

Political Actors on the Landscape

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The introduction of novel foods and crops into the developing world triggers different reactions from different political actors. Quite often, the patterns of response in *developing* countries run parallel to policy debates in *rich* countries, reflecting the close relationships that still can be found between government ministries, companies, and NGOs in rich countries and their subordinate partners in the developing world. In general, the strongest supporters of novel foods and crops will be scientists, agricultural ministries, and the private companies trying to sell the new technology. The strongest skeptics are likely to be NGOs claiming to speak for the poor, as well as environmental ministries. If the novel foods and crops are GMO varieties, the patterns of local support will be much weaker, and the opposition is likely to be broader and significantly stronger.

Key words: GMOs, biofortified foods and crops, NGOs, agribusiness companies, aid donors, World Bank, FAO, UNEP, CGIAR, agricultural ministries, health ministries, environmental ministries.

Efforts to introduce novel agricultural crops or foods are welcomed and supported by some politically important groups in the developing world, ignored by others, and at times opposed by a significant few. When considering the political actors on the landscape most likely to take active positions either *for* or *against* novel foods, there is little or no evidence of political resistance to any of the biofortified foods developed thus far using conventional crop-breeding techniques, yet resistance to GMO crops has been widespread for much of the past decade. Which actors on the landscape are opposing GMOs, how powerful are they, and will their opposition weaken if the current generation of GMO crops carrying improved agronomic traits is followed by a second generation of GMOs carrying improved nutrient traits?

To answer this question, this article first reviews the key international actors currently working in the developing world either to promote or retard the spread of GMO foods and crops. The article then moves down to the national level, asking which local actors have most often partnered with either the international promoters or opponents of GMOs. It is seen that many debates over GMOs at the national level are proxy contests between local allies of outsiders from rich countries. Then, the article asks, in a provisional way, how the participants in this contest might change their views—or not—if the GMO crops in question were biofortified.

International Political Actors

The relevant international political actors in this case include bilateral aid donors, various specialized agen-

cies of the United Nations, multinational agribusiness companies, international financial institutions, philanthropic foundations, and internationally active NGOs. All tend to work through local surrogates and partners and often in a dominant role in the poorest countries because of the superior financial resources and greater technical knowledge they bring to bear.

Forty years ago there was a strong consensus among nearly all international actors in favor of science-based agricultural productivity growth in poor countries. During the era of the original Green Revolution in the 1960s and 1970s, actors at the national level in poor countries sometimes resisted new farming technologies because they wanted to avoid dependence on imported seeds and fertilizers, but the international community was united in favoring new investments in technology and infrastructure to boost the productivity of farming in poor countries. This international consensus is now essentially gone. The visible success of the Green Revolution on irrigated lands in Asia in the 1970s created an erroneous impression that farm productivity problems had been solved everywhere, even as the drylands of South Asia and nearly all of Africa were being left behind. Then, a sharp fall in all commodity prices in the 1980s, driven more by macroeconomic events than by production trends, reinforced this mistaken notion that food production was no longer an urgent matter. In the 1980s and 1990s, international assistance to promote agricultural development was weakened further by the emergence of a market-oriented “Washington Consensus” within the donor community, especially at the World

Bank and the International Monetary Fund, which held that public investments should no longer take the lead; development was something best done by private investors rather than governments. The rise of a global environmental movement in the 1980s and 1990s also worked to discourage investments in agriculture, as modern Green Revolution farming came to be associated with chemical pollution. As one final blow, the end of the Cold War undercut the national security rationale for giving aid to developing countries. When repeated drought-induced food shortages occurred in Africa in the 1990s, the international response was to send food aid, not agricultural production assistance.

This larger political context of weak international support for science-based agricultural development in poor countries worked against the acceptance of GMO crops when they were first commercialized in 1995-96. Rich countries were not attracted to the technology because their consumers didn't need GMO foods to be well fed and their farmers didn't need GMO crops to be productive and prosperous (in contrast, the use of genetic engineering in medicine was fully welcomed, even in Europe). When it came to promoting GMO foods and crops for poor countries—where the needs of farmers and consumers remained unmet—the rich were not moved to do so because all efforts to use science to boost farm productivity had fallen out of favor. Some groups in rich countries that criticized GMO foods and crops as unneeded and potentially dangerous at home began to do so in the developing world as well. Sensitive to rich-country opinion, a number of international institutions that might otherwise have been inclined to promote GMOs in the developing world pulled back from doing so.

