the destruction of several types of useful microorganisms, in addition to its biochemical impacts" (CEE, 2010b, p. 21). Ultimately, it is argued that "Brinjal originated in and is endemic to India with 3531 cultivated and 337 wild varieties (National Bureau of Plant Genetic Research, ISAAA: Brief 38 [(Choudhary & Gaur, 2009)]). This genetic diversity must be protected. Natural rights of farmers must be protected as the contamination may end up with gene theft as the introduced gene is patented and protected" (CEE, 2010b, p. 52).

The reason for a large debate on whether India is a centre of origin of Brinjal is primarily borne out of one of the provisions of the U.N. Convention on Biological Diversity (CBD), 1992 to which India is a signatory. Under *Article 8: In-situ Conservation* within its text, it states that "Each contracting party shall, as far as possible and as appropriate: […] Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" (United Nations, 1992). Critics have treated Bt Brinjal as an alien species that will threaten the rich diversity of brinjal in India and hence, make it legally mandatory to prevent its commercialisation. The debate still persists because even the ISAAA brief quoted in the National Consultations states that "there is some uncertainty as to whether the centre of origin of brinjal is India or China" (Choudhary & Gaur, 2009, p. 5).

On the other hand, gene flow in pollen and the need for isolation distance to protect non-transgenic cultivars is well-established with scientific evidence (Nottingham, 2002, p. 62-65). The question as to whether such isolation distance could be efficiently managed by small-scale and marginal farmers is difficult to answer. In a country with limited space and one of the largest populations in the world, leaving a part of land mandatorily out of agricultural practice would certainly be a difficult task. Ultimately, the questions as to how Bt Brinjal would interact with the surrounding ecosystem and how would it behave in different climatic conditions in different regions of India can only be scientifically answered with follow-up research post-commercialisation or an intensive research program dedicated to finding these answers pre-commercialisation. Though, one of the comments made by critics does stand out and requires critical attention: "The complexity as well as inter-relatedness of species within ecosystems is such that the prediction of impacts from human interventions cannot be made with certainty, nor can the time frame within which the impact will escalate be predicted. The precautionary

principle is, therefore, paramount in giving clearance to any major or widespread intervention" (CEE, 2010b, p. 22).

Livelihood and Economic Considerations

When it comes to livelihood and economic considerations, the supporters of Bt Brinjal point out that, "Cultivation of Bt Brinjal will reduce insecticide use against FSB by 70% and so the pesticide costs for the farmer will be significantly reduced. The cost of seed to the farmer is less than 3% of the cultivation costs of Bt Brinjal and hence the question of substantial increase in input costs does not arise. [Since TNAU and UAS] are fully geared to multiply commercial seeds of Bt Brinjal for distribution to farmers […], the fears of monopoly of a multinational company over seeds are unfounded. [Ultimately,] the farmers are also getting commercially-minded nowadays, and want to produce for profit. If new technologies promise higher profits, the farmers have a right to choose. If they do not find the technology feasible they will reject it, and the companies will be forced to shut shop. Thus, the government should not shy away from introducing Bt Brinjal" (CEE, 2010b, p. 28). These arguments are further justified by looking at the Indian experience with Bt Cotton, wherein, Bt cotton is attributed to be the reason for India's second rank in cotton production as opposed to fifth or sixth in the past (CEE, 2010b, p. 29). Ultimately, critiquing the proponents of organic farming, the supporters say that, "Organic farming will never feed the country or ensure food security. The only alternative when pesticides fail to improve yield, is GM crops" (CEE, 2010b, p. 29).

The critique of Bt Brinjal starts with pointing out that "a monopoly of multinational companies in seed production and sale of the seeds is not in the economic and political interest of India" (CEE, 2010b, p. 29). "GE is not an answer to food security; better storage, distribution, pricing and marketing strategies will eliminate the need for the risky GE technologies" (CEE, 2010b, p. 30). Looking at traditional agricultural practices, it was pointed out that, "Almost 80% of India's farmers still follow the traditional system of saving, sharing and exchanging/bartering seeds, and hence do not buy them. It is important to maintain sovereignty of these farmers and their traditional methods." (CEE, 2010b, p. 31). In an attempt to legitimize their position, the critics point to the final report of the International Assessment of Agricultural Science and Technology for Development (IAASTD, 2008) which "recommended that small-scale farmers and agro-ecological methods are the way forward, with indigenous knowledge playing an important role. It pointedly noted that GM crops are not the answer to hunger, poverty or climate change" (CEE, 2010b, p. 31).

