Civic Science, Authoritative Science and the Politics of Biotechnology in India

Milind Kandlikar, Terre Satterfield
University of British Columbia

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Controversy

- There are multiple overlapping controversies over GM in India
  - Over processes of approval (1998-present)
  - Over illegal seeds (2001-present)
  - Over yields (2002-2007)
  - Over risks and ‘sheep-deaths’ (2005-2007)

- Controversy: The Questions
  - Why is Bt cotton controversial in India?
  - What explains the persistence of the controversy over yields?
  - What does the controversy tell you about the role of science within India and how regulation on GM crops might be structured?
  - Civic Science vs. Authoritative Science in India

- Here we focus on controversy over yields

Yield Controversy

- Q and Z paper in *Science* (2003)- claims 80% yield increases for Bt Cotton - 2001 field trial data.
  - Immediate reaction: NGOs claim failure in the first season (Sahai, 2003)

- In 2003 and 2004 studies claiming failure in AP (Sahai 2004; DDS 2004; CSA, 2005).
  - AP committee finds failure, GEAC bans sale of Mahyco Bt cotton hybrids in 2005

- Meanwhile, Bt cotton (legal and illegal) enjoys great success and rapid diffusion everywhere
  - Continued claims of failure by NGOs – 2005/2006
  - Flurry of academic studies through the period (farmer surveys) to pin down benefits – yet controversy over yields persists.

Why Yields?

- Because the debate in India [as in many developing countries] is over benefits and not environmental risks
  - India is not a ‘Risk Society’ unlike industrialized countries. Discourses over environmental risk have little purchase in India
  - Risk from technology is framed primarily in terms of farmers’ vulnerability to crop failures
- Because it is a simple line of attack – the “technology does not work”
  - Contestation of yields challenge the ‘raison d’etre ’ of the technology – no need to invoke complex ideas of gene-flow & ecological impacts
- Because survey techniques require no special scientific infrastructure

Three Interlocking Perspectives

- Looking at the Evidence: Positivist Approach
  - Are mean BT cotton yields/profits lower?
  - Is there greater variability (and so more risk) in BT yields/profits?
  - Is there geographical variation?

- Persistence of Failure Claims: Competing Group Politics
  - Scientific method as tool than can be used by competing groups
  - The study of social controversy – where the specifics of scientific claims are given passing attention

- Political Culture that sustains oppositional politics: Sociology of Scientific Knowledge (SSK)
  - Controversies highlight multiple alternative accounts
  - Different national policy cultures have different ways of dealing with controversy
  - What is India's "Policy Culture"?