Pro-technology agricultural development institutions such as the World Bank, the Consultative Group on International Agricultural Research (CGIAR), and the Food and Agricultural Organization (FAO) of the United Nations have not been strong promoters of GMOs for developing countries, and some donor governments in Europe have actively opposed GMOs. The US Agency for International Development has promoted GMOs in the developing world, but with little success in regions, such as Africa, where European donors have larger budgets and are more influential. The private biotechnology companies that develop these crops continue to promote their use internationally, but the message of these companies is undercut by the widespread mistrust they still encounter in the developing world. Corporate efforts to promote GMO foods and crops sometimes make the technology that much easier

for international NGOs to criticize. Consider the position of these various institutions one at a time.

The World Bank

With total operations of roughly \$20 billion annually, the World Bank has always exercised considerable influence over the agenda of global development, especially within the food and farming sector. In the late 1970s when high international commodity prices led to momentary fears of a looming global food shortage, the World Bank devoted nearly 30% of its total lending portfolio to investments in agriculture and rural development. This began to change following the success of the Green Revolution and a subsequent fall in international food prices, as well as when lending for market-oriented policy reforms (“structural adjustment”) then began to replace lending for investment. By the end of the decade of the 1980s, the share of World Bank lending going to agriculture and rural development had fallen to just 16%. Criticism of agricultural lending from environmental NGOs, which worried about infrastructure schemes and chemical pollution, forced the Bank to cut back even more. By 2005, agriculture was down to just 9% of all sectoral lending at the World Bank (2005). In September 2005, the World Bank's new president, Paul Wolfowitz, commented to a business forum, “My institution's largely gotten out of the business of agriculture” (Hitt, 2005, p. A4).

Technical specialists at the World Bank initially welcomed the development of GMO agricultural crops, and in May 1999 a Biotechnology Task Force produced a draft discussion paper that was generally positive on the new technology (World Bank, 1999, p. 15). At a higher political level, however, the Bank was not ready to become a champion for GMOs, so the recommendations of the draft discussion paper never received Rural Sector Board approval. In the end, the Bank decided not to single out biotechnology for promotion, but instead to initiate in late summer of 2002 a multi-year global consultation process on agricultural technology that would postpone the need to take a clear position. The Bank did not want to burn its political bridges with leading governments, particularly in Europe, where consumers, environmentalists, and anti-globalization activists were strongly opposed to GMOs.

CGIAR

The Consultative Group on International Agricultural Research (CGIAR) is a publicly funded network of research centers with an annual budget of roughly \$450

million and employing a staff of 8,000, including more than 1,000 scientists working in more than 100 different countries. The CGIAR is in some ways an improbable promoter of biofortified foods, GMO or otherwise, because its core mission has always been agriculture more than food, with a particular emphasis on crop germplasm improvement for on-farm productivity enhancement. Even in pursuit of this mission the CG system has recently been weakened, as its access to unrestricted funding has declined. Individual CG centers have been obliged to pursue donor funding with multiple strings attached, and as fewer donors are now placing priority on productivity enhancement research, this sort of activity now makes up only about 17% of the total CG budget (Falcon & Naylor, 2005).

To some extent the CG system remains dominated by traditional plant breeders, so even when pursuing agronomic gains it can be slow to take an interest in GMOs. When the World Bank did its draft assessment of GMO policy options in 1999, it found that the CGIAR centers were devoting only about 7% of their resources to modern biotechnology. As of 2004, the CG system was spending just \$25 million annually on agricultural biotechnology (all forms, not just GMOs) across all its centers and programs (Spielman, Cohen, & Zambrano, 2006). Also, as USAID's (US Agency for International Development) budget for international agricultural research has declined, the CG system has become increasingly Euro-centric. European contributions to the CG budget are now twice as large as contributions from North America. Many European donor governments are not comfortable with GMO research, so the CG system has been cautious about moving in this direction.

The CG research centers have been willing to work as a partnering institution in GMO initiatives conceived and funded by others. Since 1999, the International Maize and Wheat Improvement Center (CIMMYT) in Kenya has been operating with the Kenya Agricultural Research Institute (KARI) on a project to develop GMO insect-resistant maize for Africa (the IRMA project), funded by the Syngenta Foundation for Sustainable Agriculture and the Rockefeller Foundation. In the Philippines in 2002, the International Rice Research Institute (IRRI) took custody of GMO beta-carotene-enriched "Golden Rice" thanks to funding from a number of donors and foundations from beyond the CG system.