Re-examining the Bt cotton claim, the critique is three-fold, first that "Bt cotton seeds have dominated markets due to manipulative systems, and farmers as consumers are forced to purchase it due to difficulties in purchasing non-Bt varieties" (CEE, 2010b, p. 30). Secondly, "production of Bt cotton decreases over subsequent years. Hence it is not profitable for farmers in the long run" (CEE, 2010b, p. 29). "It is worth noting that almost all farmer suicides have taken place in belts where Bt cotton has unleashed a chain reaction of pesticides, seed monopolies and debt" (CEE, 2010b, p. 34). And thirdly, "even though the company (Mahyco) has suggested that the Bt cotton seeds can be re-used it has been noted that the production in the second generation reduces considerably, making this an unviable and pointless suggestion" (CEE, 2010b, p. 32).

The critics centre their take on livelihood on the right to a way of life. If farmers in India practice agriculture by saving, sharing and exchanging/bartering seeds, then privatization of seed and a possible future of monocultures of GMOs in Indian agriculture should be prevented. On the other hand, the supporters don't mind the monocultures in exchange for better productivity and higher return on investment. The choice is between a diversity of locale-specific brinjal varieties and mass-production of a monoculture of Bt Brinjal. It could argued that Bt Brinjal could also be one more addition to the brinjal varieties of India, but the possibility of genetic contamination makes the co-existence of GM crops and non-GM crops very difficult and logistically challenging. Once the choice of opting for GM food crops is made, it would be difficult to revert back to the present situation.

Consumer Concerns

In the domain of consumer concerns, the major point that was raised was concerning the adequate labelling mechanism for differentiating between Bt and non-Bt Brinjal. Since, labelling as an issue becomes important post-commercialisation of Bt Brinjal; the concerns have been mostly raised by critics of Bt Brinjal. They start by looking at the cost of the vegetable and pointing out that, "Brinjal is not a costly vegetable (Rs. 8 [€ 0.15] to Rs. 24 [€ 0.40] per kg, depending on seasons and places). Thus, it is not an important crop that needs genetic manipulation" (CEE, 2010b, p. 35). One of the primary concerns has also been that "Bt Brinjal, involving a gene insert from another organism, cannot be accepted as a pure vegetarian food" (CEE, 2010b, p. 35) and hence, for communities that only eat vegetarian food such as the Jains, the demand for strict labelling becomes much more important. This was further substantiated with the argument that "if the consumer does not know what he/she is buying and eating, it is an infringement of the individual's right to information and right to informed choices" (CEE, 2010b, p. 37). Ultimately, looking at cuisines, it was argued that "a monoculture that could result from Bt Brinjal will completely destroy the local cuisines made from specific varieties of brinjal" (CEE, 2010b, p. 35).

Labelling as a concern operates under the assumption that GM food crops have been approved for cultivation or that GM food has been imported into India. While there are strict regulation on the manufacture, use, import, export and storage of GMOs in India, there are still no policies around labelling of GM food. The PIL filed by Aruna Rodriguez and Others pointed out this deficiency in one of their prayers to the Supreme Court while requesting to "place rules to ensure that it shall be compulsory for any dealer or grower selling GMOs to label them as such" (Rodriguez et al., 2005, p. 34). Re-examining the argument of whether there is a need for genetic manipulation of brinjal, it is worth thinking as to how brinjal became the first food crop to come up for approval. As seen in *Chapter 3*, there are many food crops in the pipeline for approval, but brinjal seems to be oddly placed when it comes to need for genetic manipulation. "Second only to the potato in terms of the total quantity produced, the brinjal continues to be an important domestic crop cultivated across the country accounting for 9% of total vegetable production and covering 8.14% of the land under vegetable cultivation" (CEE, 2010b, p. 3). It is produced in such abundance that India exports brinjal as well. In such circumstances, there is an absence of a public perception of an acute need that Bt Brinjal addresses. This problematises the issue since in the absence of such a need; the public opinion has tended towards rejecting Bt

Brinjal on overriding concerns against its commercialisation. A risk is taken only in view of a possible benefit. The perception of benefit, in this particular case, seems to have fallen short of the perceived risks.

Bt Brinjal Approval Process

The National Consultations were held after the GEAC approved Bt Brinjal for commercialisation; hence, the supporters of Bt Brinjal were satisfied with the regulatory regime around GMOs in India. They elicit their support for the approval process by pointing out that, "Philippines and Bangladesh have found the Indian dossier (on Bt technique) thorough and exhaustive. Today in both these countries public partners are in advanced stage of agronomical studies and both countries are considering de-regulation of GM crops" (CEE, 2010b, p. 51). Taking the Bt Cotton case, they argue that the "knowledge of farmers is being insulted by these accusations that Bt Cotton is unsuccessful in India. The widespread adoption of Bt Cotton is only because it has been more successful than traditional varieties" (CEE, 2010b, p. 51). Hence, they suggest that "Bt Brinjal technology can be adopted for five years on a pilot basis, and if not found satisfactory should be legally rejected [and] Ministry should do the needful to clear the apprehensions which is not only about Bt Brinjal but also helps all biotechnology initiatives through proper explanations from genetic experts" (CEE, 2010b, p. 51).

