



GMO foods and crops: Africa's choice

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There is a scientific consensus, even in Europe, that the GMO foods and crops currently on the market have brought no documented new risks either to human health or to the environment. Europe has decided to stifle the use of this new technology, not because of the presence of risks, but because of the absence so far of direct benefits to most Europeans. Farmers in Europe are few in number, and they are highly productive even without GMOs. In Africa, by contrast, 60% of all citizens are still farmers and they are not yet highly productive. For Africa, the choice to stifle new technology with European-style regulations carries a much higher cost.

The future of genetically engineered foods and crops in Africa will depend heavily on choices African governments make regarding the regulation of this technology. There are essentially two different regulatory approaches available: the approach used by the European Union and the approach used by the United States. There are four key differences between these approaches:

- The regulatory approach used in Europe requires new and separate laws that are specific to genetically engineered ('GMO') foods and crops. By contrast, the United States regulates GMOs for food safety and for environmental safety using the laws that were already in place to govern non-GMO foods and crops.
- The European approach also requires the creation of new institutions (for example, national biosafety committees) and a separate screening and approval process for GMOs. In the United States the institutions that screen and approve GMOs (the Food and Drug Administration, the Animal and Plant Health Inspection Service, and the Environmental Protection Agency) are the same institutions that screen and approve non-GMO foods and crops.
- The European approach also differs because it can decline to approve a new technology on grounds of 'uncertainty' alone, without any evidence of risk. A hypothetical risk that has not yet been tested for is sufficient reason for blockage. This is

known as the precautionary approach. In the United States, if standard tests for known risks such as toxicity, allergenicity and digestivity have been passed successfully, there is usually no regulatory barrier to commercial release.

- Finally, in Europe all products in the marketplace with some GMO content must carry identifying labels, while in the United States the FDA does not require labels on any approved GMO foods.

Which of these two approaches is better? In the abstract, the best regulatory approach will be one that allows new technologies to be used while preventing new risks to human health or the environment. Using this standard, the U.S. approach has done a better job because it has allowed many more useful new technologies to be employed by farmers, without any documented new risks so far. By contrast, the European approach has blocked the planting of GMO crops in most countries in Europe, to the frustration of most European farmers who want to share in the productivity gains these crops provide.

There has not yet been any documented evidence that approved GMOs have posed new risks either to human health or the environment. This finding of 'no new risks' is the official view of scientific authorities in Europe itself. European science academies took several years to study the impacts of GMO crops on human health and the environment following the first commercializations in 1995, but by 2001–2004 a consensus had

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emerged that no new risks from these seeds had been documented.

In 2001, the Research Directorate General of the EU released a summary of 81 separate scientific studies conducted over a 15-year period (all financed by the EU rather than private industry) aimed at determining whether GM products were unsafe, insufficiently tested, or under-regulated [1]. The EU Research Directorate concluded from this study, 'Research on GM plants and derived products so far developed and marketed, following usual risk assessment procedures, has not shown any new risks on human health or the environment... ' [2].

National academies of science in Europe began drawing this same conclusion one year later. In December 2002, the French Academy of Sciences stated that 'all the criticisms against GMOs can be set aside based for the most part on strictly scientific criteria.' [3]. At the same time the French Academy of Medicine announced it had found no evidence of health problems in the countries where GMOs had been widely eaten for several years [4]. In the UK in May 2003, the Royal Society presented to a government-sponsored review two submissions that found no credible evidence GM foods were more harmful than non-GM foods [5], and the Vice-President and Biological Secretary of the Royal Society, Professor Patrick Bateson, expressed irritation at the undocumented assertions of risk that continued to come from anti-GMO advocates: 'We conducted a major review of the evidence about GM plants and human health last year, and we have not seen any evidence since then that changes our original conclusions. If credible evidence does exist that GM foods are more harmful to people than non-GM foods, we should like to know why it has not been made public.' In March 2004, the British Medical Association (BMA) that had earlier withheld judgment endorsed these Royal Society conclusions [6]. In September 2004, the Union of the German Academies of Science and Humanities produced a report that concluded, '...according to present scientific knowledge it is most unlikely that the consumption of the well characterized transgenic DNA from approved GMO food harbours any recognizable health risk.' [7]. This report added that food from insect resistant GMO maize was probably healthier than from non-GMO maize due to lower average levels of the fungal toxins that insect damage can cause.

A consensus also emerged at the global scientific level of no new risks linked to any of the GMO crops and foods to have reached the market so far. In March 2000, the Organization for Economic Cooperation and Development (OECD) in Paris organized a conference with 400 expert participants from a variety of backgrounds. These experts announced their agreement that 'No peer-reviewed scientific article has yet appeared which reports adverse effects on human health as a consequence of eating GM food.' [8]. In August 2002, the Director-General of the World Health Organization (WHO) endorsed consumption of GMO foods, saying, 'WHO is not aware of scientifically documented cases in which the consumption of these foods has negative human health effects. These foods may therefore be eaten.' [9].

Some accept that GMO foods are probably safe to eat, yet they still question their safety for other living things in the biological environment (their 'biosafety'). Because all farming disturbs and changes nature, it is difficult to agree on exactly what level of disturbance should be considered dangerous or unacceptable. Studies have shown, for example, that planting a GMO variety

of beet or rapeseed can help farmers control weeds in the field (compared to conventional beet or rapeseed), but as a result there might also be fewer insects in the farm field (using the weeds for food and shelter) and hence fewer weed seeds for some farmland birds to eat. Are these weedless farm fields to be considered a damaging disturbance of nature? Some ecologists might say yes, but most conventional environmental advocates would say no.