The CGIAR system has also now received donor funding to create the HarvestPlus initiative, a crop biofortification program that combines the expertise and

resources of 8 of the CGIAR's 16 international research centers, led by the Colombia-based International Center for Tropical Agriculture (CIAT) and the Washington, DC-based International Food Policy Research Institute (IFPRI). The HarvestPlus initiative combines plant breeding with research on plant genomics, human nutrition, social behavior, and policy analysis. In its initial four-year stage, this CGIAR program pledged it would pursue breeding strategies for biofortified crops that stop short of using rDNA genetic engineering. A subsequent move into the initial development ("but not release") of transgenic lines is anticipated in the following six-year phase of the project (HarvestPlus, 2004).

Within the agriculturally dominated CGIAR system, IFPRI has been the one center that has been most visibly committed to consumer welfare and the improvement of human nutrition, and also the one center most outspoken in defending the option of GMO crops. In a March 2006 Statement on Biotechnology and Biosafety, IFPRI's Director General explained that "it would be irresponsible not to assess the potential of genetically modified crops such as nutrient-enriched or drought-tolerant and disease-resistant crop varieties" (IFPRI, 2006, para. 1).

FAO

The Rome-based United Nations Food and Agriculture Organization (FAO) collects data, provides technical assistance, and hosts international gatherings of agricultural ministers. FAO has had a long history of promoting technologically advanced "green revolution" commercial farming methods around the world, yet prior to 2004, FAO's Senegalese Director-General Jacques Diouf had not specifically endorsed GMO technologies. He had even asserted at one point that GMO crops would not be needed in the near term to meet FAO's 1996 World Food Summit goal of reducing by half the number of hungry people by the year 2030.

Eventually in 2004, after strong evidence of the safe and effective use of GMO crops had accumulated, FAO did publish a high-profile report which summarized this evidence and endorsed GMO crops as a potential source of productivity and income gain, even for poor and low-resource developing-world farmers (FAO, 2004). FAO knew it would be criticized for taking this more positive view toward GMOs, and indeed soon after the report was issued, Director-General Diouf received an open letter signed by 670 separate nongovernmental organizations (NGOs) expressing their complete disagreement and outrage, calling the report a "stab in the back" to farmers and the rural poor (GRAIN, 2004). Director-

General Diouf stoutly defended the report, but FAO had been reminded of the sensitivity of the issue, and Diouf promised closer consultations with the NGO community in the future.

Unable to please both pro-GMO and anti-GMO elements at the same time, FAO increasingly has focused not on *shaping* or *promoting* biotechnology but on *regulating* it. Technical assistance is offered to governments regarding which measures to take for ensuring “biosafety” when planting GMO crops. Also, through the Codex Alimentarius Commission (an agency under FAO and the WHO that establishes international food standards), efforts have been made to develop technical standards for the approval and labeling of biotechnology-derived foods. Once again, highly politicized differences between the United States and the European Union over the appropriate degree of “precaution” to take toward this new technology have so far left many of these Codex efforts deadlocked.

UNEP

The United Nations Environment Programme (UNEP) has emerged as a significant force shaping the regulation of GMO crops in the poorest developing countries, particularly in Africa. Since 2001, UNEP has operated a Project on Development of National Biosafety Frameworks (NBFs) designed to prepare countries for compliance with the 2000 Cartagena Protocol on Biosafety. The negotiation of this Protocol had been pushed by a broad coalition of anti-GMO NGO activists, European environmental ministries, and like-minded allies in the developing world (Aerni & Bernauer, 2006). By 2006, a total of 134 countries had ratified the Protocol, giving it significant international legal standing. Since it is primarily an environmental agreement, the Protocol has tended to shift the focus of debate from the potential of GMOs to help farmers to their hypothetical risks for biosafety and the need to build capacity in the area of GMO crop detection and regulation. To date, 126 countries have agreed to participate in UNEP’s global project, and as of May 2005, 40 countries had produced their own draft NBF (Checkbiotech, 2006).