On the other hand, the critics of Bt Brinjal demand that "there should be a moratorium on the introduction of Bt Brinjal and GM foods for a certain period. During this period the government should set up a credible and transparent public sector institutional structure sufficiently equipped for undertaking longer and medium-term laboratory and field studies vis-à-vis the biosafety of GM food crops including Bt Brinjal" (CEE, 2010b, p. 52). They go on to elaborate how the tests that have currently been done are inadequate in determining the bio-safety of Bt Brinjal. Thereby making the grounds for the argument that "the introduction of Bt Brinjal in India calls for a 'holistic', rather than a 'reductionist' approach" (CEE, 2010b, p. 57). Also, "the proof given by GEAC on Bt Brinjal is incomplete, baseless and false. The data represented in the report is not clear and does not support the scientific arguments" (CEE, 2010b, p. 55).

Talking about Bt Cotton, they argue that "decisions related to GM crops need cautious case-by-case approach to take into consideration concerns raised by each stakeholder. Bt Cotton and Bt Brinjal are different types of crops with different implications and thus the experience with Bt Cotton is not valid for Bt Brinjal" (CEE, 2010b, p. 52). Looking at the projected monocultures of Bt Brinjal that would emerge post-commercialisation, they argue that "plant and vegetable varieties in India have not been at any stage adequately researched. This lag in research does not allow the accurate evaluation of the environmental losses that could occur if Bt Brinjal becomes a monoculture" (CEE, 2010b, p. 52). Also, "India completely lacks post-marketing surveillance and regulatory mechanisms. In such a scenario, how will we monitor any impacts of Bt Brinjal, once it is released in the open market and open environment?" (CEE, 2010b, p. 52). Ultimately, they reject the acceptance of the bio-safety of Bt Brinjal on the principle of substantial equivalence to GM food crops already in the US markets by stating that, "Bt Brinjal cannot be accepted, without any independent testing, verification or long-term tests for health effects, on the principle of substantial equivalence when the company which owns the technology has been

able to patent this very same Bt technology on the basis of substantial transformation and earns millions of dollars in patent or technology fees" (CEE, 2010b, p. 54).

At a fundamental level, the criticism on the approval process comes from a lack of trust. While, GEAC as a public regulatory authority is being questioned on its mandate, the solution that is offered is another public body institution that does not rely on voluntary consultation with GM companies but does all the bio-safety tests itself. While this raises a collection of logistical challenges in relation to the setup of such a public authority, the issue of trust on GEAC and DBT needs to be addressed first because, ultimately, even the newly created public institution would face the challenge of securing public trust. The reason for this distrust has been a multiplicity of factors, first, the reaction of DBT to the RTI application of Raghunandan, second, the presence of two independent scientists in GEAC meetings under the directive issued by the SC and three, the responses given by the Civil Society that claim that the members of the expert committee setup by GEAC are connected to Mahyco, one way or the other. There is a certain lack of transparency in the operation of GEAC and DBT that has been observed by the SC as well as the Civil society activists and this has played a crucial role in vitiating the image of GEAC as a transparent public institution. The focus on public trust of public institutions becomes an integral part of the critique of Bt Brinjal as a technology.

Channelizing Public to Participate

This chapter showcased the arguments that the fragmented public that gathered around the issue of Bt Brinjal gave during the National Consultations. These arguments indicate the success of the methods of the social inquiry as illustrated in *Chapter 2 and 3* in enabling the public to manifest its interest around Bt Brinjal. A closer look at the arguments against the commercialisation of Bt Brinjal will point out that these arguments are similar to the ones that have already been captured in the previous chapters. This is indicative of the success of the Coalition in gathering a public around its view-point. The wide variety of activities that were orchestrated by the Coalition and the context within which PIL and RTI application were used as methods, indicate that there is no one correct way of enabling a fragmented public to gather around an issue and that the nature of these methods differ depending on the context of their usage.