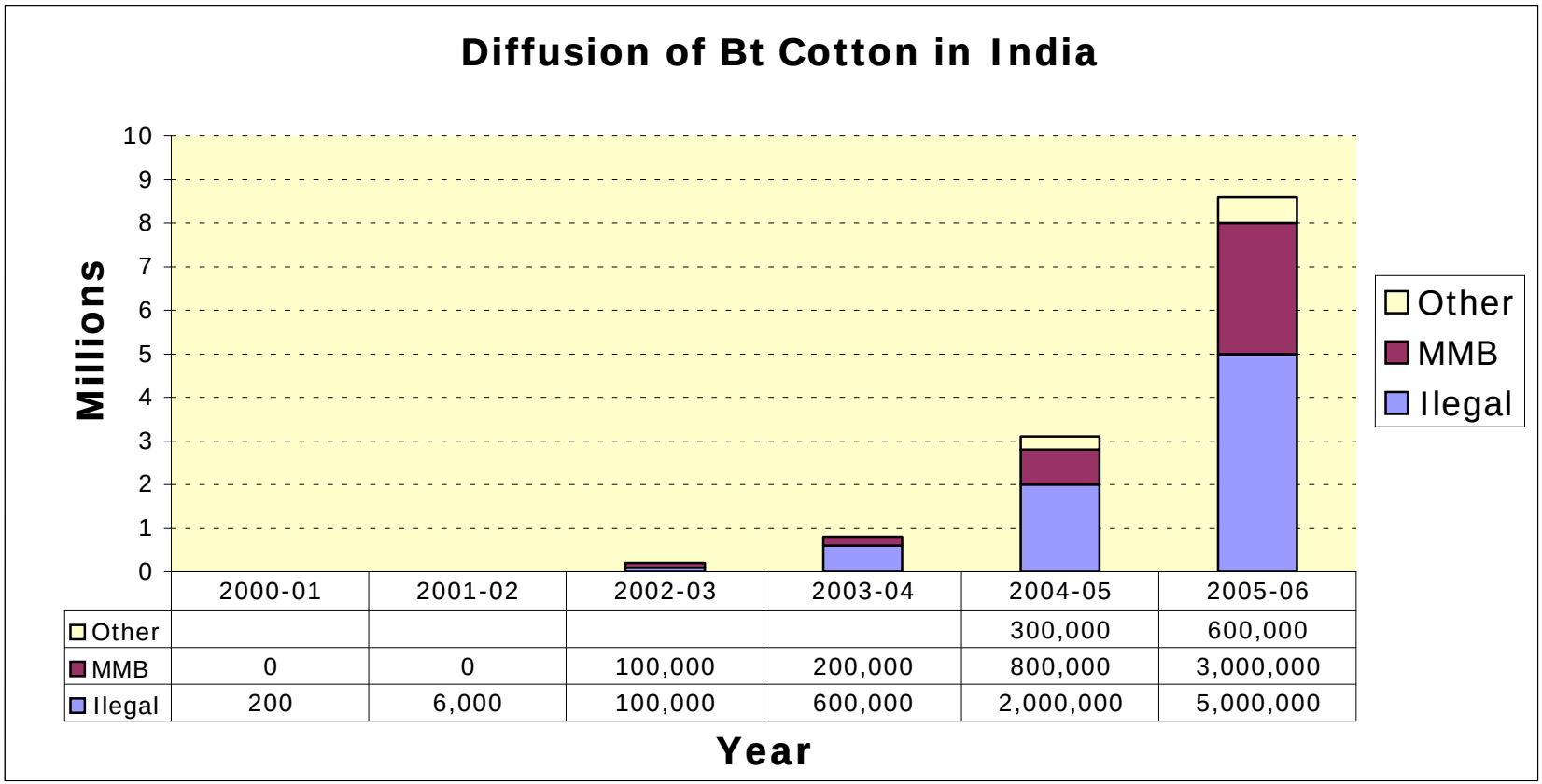
What is the evidence for the success or failure of Bt cotton?

- **In terms of mean yields?**
- **In terms of variability of yields?**
- **In terms of costs of cultivation and profits?**