As would be expected from a project designed for environmental goals and implemented through environmental ministries, the emphasis of these UNEP activities has been on a precautionary approach toward the planting or import of living GMOs (LMOs). The 2000 Cartagena Protocol asserts—counter to the rules of the WTO—that importing governments need not have any evidence of a biosafety risk when refusing imports of

LMOs. An untested hypothetical risk (a scientific “uncertainty”) is all that is needed under the Protocol to justify an official decision not to import LMOs. The terms of the Protocol were modeled after an earlier Basel Convention on Transboundary Movement of Hazardous Wastes. UNEP uses money from the Global Environment Facility (GEF) to promote caution toward GMOs by sending outside experts into developing countries to review draft regulatory legislation and hold workshops. UNEP also sponsors visits by developing country officials to countries where a precautionary approach is currently in favor, such as Switzerland, Germany, Netherlands, Belgium, and France (UNEP, 2004). Prior to the Protocol taking effect in 2003, GEF had provided \$56 million to more than 120 developing countries to assist them in developing their “national biosafety frameworks.”

This UNEP/GEF program has had only a limited impact (confined mostly to politically marginalized environment ministries) in the more advanced developing countries, such as China, India, or Brazil, where significant technical capacity and ambition in the area of modern agricultural biotechnology works against an extreme precautionary approach. But in lower-capacity countries, particularly in sub-Saharan Africa, the UNEP program has helped shape the drafting of national biosafety frameworks and laws in a highly precautionary direction.

Bilateral Donors

Many policies in low-capacity developing countries tend to be donor driven. Yet in the case of GMOs, different donors have different preferences. Important European donors have sought to coach developing countries away from GMOs, while the United States actively promotes the technology. Where European donors outspend the United States by a substantial margin, as in Africa, local policies have tended to take a highly precautionary slant. In 2004, total official development assistance from the United States to Africa equaled \$4.1 billion, just a bit more than one third the European level of \$11.0 billion (Organization for Economic Cooperation and Development [OECD], 2006).

Some European donors even give financial support to NGO campaigns against GMOs. For example, a project called “The Citizen’s Jury on GMOs” funded by the Swiss Development Corporation (SDC) and the Netherlands Ministry of Foreign Affairs (DGIS) puts GMOs “on trial” in developing countries before locally assembled juries of small and medium sized farmers,

hearing testimony from “experts” that include activist NGOs committed to blocking the spread of transgenic crops (International Institute for Environment and Development [IIED], 2006). Other European donors help developing countries build their capacity to detect the presence of GMO ingredients in food imports so they can remain “GMO-free.” The Government of Norway has been financing the construction of a \$400,000 detection laboratory in Zambia to help protect that country and its citizens from unauthorized GM crops and seeds.

These European donor attitudes and efforts usually trump USAID efforts to promote GMOs in the developing world. Since the 1990s, the United States has attempted through USAID to provide support to GMO crop research, technology development, and commercial adoption in developing countries, with efforts that have included a US university-led Agricultural Biotechnology Support Project (ABSP), an IFPRI-located Program for Biosafety Systems (PBS), and support for the CGIAR’s work on biofortified crops to combat micronutrient deficiency, particularly Vitamin A, iron, and zinc. Yet USAID’s influence has been weakened because its investments in agricultural development overall have fallen sharply. In FY2005, the Agency spent more than ten times as much for food aid to Africa than it spent on agricultural development in Africa.

In Africa, USAID efforts to support GMOs have not yet led to the commercial release of any new GMO crop varieties, as most of the technologies under development have remained confined to laboratory and greenhouse experiments, with only a few advancing even to the stage of open field trials for biosafety testing. None so far has been given a commercial release. Cautious regulators in Africa, following a European lead rather than an American lead, have slowed the progress of these technologies to a crawl (Spielman et al., 2006).

NGOs

Large segments of the international NGO community have been overtly hostile to GMO crops ever since the technology was first commercialized in the 1990s. This hostility is partly a reflection within the NGO community of a dislike for all modern science-based farming. When 670 separate NGOs criticized FAO in 2004 for endorsing the potential of GMOs, they made it clear they would oppose any “technological fix” to poverty problems. Worried as they are about risks of social injustice or about excessive western influence (except perhaps their own), these NGOs believe the latest appli-

cations of science to farming in poor countries will only make things worse, as happened—according to their perspective—during the Green Revolution (GRAIN, 2004). From the vantage point of many NGOs, the real enemy is not GMOs so much as it is all science-based, materialistic, socially inequitable, corporate-led globalization. These NGOs tend to endorse approaches based on indigenous knowledge rather than western science, incorporating a more holistic respect for nature rather than materialistic attempts to dominate or engineer nature. They want a development strategy that privileges social equity ahead of economic productivity as well as much tighter regulation of international markets and the actions of profit-making private corporations.