Though, there is one common factor that binds all of these methods together. This factor is that all of the methods, as suggested in Dewey's quote with which this chapter began, are aimed at full publicity of all the consequences of commercialisation of Bt Brinjal that concern this public. Most of these methods, which have been studied in this thesis, have been used to highlight the adverse consequences of this commercialisation and hence, the communication that they enable also has an anti-GM bias. But, the context within which these methods originate is the belief system around science-led development and progress in India. This belief system lends itself into the idea of biotech-led Second Green Revolution. Within the context of this belief system, communication of the benefits of commercialisation of Bt Brinjal has been done by the public officials (as it can be inferred from Prithviraj Chauhan's letter) and the marketing done by biotech companies. In making a case either for or against Bt Brinjal, there was a multiplicity of channels of communication and the public has used the subject matter from these communications to express their opinion on the issue at hand.

The National Consultations can also be interpreted within Dewey's heuristics. The multiplicity of stakeholders that were present during the National Consultations represents the public that gathered around the issue of Bt Brinjal. The method adopted to conduct the National Consultations is an illustration of the methods that enable social inquiry. This method required rigour, as it can be observed in the consistency of approach with which these Consultations were held in seven different cities. It garnered legitimacy because it was organized by CEE at the request of the MoSEF and it represented the MoEF's mandate of conducting open conversations on the commercialisation of Bt Brinjal. CEE itself was established as a Centre of Excellence in 1984 as a result of a unique partnership between government and a non-governmental institution (CEE, n d). Krishnan also affirmed the Consultations were transparent and it enabled an open debate to occur. Ultimately, their organization emanates from the context of the debate on Bt Brinjal which has been illustrated in the previous chapters.

The controversy on Bt Brinjal did not end with the National Consultations and the imposition of the moratorium. The activities of the Coalition continued post-moratorium with allegations of plagiarism made against the Inter-Academy report (National Academies of Science, 2010) on scientific risk assessment of Bt Brinjal brought out by six top national academies of India at the request of the MoEF after the moratorium. Responding to the report, "Nandula Raghuram of the Society for Scientific Values, an ethics watchdog based in Delhi, [said] that what should have been a rigorous assessment by India's top scientific institutions has ended up as the mouthpiece of Ananda Kumar, a plant scientist who is director of the National Research Centre for Plant Biotechnology and a known proponent of GM crops" (Shetty, 2010). The moratorium, in this sense, was a temporary closure for policy-making on the issue of GM crops, but the controversy continues on the scientific front. But, the reporting of events in the context of this thesis ends with the National Consultations. A public has expressed its interests diachronically as the events unfolded between 2005 and 2010 and with a temporary resolution of the issue in the moratorium; it has reverted back into a nascent fragmented state until the historicity of events precipitates into a demand for another public.

7

Conclusion: Tracing Co-production of Publics and the Bt Brinjal Controversy

This final chapter of this thesis offers conclusions that can be inferred from the story of the development of the Bt Brinjal controversy between 2005 and its temporary culmination in the moratorium in 2010. This thesis has studied the events that happened during the controversy using Dewey's heuristics on the creation of publics and this chapter will illustrate how these publics have been co-produced with the scientific uncertainty around risk assessment of Bt Brinjal. Co-production (Jasanoff, 2004), in this sense, is an after-thought that enables a better understanding of the development of the Bt Brinjal controversy.

Dewey's pragmatist approach to publics is about creation of methods that solve the prime difficulty of any democracy to discover "the means by which a scattered, mobile and manifold public may so recognize itself as to define and express its interests" (Dewey, 1927, p. 146). In doing so, he conceptualizes the idea of an 'issue' around which such public will gather which might or might not be scientific or technical. He does not specifically address the creation of publics around scientific issues. Hence, in addressing the issue of Bt Brinjal controversy, it becomes essential to create another layer of theoretical heuristics that enable an understanding of the democratic processes by which this public expression is manifested around scientific issues. Jasanoff's (2004) co-productionist idiom enables such understanding by suggesting that there are well-documented pathways along which this reciprocity between creation of democratic processes of public expression and the creation of scientific issues could be understood. I have treated these pathways as the second layer of theoretical heuristics that helped my understanding of how this scientific controversy on Bt Brinjal is as much a product of public expression as this public expression is a product of the scientific controversy.

Analysing the nature of the public expression that has been studied in this thesis, I am reminded of a quote by Richard Lewontin, an American evolutionary biologist and geneticist. "It is easy to be a critic. All one needs to do is to think very hard about any complex aspect of the world and it quickly becomes apparent why this or that approach to its study is defective in some way. It is rather more difficult to suggest how we can, in practice, do better" (Lewontin, 2000, p. 109). This quote indicates one problem of criticising scientific risk assessment models around GM crops. As mentioned in *Chapter 1*, the Bt Brinjal controversy is deeply embedded within scientific uncertainty around the use of GMOs for agricultural purposes and their potential ecological impacts. The discourse of the critique of this uncertainty makes it travel from the domain of science into the domain of environment, livelihood, food safety, regulation, ethics of information and ultimately, policy-making. In all of these different discourses that this critique combines, there are only a few suggestions for solving the scientific problem of assessing biosafety of GMOs.