Positivist Approach - A Meta Analysis

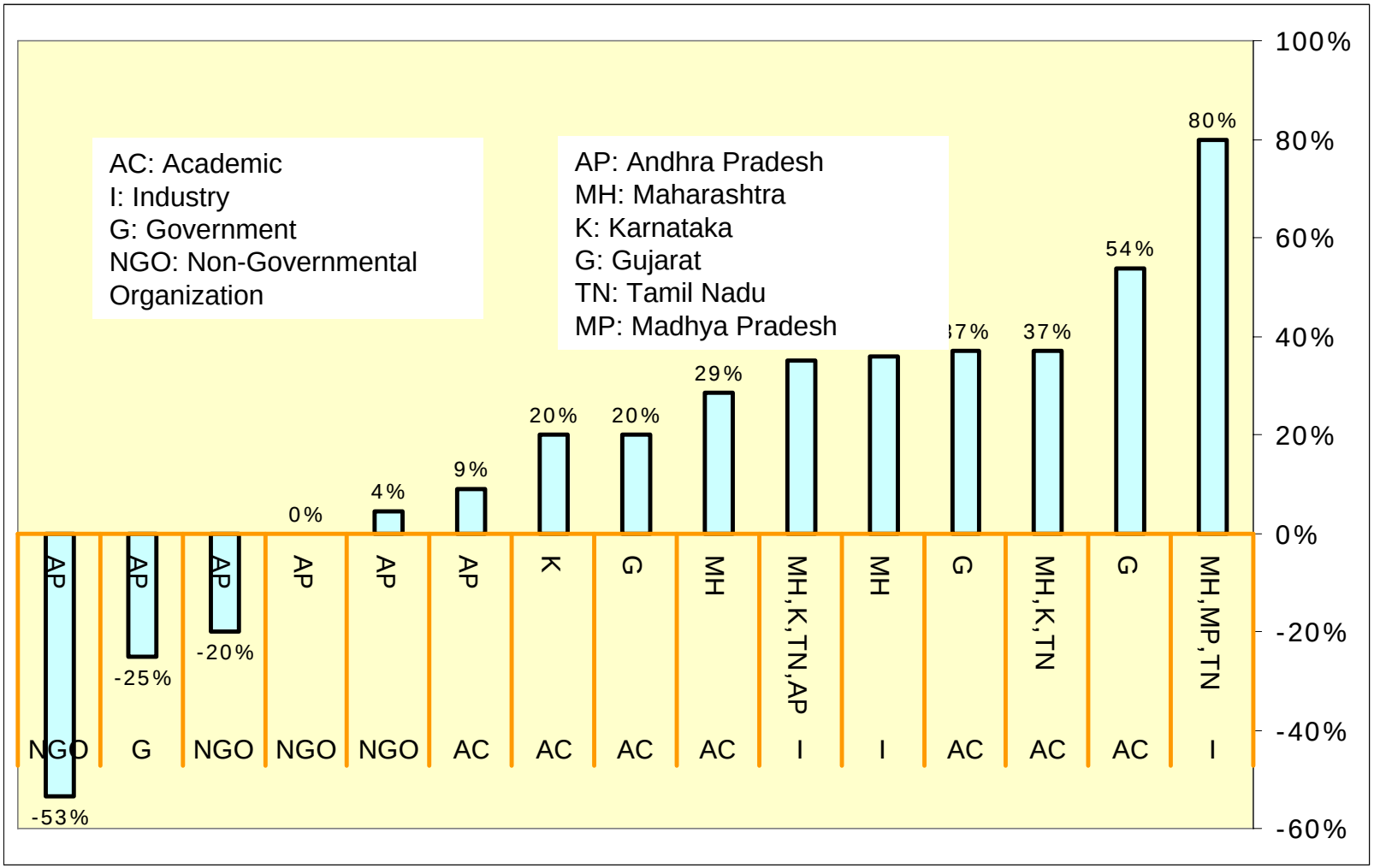
- A statistical approach for combining the results of multiple studies, all examining similar or related hypotheses
- ~20 Studies/Surveys – though not all can be used
- Within Study Problems
  - Random selection of respondents; “check” varieties; attributes of adopters vs. non-adopters (partial adopters); Reporting Problems – counterfeit seeds;
- Across Study Problems
  - Quality of Research: Peer-review or not; Methods and commensurability of questions; Regional variation; no access to study questionnaires
- So restricted to an informal Meta-analysis, i.e., comparison of descriptive statistics

