
Global lessons for agricultural sustainability from GM crops

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With rising world populations, persistent hunger and chronic, growing demand for food globally, the need to protect land for biodiversity and ecosystem services, and the mounting threats associated with climate change, it is unsurprising that advances in the biosciences – and in the development of genetically modified (GM) crops in particular – are proposed to play a critical role in meeting the challenges of global food security.

Yet, although the rise of GM crops has been dramatic, their uptake has not been the smooth nor universal transition predicted by its advocates. Controversy has been marked, even in those countries where approvals have been impressively rapid. All too commonly, the regulation of GM crops has been challenged as inadequate, even biased – and in some settings, such as India and Mexico, the planting of certain crops has been judicially suspended.

The strategic question for this John Templeton Foundation project, led by Durham University and with international partners in Mexico, Brazil and India, was to examine why GM crops have not been universally accepted as a public good, since if we do not address this we will fail to understand the conditions under which GM crops may contribute to global food security in an inclusive manner.

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Current approaches to the regulation and governance of GM crops have been dominated by risk-based assessment methodologies, the assumption being that the key criterion mediating the release of GM products into the environment should be an independent case-by-case risk assessment of their impact on human health and the environment. One consequence is that the public debate surrounding GM crops has been reduced to one of safety: whether they are safe to eat and whether they are safe for the environment. In relation to these questions we remain agnostic. Our argument is otherwise. Our argument is that if we are to govern GM crops in a socially and scientifically robust fashion, we need to engage with the issue within the terms of the debate as it is considered by an inclusive array of actors.

At the core of the project was fieldwork undertaken in three of the global rising powers, namely Mexico (on GM maize), Brazil (on GM soya) and India (on GM cotton), and involving ethnographic, interview and focus group research with farmers, scientists and the public.^{1,2} The choice of three rising-power Global South case studies is deliberate. Most of the scholarship on GM crops has focused on Global North settings with – to date – relatively minor engagement with the dynamics of the issue in the Global South. Yet it will be in countries such as Brazil, Mexico and India, where agricultural innovation is most needed, that the bulk of food provision is expected to take place and where debates over GM agricultural technologies are likely to be most intense.

In Mexico, we found that the public debate on GM maize has been deeply controversial and culturally resonant, that protests against GM maize were

widespread, and that they signified the defence of Mexican culture and identity in the face of unwanted forms of globalisation. We saw that decisions by regulatory bodies had been compromised and lacked transparency, and that there has been little sustained effort by involved institutions, including the Mexican state, to engage with the public. In our ethnographic field research, we found that farmers retain strong and enduring relations around maize agriculture and that the prospect of GM maize is seen as an intrusion on traditional practices. In our ethnographic research with scientists, we found a clear distinction within the laboratory between senior and older researchers who were more avowedly in favour of the application of GM agricultural technologies, and younger and more junior researchers who were more cautious and nuanced. Meanwhile, in our research with the urban public, we found a generally negative reaction to GM crops and foods, reflecting deep-seated mistrust in the Mexican government and its apparent collusion with large business corporations.

In Brazil, we found that even though the coverage of GM crops had risen rapidly since 2005 (mostly GM soya and maize), the issue was far from settled, with little evidence of public acceptance or inclusive governance. In our ethnographic field research, we found evidence of a conflict between the farmers and the technical experts from seed companies, each blaming the other for the growing problem of weed resistance to glyphosate. In our ethnographic research with scientists, we found clear and unqualified optimism amongst scientists on the role of GM crop technologies

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Table 1. Factors shaping the controversy over GM crops

Country	Perceived authority of the regulatory agencies	Cultural resonance of the crop
Mexico GM maize	Low Decisions by regulatory bodies seen as lacking in authority and transparency and judged at times to be illegal	High Maize is an integral part of Mexican identity, history and culture
Brazil GM soya	Low/Medium Approvals have been successfully authorised by the National Technical Commission for Biosecurity (CTNBio) since 2005, leading to widespread planting, but decisions remain contested	Low Soya has little cultural significance in Brazil
India GM cotton	Low Regulatory bodies seen as lacking in transparency and capacity; perceived gaps in the regulatory system led to 2013 moratorium	High The fragile thread of cotton is a national symbol of Indian self-sufficiency

in providing significant future agricultural advances, emphasising economic benefits, the apparent unparalleled ability of GM crop technologies to provide improvements and the necessity for agricultural GM research to have a strong national base. In our research with the urban lay public in Florianopolis, we found little knowledge or awareness of GM crops and foods and genuine surprise about the extent of their adoption. Notwithstanding a general trust in science, participants expressed largely negative opinions on GM foods, not least because the technology was seen as benefiting the producer, not the consumer, and because they had not been consulted or clearly informed.

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Intensity of protest movements	Genetic modification as symbol of wider struggle	Degree of public engagement
High The anti-GM campaign has sustained its presence since 2002	High GM maize is a symbol of the protest against neoliberalism and the North American Free Trade Agreement (NAFTA)	Low There has been little sustained effort by institutional actors to engage the public
High until 2003 Low from 2005 Following the passing of the Biosafety Law the protests peter out	High until 2003, with GM crops situated within an anti-globalisation discourse Low from 2005	Low There has been little sustained effort by institutional actors to engage the public
High The anti-GM campaign has sustained high-profile protests	High <i>Bt</i> (insect-resistant) cotton is a symbol of the struggle against multinationals and neoliberalism	Low There has been little sustained effort by institutional actors to engage the public

In India, we found that GM cotton had become a provocative symbol of foreign control and imposition, where regulatory bodies have been routinely criticised for using inadequate procedures for the approval of GM crops. In our ethnography of laboratory scientists, we found that those whose work we observed were opposed to the moratorium and constructed and perceived the position of anti-GM actors as “ignorant” or “publicity seeking”. Scientists’ critique of the moratorium was often framed in post-colonial language, as they argued that India could not afford the risk of falling behind in the development of biotechnology. In research with groups of lay people, we found the majority of our participants to have developed negative views on GM crops and foods,

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with city dwellers emphasising their mistrust of governmental and local-authority capacity to provide a reliable regulatory system, and with rural participants arguing that using GM seeds was interfering with the preservation of indigenous seeds.

Across all three case studies, we found that the technical regulatory bodies responsible for approvals for the release of GM crops had not provided “authoritative governance”,³ that the predominant research culture in national biotechnology laboratories had little capacity to respond to wider societal responsibilities, and that lay people broadly tended to adopt negative views when introduced to the technology and its application. To summarise, we found that the key factors explaining the controversy over GM crops are social and institutional in nature, and transcend questions of technical risk. These are presented in Table 1.

Responding to this “institutional void”, we proposed a novel way to govern GM crops informed by recent debates on responsible innovation:⁴ if we are to innovate responsibly and robustly, we need new institutional capacities to better anticipate the wider driving forces as well as impacts of emerging technologies, and we need to open up an inclusive debate with stakeholders and the wider public, to develop more reflexive scientific cultures and to develop new governance architectures that are responsive to these processes. The responsible innovation framework has been pioneered in UK research and is being implemented by UK research councils⁵ and more widely across Europe. It offers new potential to reconfigure the debate on the governance of GM foods and crops in the UK, in Europe and

internationally, and hopefully to help move the debate away from its current polemic and impasse.

References

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