The politics and economics of GM food production in China, India and Kenya

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Two decades after the first genetically modified (GM) crops were commercially grown, their cultivation remains limited to a few crops in a few countries. In India, China and Kenya no major GM food crops can be grown legally. However, after many years of political paralysis on GM food production, there are signs of change. China has laid out a pathway that starts with industrial crops like cotton and then goes to indirect food crops such as corn for animal feed, and finally to food crops.[1] The new Indian government has allowed tests of GM feed and food crops including eggplant, maize and rice, and suggested agricultural biotechnology as a possible area for foreign investment.[2] Some key ministers and members of parliament in Kenya support lifting the 2012 ban on GM food imports.[3]

Consumers as a group benefit from the lower food prices of GM food crops ... but rarely support GM crop policies

To understand the restrictions on GM food production that have occurred despite the scientific consensus that GM crops are safe for human consumption and have considerable societal benefits, our research examined the economic, political and social forces that have shaped biotechnology policies in China, India

and Kenya. The adoption of productivity-enhancing technologies like GM food crops has a direct impact on many groups, including input suppliers, farmers and the food and livestock industries, as well as consumers. If an interest group perceives that they can capture significant economic or social gains from the adoption of GM crops, they may lobby the government for policies to encourage GM adoption. Whether they succeed or not depends on how much political influence they have and whether their policy objectives diverge from those of their governments.

Consumer reaction

Research has shown that consumers as a group benefit from the lower prices of GM food crops, but despite these economic benefits they rarely support pro-GM crop policies. Our studies on the impacts of GM maize and rice in China, India and Kenya show that among the various stakeholders, consumers would be the major beneficiaries (Table 1). We did not, however, find any consumer groups that were actively supporting GM food in these countries.

Part of the reason for the lack of support is that while consumer benefits from GM crop production are large in aggregate, they are small at the individual level. We estimate that insect-resistant rice would cause a 2–4 per cent decline in rice prices in India and China and adoption of insect-resistant maize would cause nearly a 1 per cent decline in meat prices in China, while the adoption of insect-resistant and drought-tolerant maize in Kenya would also lead to a decline in consumer prices, albeit small.

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The other reason for limited consumer support for GM food crops is concern about food safety.

Table 1. Distribution of benefits from the commercialisation of GM crops as a share of total benefits accruing as a result of their adoption

Country	China		India		Kenya
Methodology	General equilibrium model with international trade		Multimarket model		Economic surplus/partial equilibrium
GM crop	*Bt* rice	*Bt* maize	*Bt* rice	*Bt* maize	*Bt* and DT maize
Benefit distribution, %					
Seed and biotechnology firms	1.5	6.1	17	3	27
Pesticide industry	-1.2	0	id	id	0
Farmers	20.6	17.6	30	34	24
Processors	na	na	id	id	2
Feed and livestock industries	11.5	8.7	na	26	small
Food retailers	na	na	12	8	na
Consumers	67.6	67.6	42	29	47.9

Bt = containing insecticide-producing genes from the bacterium *Bacillus thuringiensis*
DT = drought tolerant **na** = not applicable **id** = insufficient data

Note: *All models assume no government price support. In India, all these commodities except maize have price support. If the government is assumed to continue supporting farm prices of these grains, the total benefits to society would be the same, but many of the benefits to consumers shown here would go to farmers.*

For example, in China in 2012, 45 per cent of urban consumers considered GM food to be unsafe, with just 13 per cent reporting it as safe and 42 per cent saying they did not know. Previously, from 2002 to 2010, the proportion of consumers that considered GM food unsafe was somewhat lower, at 13–18 per cent.[4] The increase in concern appears to be due to the negative media attention given to the preliminary approval of GM rice production in 2009,

alongside a large number of unrelated food safety problems with milk and other food products that undermined consumers' faith in government food safety regulation.

Studies of urban consumers in India characterised them as somewhat concerned about the safety of GM food.[5] Research by our group further found that food safety was a major topic in the national newspapers that served urban consumers.[6] Surveys of Kenyan consumers during the period 2003–2009 found that most urban and rural consumers held positive views about GM food but that some urban consumers were concerned about food safety.[7]

Political lobbying by industry groups

Given that consumers are largely ambivalent towards GM crops, if not actually opposed to them, what other interest groups could champion or prevent their commercialisation? In many countries farmers played an important political role in promoting the commercialisation of GM crops – for example GM soybeans and maize in Brazil and GM maize in South Africa. Our studies, summarised in Table 1, show that farmers are the second largest beneficiaries of *Bt* maize and rice production after consumers, which is consistent with the results of previous studies.[8, 9] However, farmers played a very limited role in pushing for GM food crops in China, India and Kenya. The smallholder farmers of Asia and Africa are not well organised and have very limited political power to push technology policies, unlike the large commercial farmers of Brazil, Argentina and South Africa who produce for the export market.