Diffusion of Bt Cotton In India

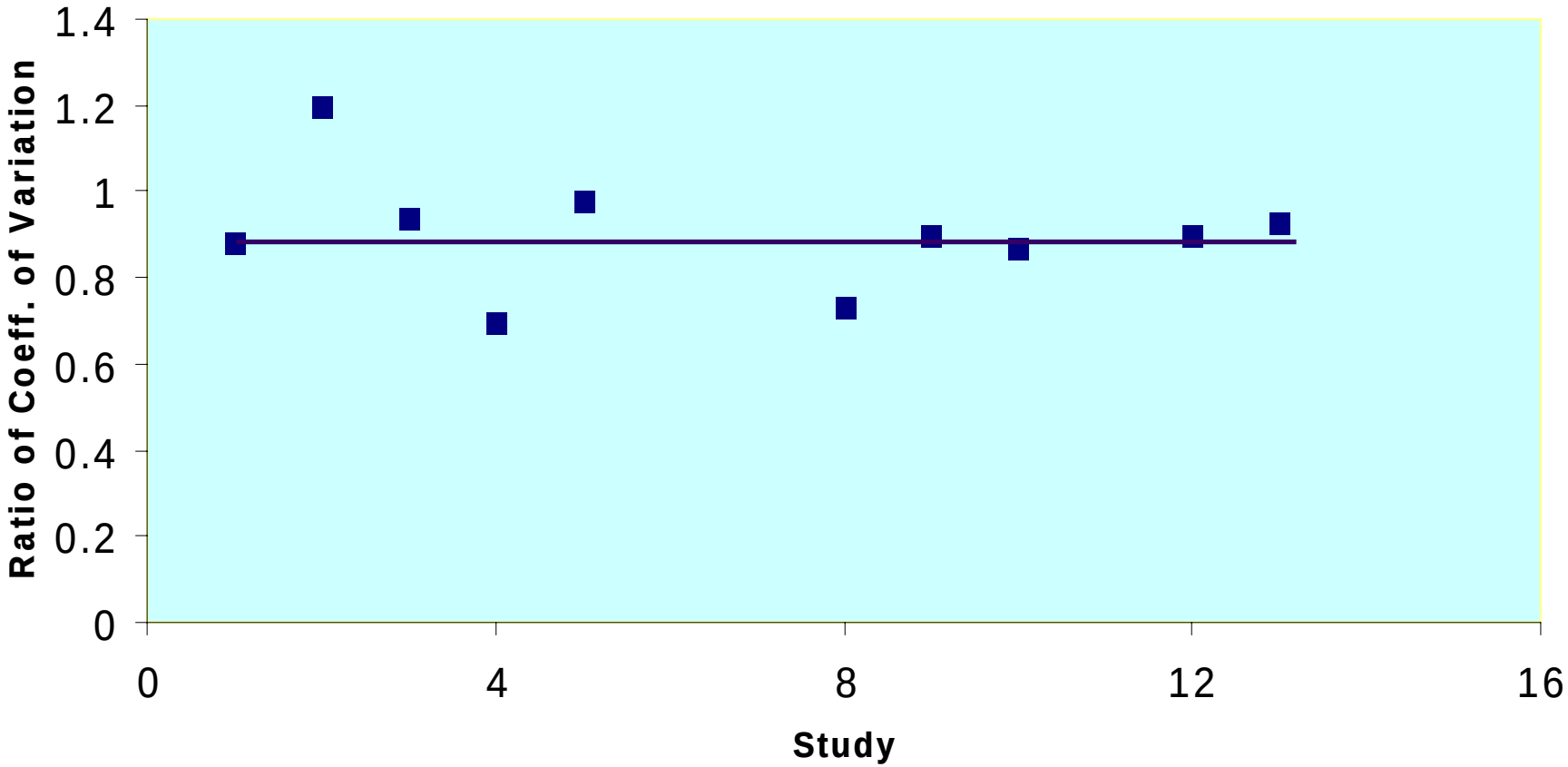


	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Other					300,000	600,000
MMB	0	0	100,000	200,000	800,000	3,000,000
Ilegal	200	6,000	100,000	600,000	2,000,000	5,000,000