First solution is a rejection of the technology in favour of sustainable, ecological farming practices. Second solution is the creation of a new transparent public institution that does not rely on voluntary consultation with biotech companies for regulating GMOs and conducts its own medium and large scale biosafety tests on these GMOs pre-commercialisation. Finally, the third solution is a revision of the list of biosafety tests that need to be conducted before commercialisation and these are listed in Andow's (2010) analysis and the tests recommended by Bhargava (2002). The first two solutions, in and of themselves, do not deal with the science of GM technology. The first solution takes a strong approach to Precautionary Principle and demands a ban on its commercial use. The second addresses the issue of trust and accountability in regulatory mechanisms, instead of looking at the uncertainty within the technology itself. The third solution is useful but, again, if these recommendations are rejected by the regulatory authorities as being "neither relevant nor applicable" (Expert Committee II, 2009, p. 61) as in the case of Bhargava's list of tests, then the situation would continue to remain in a deadlock. The MoEF has asked to GEAC to come up with new regulatory protocols with a larger base of public trust. If the response of the *shallow ecologist* public and scientists that supported them (refer *Chapter 4*) is not adequately represented in this re-evaluation, then a closure of this debate is unlikely and the re-evaluation will not lead to a better resolution of the controversy.

As established in *Chapter 1*, co-production occurs neither at random nor contingently, but along certain well-documented pathways. An analysis of these pathways is not simply an effort to understand the nature of any scientific controversy; it also provides insights into how the controversy progresses diachronically. These pathways are adopted to build the complexity of a controversy. For example, looking at the pathway of *making identities*, understanding the construction of these identities is not just about exploring the plurality of view-points that are expressed through these identities in a controversy. These identities are expressed diachronically in the progression of a controversy and it is within these expressions that the controversy originates. In the specific context of Bt Brinjal, the communitas of anti-GM civil society (refer *Chapter 5*) has a definite and determinate identity of opposing the commercialisation of Bt Brinjal. It is through the expression of this identity that the controversy became the issue for the National Consultations. The next four sections will look at the four pathways along which co-production occurs and they will offer, not only an understanding of the controversy, but also an explanation as to how each of these pathways was adopted to create the controversy.

Making Identities

A controversy originates in a clash of identities; without a multiplicity of identities within a public that gathers around an issue, a controversy cannot take shape. The Bt Brinjal controversy exhibits a plurality of identities around the issue of Bt Brinjal. Extending Dewey's thesis on publics, when occupations determine the consequences of associated activity, they also determine the identity of the person who carries out the occupation. Taking this lens of occupation into the National Consultations, the multiplicity of stakeholders that participated in them had different occupations. It ranged from farmers, civil society activists and scientists to bureaucrats, politicians and consumer groups. Each of these stakeholders had a different occupation and hence, a different identity and they expressed it with different concerns around the issue of Bt Brinjal. But, this analysis of identities only offers a vantage point for understanding the nature of

the controversy. For Jasanoff (2004), the pathway of making identities implies redefinition of identities as a "way of putting things back to familiar places" (p. 39). This redefinition not only redefines the scope of the controversy, its analysis also enables a better understanding of the controversy. It is in this context that the Coalition of GM-Free India was explained in *Chapter 5* with the theoretical construct of communitas.

As explained in *Chapter 5*, a communitas is created by people who experience liminality together. Liminality could also be understood as an intermediate space between two distinct identities. For example, during rites of passage, people who experience liminality are in between two known cultural identities of a child and an adult. The Coalition experienced this liminality because of the changes in the policy paradigm of Indian agriculture. As Indian policy moved from Green Revolution to Gene Revolution, the practices advocated by the members of the Coalition became liminal. Their practices are more commensurate with Green Revolution policies than Gene Revolution policies. By redefining their identity from being propagators of their individual institutional ideology of agricultural practices to an opposition to GM crops in India, they were able create a definite and determinate identity within their liminal state. The creation of this identity inevitably leads to a stronger focus of the Coalition's activities on opposition to GM crops than on the future of Indian agriculture. The reason why the Coalition is not treated as an organisation by its members is because this identity is transient. Since liminality, in this case, exists between two policy paradigms, the experience of liminality for these organisations would end after they attain closure by either accepting the Gene Revolution policy paradigm or making the policy paradigm itself liminal. The imposition of the moratorium makes Indian policy paradigm around agriculture liminal between Green Revolution policies and Gene Revolution policies. In this liminal state of policy paradigm, these organisations can now revert back to the 'familiar places' of their original institutional mandates and propagate their organizational identities, whether it is support for NPM or IPM or sustainable agricultural practices.