The most prominent anti-GMO activist organizations today include not only European-based Greenpeace, Friends of the Earth (FoE), and GRAIN, but also some US-based organizations such as Food First, the Foundation on Economic Trends, and the Institute for Agriculture and Trade Policy (IATP). Greenpeace has local chapters in 40 countries and employs more than 1,000 full-time staff members. FoE has chapters in 68 countries and approximately 1,200 full-time staff (Ansell, Maxwell, & Sicurelli, 2006). Consumers International (CI) is an international federation of more than 230 food-consumer advocacy organizations in 113 different countries, including many developing countries, which conducts an international campaign called “Consumers Say No to GMOs.” The financial resources of these organizations can come from large numbers of small individual donors (as in the case of Greenpeace) or from politically motivated private donations (e.g., from the Foundation for Deep Ecology). Anti-GMO groups engage in a range of international outreach activities, legal actions, advertising campaigns, and training programs employing professional public relations firms and well-paid lobbyists as well as highly motivated unpaid volunteers (Byrne, 2006). By supporting advocacy through local affiliates, they succeed in presenting their resistance to GMOs as a bottom-up grass roots movement, in purported contrast to the less democratic top-down efforts of foreign multinational corporations.

The scientific and social-scientific claims of these anti-GMO activist organizations—presented in press releases, open letters, and self-published reports—often gain quick acceptance in the tabloid press and on the Internet, and on occasion they do have direct impacts on government policy in the developing world. An NGO campaign against GMO maize in food aid, led by groups such as FoE, played a role in slowing the acceptance of food aid deliveries to southern Africa in 2002-03, at a

time when roughly 15 million people in six drought-stricken countries faced significant food deficits. Andrew Natsios, the Administrator of USAID, was asked at the time by a government minister from one African country if it was true that the GMO maize being offered by the United States as food aid contained pig genes, as anti-GMO activists had been telling people in local Muslim villages (Natsios, 2006).

MNCs

Four types of multinational companies (MNCs) have had an impact on the adoption of GM technology and food fortification in developed and developing countries: agricultural seed and biotechnology companies, chemical pesticide companies, food and feed companies, and major retailers such as supermarkets and fast food chains. The private multinational seed and biotech companies that have developed most of the GMO crops currently on the market, led by the Monsanto Company, DuPont/Pioneer, and Syngenta, have made substantial efforts to counter the campaigns of activists to halt the spread of GMOs. These companies, much like their critics, try to work through non-profit surrogates and locally credible allies. For example, the US-based International Service for the Acquisition of Agri-Biotech Applications (ISAAA) receives corporate funding for its annual reports on the spread of GMO crops around the world. ISAAA has a Kenya-based AfriCenter and has spun off a pro-GM NGO in Africa, the African Biotechnology Stakeholders' forum. Also in Kenya, the Syngenta Foundation supports a GMO Insect Resistant Maize for Africa (IRMA) project.

There is a limit to what corporate funding can accomplish politically, due to the tendency of their sponsored projects and studies to be dismissed as self-serving (Ansell et al., 2006). Even some pro-GMO organizations that keep direct corporate funding at a distance, such as the African Agricultural Technology Foundation (AATF), the Africa Harvest Biotechnology Foundation International (AHBFI), or the US-based AgBioWorld Foundation, are frequently dismissed as little more than fronts for private companies. The companies try to soften their profit-driven image by offering to share their technologies for royalty-free use by poor farmers in developing countries. The Monsanto Company did this with a virus-resistant sweet potato in Kenya in the 1990s, and more recently DuPont/Pioneer made a \$4.8 million in-kind donation of its intellectual property (IP) rights, materials, and know-how to a Nutritionally Enhanced Sorghum for the Arid and Semi-

Arid Tropical Areas of Africa project, to be carried out by Africa Harvest with a Grand Challenges in Global Health grant from the Bill and Melinda Gates Foundation.