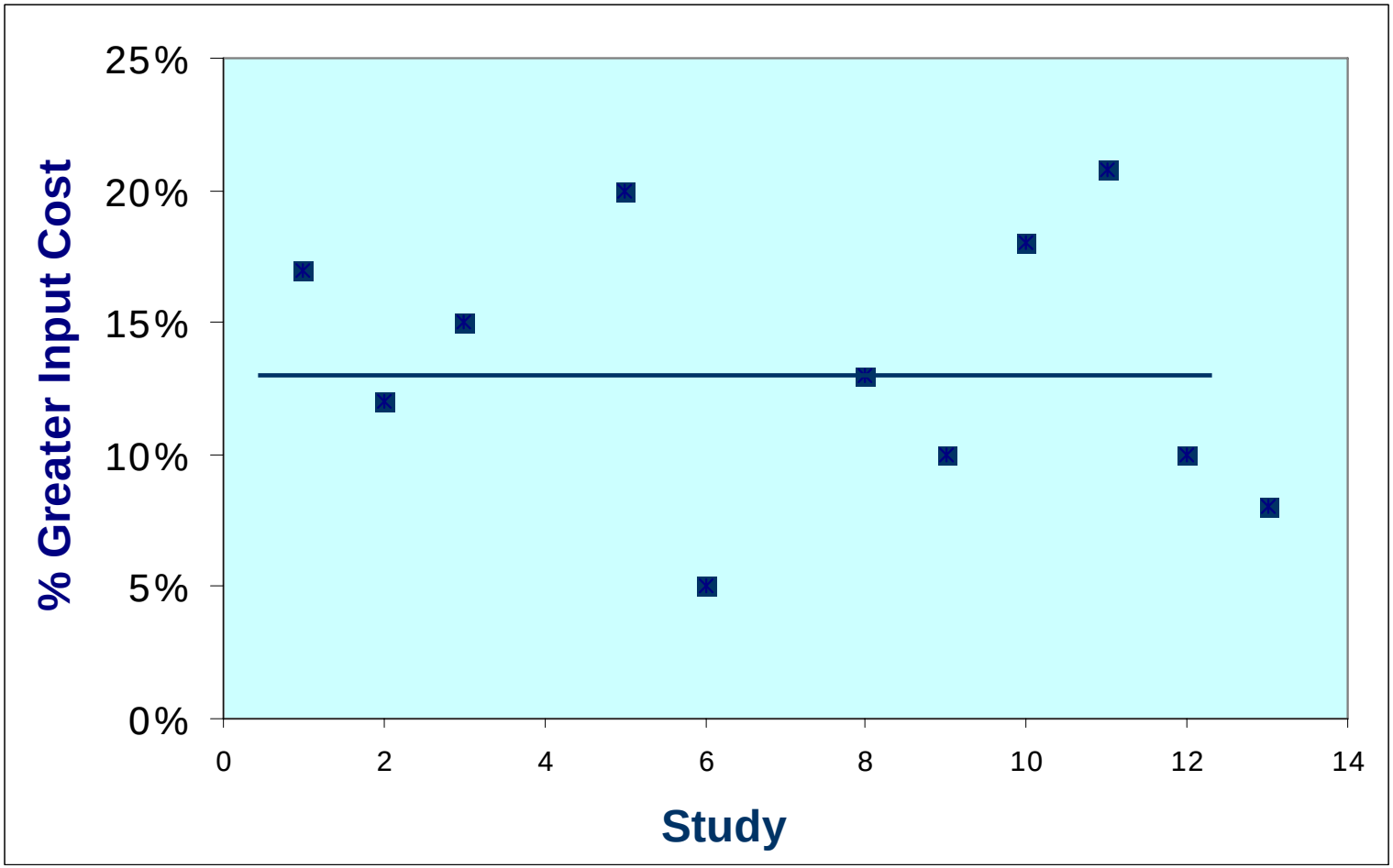
Mean Yield Difference (%)