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Industry groups that could gain from GM food crops are better organised and more influential than farmers ... but have not been active in supporting GM crops

One important contribution of our study is to identify other significant interest groups that could gain or lose from GM maize and rice adoption: the biotechnology and seed industry, pesticide industry, feed and livestock industries, grain millers and exporters, and the food industry. Table 1 shows that some of these industries can increase their profits significantly, either because sales increase (seed and biotechnology firms) or their grain costs decline (the feed and livestock industries), but others lose money because their sales decline (the pesticide industry).

The industry groups that could gain from GM food crops are better organised and more influential than farmers. With the exception of the biotechnology industry, however, they have not been very active or effective in supporting GM food crop production for several reasons. First, foreign seed and biotechnology companies are perceived as a threat to the local seed industry and local agriculture by some groups. Seed firms in both Asia and Africa fear that they would lose their seed markets to multinational biotechnology companies. Second, until recently, the grain, feed and livestock industries have had sufficient supplies of grain from local production or imports, and have only latterly felt the need for GM crops in order to increase local production and lower their prices. Third, some important subgroups in these industries would lose money or would not benefit, so they work with anti-GM groups or remain silent in the debate. The pesticide industry loses sales and profits from the adoption of insect-resistant crops. Farmers who grow basmati and other fine rice varieties in India could lose export markets and profits if GM rice is

commercialised but resisted by export destinations. For China, the food industry that exports rice-based products has already lost money because of extremely low levels of GM rice in their exports to Europe.

Successful lobbying depends on the goals and structure of national governments

The impact of the pro- and anti-GM coalitions on policy will depend on whether their goals are consistent with those of their governments. The governments of all three countries share the basic objectives of ensuring food security through low food prices while supporting the livelihoods of farmers. They differ, however, in their specific agricultural technology goals. China seeks to build a globally competitive agricultural biotechnology industry that is not dependent on imported food grain technology. In India, prior to the change of government in May 2014, the ruling coalition was split. One group wanted to encourage the development of GM crops by Indian biotechnology and seed companies while allowing foreign biotechnology firms to operate. Another faction wanted to stop the development of GM crops for ideological, food safety and environmental reasons. In Kenya, the science and agriculture ministries support the development of the local seed industry and royalty-free access to GM food technology through public-private partnerships. However, GM technology faced opposition within the government itself, with the Minister of Public Health pushing through the 2012 ban on GM imports.

The case of GM maize

The ongoing debate on whether to approve GM maize in these three countries shows how policies are shaped by economic interest groups,

Policies are shaped by economic interest groups, political lobbying and government objectives

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political lobbying and government objectives.

In China, GM maize is likely to be commercialised in the next few years. Almost all China's maize is fed to animals or used by industry, and imported GM maize has been used for years as animal feed, so consumer objections are not expected to be serious. Meanwhile, the government and feed industry are concerned about their growing dependence on imports of American maize. Chinese scientists have developed their own insect-resistant and herbicide-tolerant maize traits, which are not patented by foreign companies. So commercialising GM maize could reduce dependence on foreign grain and be the beginning of a globally competitive agricultural biotechnology industry. In addition, cultivating GM maize would increase farm income and reduce farmers' exposure to insecticides.

In India it is less clear whether GM maize or other food crops will be approved. The new government has no major split in its agricultural technology objectives, and its goal is to increase foreign investment in general and specifically in agricultural biotechnology. However, there could be more opposition from consumers than in China since about 30 per cent of maize is consumed directly as bread rather than fed to cattle, and civil society is more opposed to GM food. Most maize farmers profit from growing GM cotton and would like to grow GM maize. Local seed industry support is mixed, since most seed industry benefits will go to the foreign seed and biotechnology firms that control the current maize seed market. Feed

and livestock companies, meanwhile, are starting to be concerned about the availability of maize and have asked the government to allow GM maize imports.[10]

Whether the government in Kenya will approve GM maize in the near future is also unclear. Kenyan government agricultural scientists, foreign biotechnology firms and some foreign aid donors have been pushing for GM maize production and consumption. The seed industry, some large-scale farmers and the cereal millers provide limited political support for commercialisation. In Kenya, GM maize is likely to face more opposition from consumers than in China or India because it is the main food crop, and civil society organisations supported by foreign donors are very active in opposing GM food. With the new government of 2013, a new constitution and a completely new government structure, it is hard to know what will happen for GM maize in Kenya in the near future.

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