The three other types of MNCs have not been as active in political lobbying for or against GMOs in developing countries, but they can influence regulators and they do make commercial decisions with important impacts on GM crops. All of today's large MNC biotechnology firms are also (or were) major chemical pesticide companies, a fact that leaves the industry as a whole internally divided over how strongly to stress chemical-use reductions as an environmental goal. A number of pesticide companies such as BASF and Bayer did not start research and development on biotechnology until around 2000, and others still have not made major investments in biotechnology; Monsanto, on the other hand, has moved strongly away from chemicals. To the extent that biotech crops have replaced chemical pesticides, or are linked to a specific herbicide, corporate chemical sales can be hurt. The multinational chemical companies have thus been much less enthusiastic about biotechnology, and some of their subsidiaries and dealers have actually worked at times in the developing world to dissuade farmers and government officials from accepting GM crops.

Food companies also play a role. In the United States, the demise of GM potatoes was due primarily to a refusal by Frito-Lay and McDonalds to purchase them. In the United Kingdom, the Tesco supermarket chain decision to stop selling tomato paste produced from GM tomatoes in California finished off a delayed-ripening tomato technology. The refusal of the major chains such as Carrefour, Ahold, and Tesco to stock food that is labeled as containing GMOs has a major impact not only on the political debate about biotech crops in Europe but also in developing countries, through the signal it sends to least-developed country (LDC) exporters. In the United States and Canada, where labels are not mandatory, the food industry, supermarkets, and fast food chains have been able to continue selling food produced with GM soybeans, corn, and canola with less concern about consumer or NGO complaints. However, rapidly growing markets for organic and natural foods in the United States create demands for certification that GM technologies have not been used in production.

National-Level Institutions in the Developing World

At the national level in most developing countries, the debate over novel foods including GMOs tends to be an elite debate rather than a popular debate, one that usually takes place in the capital city rather than the countryside. Since urban elites in poor countries—particularly in Africa—are open to considerable international and donor influence, it comes as little surprise that the terms of debate in these countries quite often reflect the concerns and reference points of international actors. Governments and ministries that take funding from anti-GMO international donors tend to adopt a skeptical view toward the technology, while those that receive international funding from pro-GMO actors tend to keep a more open mind. In countries where MNCs and the United States are not trusted, the technology tends not to be trusted either. In countries less dependent on foreign donors or companies, particularly those with strong independent agricultural research capacities, local ownership of the technology is more likely and political acceptance becomes easier.

The most common pattern of GMO governance at the national level in the developing world is governance by committee, where all the major stakeholders will have something close to veto power. The most important national decisions on GMO foods and crops will typically be made by a gatekeeping committee called a “national biosafety committee,” given authority to approve—or not—the use of GMOs on a case-by-case basis. All stake-holding ministries will usually have a seat on this committee, including the ministries of Agriculture, Science and Technology, Environment, Health, Trade, Education (representing universities), and in many instances representatives will also be welcomed from the President’s office, civil society (NGOs), and even the private sector. This single committee will be charged with making technical decisions to approve—or not—applications from companies or scientific researchers for the import, field testing, or commercial release of individual GMO crops.

Those seeking to use GMOs for research or commercial purposes will submit to this committee a formal application accompanied by a dossier of evidence showing that the crop variety in question has passed a number of standard tests for risks to food consumers (such as toxicity or allergenicity) plus biosafety tests to protect against unwanted gene flow or damage to the other plants or non-target species in the environment. In some cases this national biosafety committee will also be

mandated to evaluate a new crop technology for evidence of positive (and equitable) socioeconomic impact. Since the case-by-case decisions of these national technical committees can effectively determine the degree to which a nation will accept the use of GMO crops and foods, intense political pressures are commonly brought to bear at every turn. The political struggle over GMOs is often reduced to a practical contest over which actors will be able to control the supposedly technical decisions made by these national biosafety committees.

The physical location and institutional chairmanship of these inter-ministerial national biosafety committees, as well as the year of their inception, can sometimes be an indicator of how promotional or precautionary they will be toward GMO technologies. National committees located in or chaired by officials from agricultural ministries, and also those that established themselves and began operation prior to the emergence of European opposition to GMOs in the late 1990s (e.g., committees in countries such as Argentina, China, the Philippines, and South Africa), have been among those more willing to go forward with GMO approvals. Committees located either in neutral political territory (in ministries of science and technology) or closer to skeptical ministries (especially environment ministries) and those constituted more recently, since the negotiation of the Cartagena Protocol in 2000, have tended to be far more precautionary.