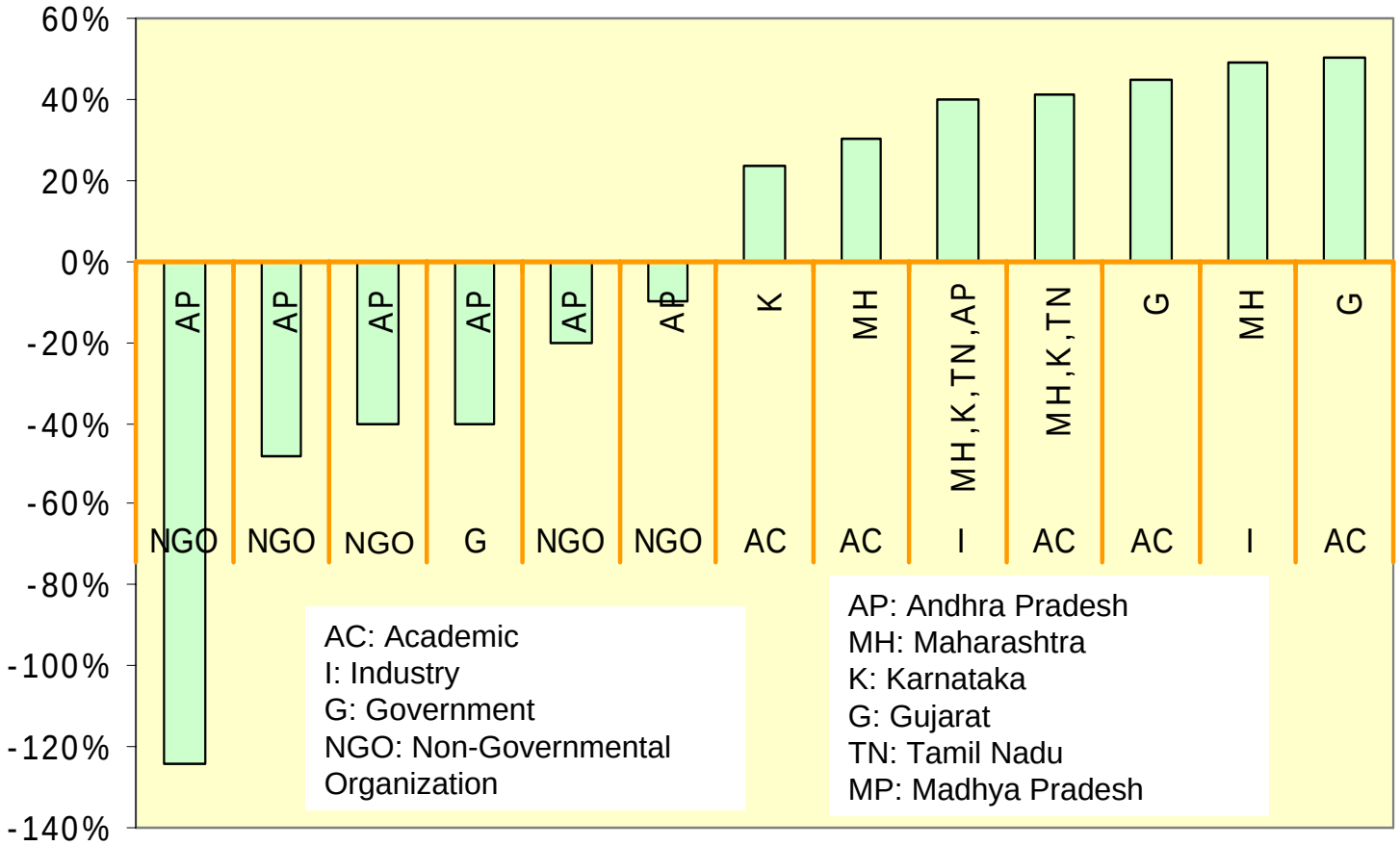
Variability in Yields



Excess Cultivation Costs



Net Income Differential (% of non-BT income)



Summary of Results

- Analysis of yields, revenues and profits
  - ***Success*** (25-40% yield gain – as opposed to 87% in Qaim and Zilberman) everywhere except in many NGO driven AP studies
  - ***Failure in NGO studies*** in AP; Evidence of failure in 2004 in AP in one academic study.
  - ***No evidence*** of greater variability of Bt cotton yields
  - ***Costs*** of Bt cotton cultivation ~ ***12% greater*** on average
  - ***Net income gains*** in most places across the country

- ***Little evidence of lower yields or greater risk***, except briefly in AP.
  - So why do claims of failure persist?
    - Look for other explanations

If the evidence for success is strong, and farmers are adopting the technology with gusto – what explains the continued claims of failure by NGOs?