In expression of this definite and determinate identity of opposition to GM crops, the members of the Coalition are treated as being anti-science within the persistent notions of science governance in India. This counter this treatment, the Coalition has heavily relied on building a scientific critique around uncertainty of GM technology and in the process, they have also ridiculed the science of GM technology. These activities showcase what an opposition to technological solutions that have been assumed, within the belief system around Science, to be a part of the future of India would entail. Their dissent is not only systematic and continuous in the five years that have been studied, it is also rigorous. In the process, they have accused biotech companies of a lack of accountability, regulatory authorities to be in conflict of interest and they deemed the Indian public at large to be ignorant of the sweeping changes that appropriation of GM crops would entail on the agricultural landscape of India. The issues incorporated within the idea of commercialisation of Bt Brinjal became multiple and manifold through the critique offered by the Coalition and the identity of the Coalition emerged because of the realization that this commercialisation would reaffirm the Gene Revolution policy paradigm. In this sense, the Communitas of Anti-GM Civil Society and the controversy have co-produced each other.

Making Institutions

Jasanoff (2004) treats institutions as stable repositories of knowledge which also enable recognition of legitimacy and social acceptance of new technologies into society. With respect to policy, specifically regulation of GMOs in the present context, "institutions [such as GEAC and DBT] are required to interpret evidence, make law, standardize methods, disseminate knowledge or ratify new identities" (Jasanoff, 2004, p. 40). As illustrated in *Chapter 3 and 4*, the role of the DBT and GEAC was instrumental in the construction of the controversy and its extension from simply a debate on scientific uncertainty to a controversy on the accountability of public bodies and probity in governance of GMOs. The refusal of DBT to release information on the biosafety data on Bt Brinjal to protect commercial interests of Mahyco and the decision of GEAC to refer the final decision on the commercialisation of Bt Brinjal to MoEF were critical events in the development of the controversy. As events progressed, ultimately MoSEF's directed GEAC to re-evaluate the approval process of GMOs to generate larger public trust. This indicates how GEAC as a knowledge repository had become unstable from the point of view of the public and required a recalibration of its mandate to regain the status of stability. These doubts around GEAC as a stable repository of knowledge led to the critique around regulation of GMOs, which was an important issue during the National Consultations.

Another institution that played a critical role in the controversy was the Supreme Court. As a legal institution, the SC enables Indian society to "have access to tried-and-true repertoires of problem-solving, [...] methods of securing credibility, and mechanisms for airing and managing dissent. Solidified in the form of administrative routines, these repertoires offer constant fall-back positions from which responses to novel problems can be constructed" (Jasanoff, 2004, p. 40). The directives issued by the SC added to the critique on GMO regulation in India. The acceptance of the PIL petition filed by Aruna Rodriguez and others for Court proceedings gave the concerns raised by civil society activists the legitimacy they required to question the Gene Revolution policy paradigm. As interim directive issued during Court proceedings, the SC superseded the mandate of GEAC and imposed a ban on the field trials of GMOs. It also directly influenced the functioning of GEAC by requesting two additional scientists, Swaminathan and Bhargava, to be present in all the meetings of GEAC when approvals of GMOs for field trials were discussed. Both these directives issued by the SC vitiated the legitimacy of GEAC as a regulatory authority and enabled a larger critique on probity in regulation to develop. The SC also directed GEAC to release biosafety data on Bt Cotton for public inspection which was used as an argument for the release of biosafety data on Bt Brinjal. All of these directives enabled the civil society activists to secure credibility and the acceptance of PIL itself provided them an arena for airing their dissent.

The impact of the increase in doubts on the functioning of GEAC, ultimately, led to the demand for a new public institution for GMO regulation in India. This demand was explicitly made during the National Consultations for this new institution to be "sufficiently equipped for undertaking longer and medium-term laboratory and field studies vis-à-vis the biosafety of GM food crops including Bt Brinjal" (CEE, 2010b, p. 52). This demand indicates a complete lack of trust in the process of voluntary consultation with which GMOs are regulated in countries that have adopted GM technology. Whether this demand would be addressed by the Government of

India in the future cannot be predicted, but it can be observed how trust in regulatory institutions can lead to a smoother appropriation of new technologies. In the absence of this trust, the uncertainty around scientific risk assessment of Bt Brinjal became a prominent issue because the GEAC is deemed to be unfit to handle its regulation by civil society activists. *Chapter 4* illustrates the different publics that gathered around this issue. The GEAC in response created Expert Committees to evaluate Bt Brinjal. The creation of these Expert Committees led to a further deepening of the controversy with issues such as inadequacy of their evaluation, conflict of interests in the formation of EC-II on Bt Brinjal and newspaper articles exposing that EC-II was being pressurized to approve Bt Brinjal. In this sense, all the different publics that gathered around the issue of risk assessment of Bt Brinjal and the functioning of GEAC have co-produced each other in the controversy.