On the national political landscape in all developing countries, there will be a spectrum of institutional positions on GMOs often determined by whether or not the institution is pro-science overall. Institutions with a pro-science leaning, including ministries of science and technology, national agricultural research systems, and the relevant schools and research departments inside national universities will typically be eager to host donor-financed scientific research, including research on GMOs. At the other end of the spectrum are those institutions who claim to speak for the poor, especially local NGOs working in advocacy or community development. While these organizations are strongly motivated to help those in need, they often bring a bias against using science-based technologies which they reject as “silver bullet” approaches inappropriate to local needs, particularly when brought in from the outside or marketed by profit-making international companies.

Government Ministries

National Health Ministries typically have responsibilities for nutrition programs including food fortification regulations and community or maternal/child health initiatives such as supplementation, enriched weaning foods, simple preventative care for mothers and infants, nutrition education, and investments in clean drinking water and sanitation. Yet in the case of locally produced biofortified foods, authority must be shared with agricultural ministries since farmers are also involved. Agricultural ministries place greatest weight on farm production, farm income, and agricultural exports rather than on health or nutrition.

The jurisdictional divide between production responsibilities (in the Ministry of Agriculture) and consumption or nutrition responsibilities (in Ministries of Health or similar agencies) is problematic in the case of biofortified crops, since they fall simultaneously and equally into both jurisdictions. Although the World Bank, among others, advocates broad integration among goals such as agricultural productivity, poverty relief, and nutritional improvement, this vision is rarely reflected in national programs or policies. The political reality is that agencies are dependent on program budgets determined by traditional jurisdictions, and they may be inclined to resist new approaches that dilute their areas of authority.

Also, agricultural ministries in most developing countries are usually focused less on the well-being of poor subsistence farmers than on the prosperity of export-oriented commercial farms. In parallel fashion, most national organizations of farmers are also dominated by the export-oriented commercial farming elite. Their political focus tends to be on boosting state investments in the infrastructures and technologies needed to remain competitive in international markets. An institutional bias favoring the prosperity of technically advanced commercial farmers also prevails at the international level, at the United Nations Food and Agriculture Organization (FAO). The resulting importance that is placed on preserving commercial export sales has recently discouraged elite farm organizations and agricultural ministries in many developing countries from a hasty embrace of GMOs, since GMOs can encounter consumer resistance and tighter import regulations in European and Asian markets.

Linked closely to agricultural ministries quite often are national agricultural research systems (NARS). When international funding for these systems began to fall in the 1980s, the job of servicing the need of com-

mercial farmers for improved seeds and inputs was largely handed off to the private sector, leaving public-sector national research and extension institutions with a much diminished role. Particularly in the low-resource countries of Africa, these national systems now have difficulty providing the salaries and facilities needed to retain good scientists or act as equal partners with the international research centers of the CGIAR system or with private companies. Despite their technical and financial limitations, these NARS can provide essential local credibility in efforts to introduce novel foods or crops, especially GMO crops. An application to a national biosafety committee from an NARS is more likely to receive an approval than a similar application from a foreign company, or even from a foreign joint venture with a national company. Regulators in China were willing to approve a Monsanto variety of Bt cotton in 1997 in part because a Bt cotton variety developed by China's own national researchers was ready to be approved at the same time.

National Universities

University-based scientists tend to have local credibility even higher than those working in NARS because they are perceived to be less dependent on donor money. Stakeholder surveys in the Philippines, Mexico and South Africa (Aerni, 2002, 2005) reveal that academics speaking about agricultural biotechnology are more trusted than either NGOs, the mass media, business, or government. In developing countries where academics have assumed public leadership in the debate over GMOs, political space is usually opened to allow research to go forward. Credible leadership by these national scientists tends to trump the skepticism of critics, and local technology development comes to be seen as a matter of national pride and economic advancement. This dynamic has been observed in countries as disparate as Cuba, Chile, South Africa, and China. In the poorest countries of Sub-Saharan Africa, because academic institutions tend to be weak and less independent of the state, this same university-led dynamic is less often in evidence.

National environment ministries usually take the strongest position against GMO foods and crops. Environment ministries are normally weak, but they have been able to play a larger role on GMO policy thanks to the Cartagena Protocol and the UNEP/GEF program, which have backed their claims for political jurisdiction over GMO policy. Environment ministries in the developing world quite often espouse, without much exami-

nation, the same highly precautionary formulae regarding GMOs that are espoused by environmentalists in rich donor countries. The real risks to local biodiversity and biosafety may come from habitat destruction and the entry of wild exotic species into local ecosystems rather than from GMOs, but national environment ministries usually receive much less assistance from donors to manage these issues, so they focus—like the donors—on risks from GMOs that so far have been only hypothetical.