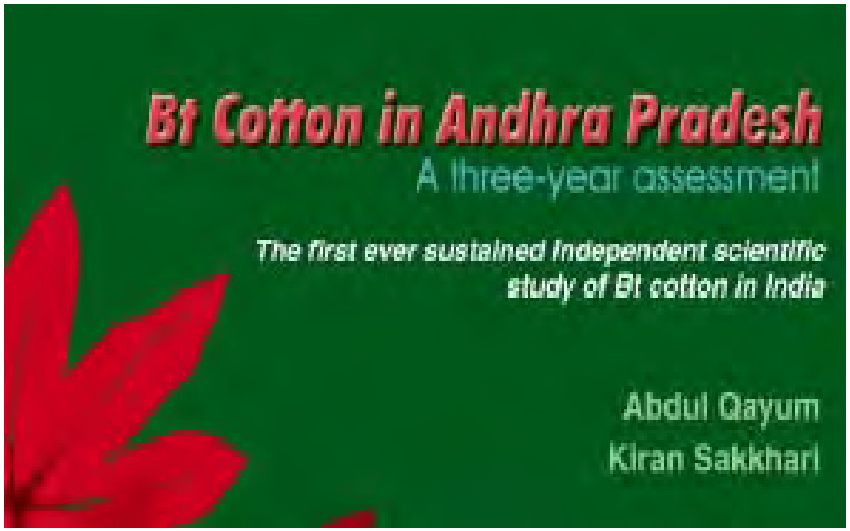
Competing Group Politics

- In Industrialized countries GM disputes focus on environmental risks
  - Beck's Risk Society thesis - Primary conflict across social groups in post-industrial world is not access to wealth per se, but exposure to the risks that modernity generates
- Thesis: In India the debate is largely about benefits (yields, royalties, equity) so failure/success of the technology is where groups mobilize to make their case
- Methods: A study of groups who deny the success of Bt Cotton.
  - Structured interviews with protagonists and a network of activists
    - Integrated Pest Management Group (CSA, Hyderabad)
    - GM Watchdog (Gene Campaign)
    - International E-NGO (Greenpeace)
    - Industry (Monsanto/MMBL, Nuziveedu)
  - Analysis of claims and arguments made in newspapers and magazines

Center for Sustainable Agriculture – CSA

- A Hyderabad based NGO with roots in Integrated Pest Management
  - Close collaboration with DDS (the sponsor of Bt cotton studies that showed failures in ‘02 and ‘03)
- Accuse MMBL of data falsification during large scale field trials.
- Non-pesticidal management
  - Opposition to Bt Cotton – seen as a ‘just another pesticide’
- Reductionist technology & mindset –refrain (CSA)
- Erasure of differences between MMBL cotton and the technology itself, as well different strains of MMBL

Deccan Development Society



3. Methodology

This year the well planned methodology included two new districts where Bt cotton was introduced last year. The main features of the methodology are as follows:

1. The study has been structured in 3 tiers:
   a. A season long video documentation of crop stand and farmers, observations at regular monthly intervals in three selected villages.
   b. Fortnightly recording of data on field operations, use of fertilisers and pesticides, status of crop and pest damage, in 164 farmers' fields from 27 villages in the three districts during the whole crop season (from July 2003 to March 2004).
   c. Examination of the crop status by a team of scientists who would randomly visit the fields in villages not covered by the team, under (a) & (b) and record farmers experiences every month.
2. In tune with this, the data collectors recorded farmers reaction and response to a pre structured questionnaire during their fortnightly visit to the villages assigned to them..
3. The average values of quantitative data were the basis of the report and conclusion.

http://www.ddsindia.com/www/PDF/BT_Cotton_-_A_three_year_report.pdf
http://www.ddsindia.com/www/default.asp

Gene Campaign

- A one-person NGO focusing on agriculture, seeds and technology
- First to use a ‘small study’ in 2003 to question ***claim technology failure*** –vulnerability to ‘pink bollworm’ and/or timing of endo-toxin expression.
- Equating technology with Monsanto Hybrids
- Theme followed by in a debate with Kranthi
  - Kranthi’s paper in *Current Science* and the response that ensued
- In 2007 newspapers reported failures in Maharashtra [as findings of GC study] in Maharashtra, but no published paper/report found to confirm this

Kranthi vs. Sahai

- ***Sahai***: A new report published by Kranthi et al. the Central Institute for Cotton Research (CICR), Nagpur, in the 25 July issue of *Current Science*, validates many of the observations made by Gene Campaign during three years of field studies on Bt cotton cultivation. The study conducted at India's premier cotton research institution gives the scientific reasons ***for the failure of the Monsanto Bt cotton varieties*** and shows that India's Bt cotton technology itself is faulty and will fail to protect cotton farmers from the bollworm. The study recommends additional pesticide sprays since the Bt technology fails to provide adequate protection.