Making Discourses

Changing the nature of discourse in a critique enables addition of further complexity into a controversy. Jasanoff (2004) suggests that, "Solving problems of order frequently takes the form of producing new languages or modifying old ones so as to find words for novel phenomena, give accounts of experiments, persuade sceptical audiences, link knowledges to practice or action, provide reassurances to various publics, and so forth" (Jasanoff, 2004, p. 40-41). As it can be observed in development of the Bt Brinjal controversy, these strategies have involved the appropriation of existing discourses such as Farmers' varieties of seeds (Shiva et al., 2000), corporatisation of seeds (Shiva & Crompton, 1998), work of scientists such as Pusztai on genetically modified potatoes (S. Ewen & Pusztai, 1999) and their selective re-tailoring to suit new needs of creating the discourse of opposition to Bt Brinjal. In this process, "scientific language often takes on board the tacit models of nature, society, culture or humanity that are current at any time within a given social order" (Jasanoff, 2004, p. 41). This can be observed in the way the primary purpose of Bt Brinjal as an effective pest management technique has been critiqued using an ecological understanding of pest management wherein "controlling pests with single toxic molecules either produced in factory or plant cell is an unscientific way of managing pests" (CEE, 2010b, p. 27). Thereby, making an argument that pests should not be killed but managed or controlled.

There is a multiplicity of discourses that the Coalition has used to critique the science governance of GMOs in India. These discourses incorporate the lifeworld (Husserl, 1936) of farmers, consumers, and public officials. When the discourse is built around farmers, Bt Brinjal becomes a livelihood issue where the traditional practices of Indian farmers are threatened by corporatisation of seeds. When the discourse is built around consumers, Bt Brinjal becomes a public health issue wherein the toxicity and allergenicity of Bt Brinjal have been inadequately testing. When the discourse is built around public officials, Bt Brinjal becomes an issue of incorrect assumptions around the benefits of GM crops wherein these officials (such as Prithviraj Chauhan) have 'erroneous views' on assessing the biosafety of GM crops. These views have driven successive government policy towards the Gene Revolution policy paradigm. While a few of these discourses deal with immediate consequences of appropriation of GM crops, such as food safety, the others approach the long-term consequences of this appropriation, such as corporatisation of seeds. In doing so, they not only address the tacit models of Indian agricultural

society and cultures of food, they also increase the complexity of Bt Brinjal controversy from an issue of scientific uncertainty to an issue that incorporates these lifeworlds as well.

By increasing the complexity of Bt Brinjal controversy, these discourses raise pertinent questions which have been captured by Visvanathan (2010a) in his analysis of the moratorium. "Can regulation go beyond a code of experts and represent the interest of different stakeholders? [...] Is the logic of a subsistence society of small holdings different from the logic of market as visualized by biotechnology firms?" For him the moratorium creates the space where these questions could be debated upon. But, looking at the nature of these questions, they are not directly related to the science of Bt Brinjal. They develop around it by reformulation of the discourse of the science of Bt Brinjal as a regulation and a livelihood issue. Scientific practice, in this sense, leaves the realms of objectivity to cater to the subjective demands of a society. This aspect of scientific practice is the subject of analysis in Bijker et al's (2009) work on the paradox of scientific authority. Their work examines this paradox that while scientific advice is deemed to be very important for an understanding of emerging technologies such as GM crops, yet it has also been increasingly questioned by policy makers, stakeholders and citizens. In this respect, as the nature of scientific advice changes in order to cater to these increasing questions, it gets co-produced between the scientists and the stakeholders who question it. In this sense, within the Bt Brinjal controversy, the public that participated during the National Consultations to express their opinion on the GEAC's recommendations was co-produced with the paradox of scientific authority of GEAC.

Making Representations

Representations are usually created to serve two purposes: first, easy interpretation of the subject matter and second, to put forth a point of view which is embedded in the representation. Talking about these aspects, Jasanoff (2004), argues that scientific representations are made to be "intelligible in diverse communities of practice, but the connections between this work [of making scientific representations] and that of political and social representation [embedded in this work] has not always been apparent" (p. 41). The act of making a representation is embedded within the politics of it. In this respect, the representation of GM technology as the future of agriculture is embedded within the persistent notions of science governance in India. GM is not simply a technology, but it is also represented as a tool enabled by science that will solve the problem of food security for the growing population of India. Within this representation, to oppose GM technology is to oppose the practice of science. It is within the context of this representation that the Bt Brinjal controversy develops and gets complicated. The civil society criticism is viewed as an unnecessary intrusion into the world of scientists and it makes open conversations between scientists and citizens on the issue of GM technology difficult to organise. Even during the National Consultations, the percentage of scientists among the public was 10.6% and the civil society activists at 19.6% were literally double in number. Though, the presence of both these groups in the same forum is indicative of a gradual increase in such conversations.