National Seed, Pesticide, and Food Companies

Seed companies at the national level may be public or private—or private but still enjoying a virtual monopoly. They may be independent or a subsidiary of a multinational, or an independent that is joint venturing with a multinational. In most cases, the poorest farmers save seeds from their own fields, rather than purchasing improved seeds every year from a vendor. Well-functioning seed companies capable of reaching the poor, companies with knowledge and ability in managing locally desired crop varieties and with a scientific capacity to move desired traits into local varieties, will be important to the successful extension of biofortified crops, GMO or otherwise. In some very poor countries in Africa, formal seed companies are almost non-existent, either in the public or the private sector. Government research and extension programs provide foundation or commercial seed of improved varieties and then they are distributed from farmer to farmer. NGOs play an important role in distributing seed in many African countries.

Commercial seed markets in India, China, South Africa, Argentina, and Brazil have been significantly transformed by the introduction of GM cotton and soybeans. GM cotton, in particular, dramatically increased potential on-farm profit margins, which led to new local and foreign investments in research, production, and marketing of seed. Also, Bt cotton and GMO soybeans have been so superior to conventional technologies that the foreign companies or small local companies that first sold these varieties grew dramatically and displaced firms still selling conventional seed.

National pesticide companies and their distributors have generally been hostile to GMO technologies that lead to reduced chemical sales, such as Bt cotton. In India pesticide producers lobbied quietly against approving Bt cotton, helping put off the commercial release of this technology. Chemical dealers at the vil-

lage level in India and some parts of extension service in China have advised farmers that Bt cotton is not a good idea, and that if the farmers do use Bt cotton they should also continue to use pesticides.

Food processors and retailers also play a role. In South Africa, for example, the largest processor of maize (African Products, with about 10% of the market) only buys non-GM crops. Woolworth's, South Africa's upscale food market, has declared itself to be non-GM and requires labeling of GM products. However, unlike in Europe, this has not led policy makers, regulators, and farmers in South Africa to back away from GM crops, but instead to the development of separate market channels for GM and non-GM maize. In most other African states, where marketing infrastructures are less well developed, such segregation options may not be affordable.

National NGOs

Many of the NGOs in developing countries engaged in advocacy over food and farm policy are local affiliates of larger international NGOs such as Greenpeace, FoE, ActionAid, or WWF. If their dependence on a foreign parent NGO for funding and technical literature becomes too obvious, local credibility suffers, yet in developing countries where the poor have little political power (because so many are illiterate women and children living in remote rural communities, or members of marginalized racial, caste, or ethnic groups), local NGOs can claim to speak on their behalf and thereby gain effective veto power over new initiatives that might reach rural communities.

Some local NGOs and grassroots organizations (GROs) engage in community development or actual service delivery among the poor, rather than just advocacy, i.e., groups such as the Bangladesh Rural Advancement Committee (BRAC) or the Grameen Bank. These organizations also depend on external funding, sometimes from faith-based organizations as well as bilateral donors, and they often emphasize community self-help and autonomy, including reduced dependence on inputs purchased from the market, a tendency that has made them suspicious of Green Revolution farming and now suspicious of GMOs as well. In efforts to reach the poor with biofortified foods and crops, winning the support of such organizations will be essential, yet it will be more difficult if the foods in question are GMOs.

Conclusion

The political actors currently on the landscape fall into remarkably predictable patterns in the developing world when it comes to their views toward novel foods and crops, both GMO and non-GMO. In large part this reflects a projection onto the developing world of the dominating debates that have emerged among and within rich countries regarding the use of modern science for crops and foods. This super-imposition of rich-country policy debates onto the developing world is most pronounced in the case of Africa due to the greater dependence of that region today on continued flows of technical and financial assistance from rich countries. Because of Africa's greater dependence for both aid and markets on Europe in particular, it is not surprising to see so much of the policy debate in Africa regarding novel foods and crops evolving in a close parallel to the policy debate in Europe. Nor is it surprising to see policy debates in the less dependent countries of Asia evolving in a more independent manner, or to see debates in Latin America quite often evolving parallel to the debate in the United States. Such regional variations will be explored in greater detail elsewhere in this special issue of *AgBioForum*.

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