- ***Kranthi's Response***: ***Does our research paper support her argument? It does not.*** Our report does not provide evidence to say that the technology is ineffective or flawed, as Dr. Sahai wants the world to believe. We said in our paper very clearly that "despite the variability in toxin expression, the pest control properties are unlikely to be affected significantly at least until the crop becomes 100-115 days old.The cotton bollworm (*Helicoverpa armigera*) generally infests cotton 60-120 days after sowing. While Bt cotton is highly effective 60-115 days after sowing, there are chances of bollworm causing damage during the remaining one to two weeks. We therefore recommended pest scouting and need-based supplemental sprays for this period. In an overall analysis, ***Bt cotton controls at least about 70-80 per cent of bollworm infestation***. This is very significant in economic and environmental terms.

It is Civic, but is it Science?

- Some reports with detailed assessment …. but no peer review
- Erasure of boundaries between science and politics
  - Data tables commingled with farmer suicide vignettes
- Erasure of boundaries between bollworm and other pests; between the technology and a hybrid manifestation
- On the other hand, ***there were failures in AP*** in the first season, according to one peer-reviewed study and informal discussions with several agronomists ("Something happened in AP").

Shifting Targets, Oppositional Politics

- Like Boggarts in the Harry Potter series – GM takes the shape of whatever is feared, and therefore opposed.
- Strong evidence of what psychologists call a ‘belief or confirmation bias’ (Kranthi and Sahai example). Difficult to overturn.
- The yield controversy is no longer sustainable as an oppositional device
- New reasons for opposition have emerged (Sheep deaths, Gene flows)
- Official Science - Missing in Action.

What is it about policy debates in India that sustains controversies?

SSK – Cultures of Regulation

- Jasanoff (1991; 2005): **Distinct national patterns (cultures)** for addressing environmental risk & legitimating decisions
  - **'Open' political societies** (U.S.): expectations for decision accountability are high, produces a preference for formalized, quantitative risk assessments to justify 'objective' regulatory decisions
  - **Comparatively closed political cultures** (UK, Germany, France) = greater use of expert panels which preserve a degree of informality and flexibility in their technical analysis and regulatory decisions
  - **Recent trend in democratization of Science:** intertwining of analysis (science) and deliberation (politics) from the very earliest stages of the [decision] process" (1999:149)
- Science is authoritative and credible (relative to the India case)

India's Science for Policy

- Authoritative science does not play a mediating role – simple because it does not exist
- Official scientific bodies are seldom involved in production of independent knowledge for regulatory purposes
- Debates on science and technology emerge from crises, and consequently from political movements and NGOs not from official science
- Handful of entrepreneurial NGOs often *generate* scientific data
- Regulatory science is mostly reactive and chaired by committees of 'wise men' after the fact. Merely, a ritual enacted by the state and its bureaucratic apparatus.

India's "Policy/Political Culture"?

- A world of its own – sealed from external forces of accountability and ignorant of its own errors of omission and errors of commission
  - e.g. GEAC's and DBT response is mostly silence
- Lots of public debate – shrill claims/counter-claims
  - Deep disconnect from factual basis – Bt cotton yield example
  - Little intersection with actual policymaking
  - In cast of Bt cotton, the audience is primarily Global/European
- 'When the debate is a clash of intentions there is no common space that can be assigned to adjudicate and properly debate differences' (Mehta, 2003)
  - 'The more you feel distant from the state the less implicated you feel in its policies and the more likely you are to be casual in forming your policy judgments'

Authoritative Science, Civic Science: What difference does it make?

- Official science become authoritative from the ability to influence policy (aside from making truth claims)
- When there is little space for an honest debate and clear-headed assessment of knowledge for policy, official science [however well done] can have little impact
- In India, we see no official science (and authoritative science) on GM, or on most other issues
- ‘Civic Science’ or ‘Official Science’ make little difference in a polity where the state is impervious to ‘facts that matter’.
- Controversies over GM will continue