The civil society activists have used a multiplicity of representations to put forward their opposition to Bt Brinjal. They equated Bt Brinjal to be poison on the food plates of Indians and they treated its commercialisation as a large scale experiment on Indians as lab rats to ascertain the biosafety of GM crops. Both these representations are similar in the simplicity with which

they represent the biosafety of GM technology. Treating Bt Brinjal as poison or Indians as lab rats of an experiment might not be scientifically accurate, but these representations accentuate the health concerns around GM technology to get the attention of the Indian middle class towards the debate. In publicising these representations, they also use the popular discourse of corruption rampant within the bureaucratic machinery of India, to make a case that GM food will proliferate into the Indian food culture because of a corrupt regulatory mechanism that has been bribed by biotech companies (refer *Chapter 5*). Their campaigns and the representations they publicised can be interpreted as one of the reasons for the large participation of public during the National Consultations.

Finally, the decision of Jairam Ramesh, the MoSEF, to impose a moratorium on the commercialisation of Bt Brinjal has been represented as his way of understanding the ethical issues that emanated from the practice of mining in Indian forests. Visvanathan (2010b) equates the moratorium to the regulation of mines which have historically been "a source of exploitation and corruption" (Visvanathan, 2010b) in India by setting up regulatory procedures of environmental clearance prior to their institution. In this interpretation, the moratorium has been interpreted as a stay on the environmental clearance of Bt Brinjal prior to its commercialisation and biotech companies have been equated to mining cartels that have historically operated in India "with complete indifference to the local people and their ecology" (Visvanathan, 2010b). This representation enables an understanding of the long-term consequences of corporatisation of seeds. Representations can be used to propagate a message; they can enable the creation of an audience that identifies with the politics of the message and gathers around it by making it an issue. The subject of this message originates from a controversy or a problem that that it addresses. In this sense, representations are the middle-ground where the controversy and an audience can co-produce each other.

A Final Note

> "Objectivity results not from the absence of bias but from controversy between conflicting preconceptions, a controversy which is at bottom cooperation" (Auden, 2002, p. 72).

Wystan Hugh Auden, an Anglo-American poet, suggested a way to approach controversies with this quote. A controversy needs to be understood as cooperation between conflicting preconceptions before it can be objectively addressed. If bias is not acknowledged and is treated as unwarranted, the resolution of a controversy would inevitably take longer time and would require larger negotiations. In this context, this thesis can be seen as a documentation of how different positions taken by different publics have developed diachronically in time and have added to the complexity of the Bt Brinjal controversy. In conclusion, this thesis should be treated as an invitation to Indian scientists and the civil society activists to acknowledge each other and understand that the conversations that they bring to a discussion on GM crops are deeply embedded in the context from which they originate. An understanding of these contexts is a minimum condition to resolve these debates.

By understanding that science and society co-produce each other, the scientists need to realize that scientific practice can also be debated within the cultural and political domains and to

expect that the concerns coming from these domains would be objective and free of bias would not help in the process of resolution of the debate. On the other hand, the civil society activists need to realise that we cannot live by scepticism alone. "By definition, the logic of a sceptical argument defeats any amount of evidence; one can deduce that no inference from observation can ever be certain, that one cannot be sure that the future will be like the past, and that nothing is exactly like anything else, making the process of experimental repetition more complicated than it seems" (Collins, 2009). This does not resolve any issue and resolution is stuck in an endless cycle of debate around the nature of the evidence provided.

Taking about scepticism, Collins (2009) also gave an important insight for both the scientist and the society at large. He wrote that, "Science [...] can provide us with a set of values — not findings — for how to run our lives, and that include our social and political lives. But it can do this only if we accept that assessing scientific findings is a far more difficult task than was once believed, and that those findings do not lead straight to political conclusions. Scientists can guide us only by admitting their weaknesses, and, concomitantly, when we outsiders judge scientists, we must do it not to the standard of truth, but to the much softer standard of expertise" (Collins, 2009). In this sense, the democratic governance of science requires both forms of knowledge: first, the one emanating from the expertise of scientists, and second, the one emanating from the views, opinions and experiences of the public which includes the civil society activists. The role of regulatory authorities would then be to recognise both these forms of knowledge and place them within the changing notion of science governance in India brought about by this recognition.

III

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