By most conventional definitions of biosafety, the GMO crops currently on the market have not disturbed nature (beyond farm fields) any more than conventional crops. A 2003 study conducted by scientists from New Zealand and the Netherlands [10] examined data collected worldwide up to that time, and the authors concluded from this data that the GMO crops approved so far had been no more likely to worsen weed problems than conventional crops, no more invasive or persistent, and no more likely to lead to gene transfer. There was no evidence that GMO crops had transferred to other organisms (including weeds) new advantages such as resistance to pests or diseases or tolerance to environmental stress.

Later in 2003 the International Council for Science (ICSU) examined the findings of roughly 50 different scientific studies that had been published in 2002–2003 and concluded, '[T]here is no evidence of any deleterious environmental effects having occurred from the trait/species combinations currently available.' [11]. In May 2004, the United Nations Food and Agriculture Organization (FAO) issued a 106 page report summarizing evidence that, 'to date, no verifiable untoward toxic or nutritionally deleterious effects resulting from the consumption of foods derived from genetically modified foods have been discovered anywhere in the world.' [12]. On the matter of environmental safety, this FAO report found the environmental effects of the GM crops approved so far, including effects such as gene transfer to other crops and wild relatives, weediness and unintended adverse effects on nontarget species (such as butterflies), had been similar to those that already exist from conventional agricultural crops. Finally, in 2007, a study done for the journal *Advanced Biochemical Engineering/Biotechnology* surveyed ten years of research published in peer-reviewed scientific journals, scientific books, reports from regions with extensive GM cultivation, and reports from international governmental organizations and found that, 'The data available so far provide no scientific evidence that the cultivation of the presently commercialized GM crops has caused environmental harm.' [13].

Sceptics who remain fearful sometimes respond that 'absence of evidence is not the same thing as evidence of absence.' Yet if you look for something for 15 years and fail to find it, that must surely be accepted as *evidence* of absence. It is not *proof* that risks are absent, but proving that something is absent (proving a negative) is always logically impossible.

The explanation for Europe's highly precautionary regulatory approach toward GMOs goes beyond risks. It is a policy posture that reflects not a presence of new risks for Europeans, but instead an absence of new benefits for most Europeans. The first generation of GMO crops has provided significant benefits to some farmers, but for ordinary food consumers in rich countries there have so far been few benefits so far.

The first generation of GMO crops that came to the market in 1995–1996 provided benefits mostly to farmers growing cotton, maize, and soybean, in the form of lower costs for the control of insects and weeds. Yet Europe does not have many cotton, maize,

and soybean farmers, so the new technology had few champions. For the 99% of Europeans who were not maize, cotton, or soybean farmers, the new technology offered almost no direct benefit. For consumers, the new GMO products did not taste any better, look any better, smell any better, prepare any better or deliver any improved nutrition. Because the vast majority of Europeans saw little or no direct benefit from the technology, they felt they had nothing to lose by keeping it out of farm fields and out of their food supply. They welcomed a highly precautionary regulatory approach as one way to ensure that outcome.

To demonstrate that it was a benefit calculation rather than a risk calculation that mattered most to Europeans in this case, look at the quite different way Europe regulates GMOs in medicine, versus GMOs in agriculture. In the case of medical drugs, Europe does not hesitate to permit the commercial sale of medicines developed with genetic engineering. By 2006, the European Medicines Agency had actually approved 87 recombinant drugs derived from genetically engineered bacteria or from the ovary cells of genetically engineered Chinese hamsters. These drugs were not free from new risks; clinical trials had shown that many actually increased risks of heart disease, malignancy, and gastric illness, but European regulators approved them just the same because of the benefits the drugs could deliver to so many Europeans. While fewer than 1% of Europeans stood to benefit directly from GMO agricultural crops, 100% were vulnerable to the diseases these GMO drugs could help treat, so the regulator treatment of the GMO drugs was far less precautionary. There were both known risks from clinical trials and plenty of uncertainties surrounding long-term exposures, yet the 'precautionary principle' was not allowed to block the commercial release of a technology that could bring significant benefits to Europeans.

Consider now the very different circumstances of Africa. In Africa, the percentage of the population that might benefit directly from agricultural GMOs is much higher than in Europe, because 60% or more of all Africans are still farmers who depend directly on agriculture for income and subsistence. Some GMO crop traits now widely commercialized outside of Africa, such as *Bt* crops (e.g. for maize and cotton) that resist insect damage with fewer chemical sprays, could have wide benefits if planted in Africa today. Other GMO traits soon to come out of the research pipeline, including abiotic stress tolerance traits such as drought resistance, could provide even wider benefits in the future.

Drought tolerant maize is only one of the new GMO crop technologies now emerging from the research pipeline. Maize is a staple food for more than 300 million people in Sub-Saharan Africa, many of whom are themselves growers of maize. These Africans remain poor and food insecure because the productivity of their labor in farming is so low. Population growth has been pushing maize production into marginal areas with little and unreliable rainfall (only 4% of cropland in Sub-Saharan Africa is irrigated). These factors, combined with human-induced climate change, are expected to increase drought risks to maize growers in Africa in the years ahead. The development of maize varieties better able to tolerate drought is one important response to this growing challenge.

Not all drought tolerant maize varieties will be GMOs. CIMMYT's Drought Tolerant Maize for Africa (DTMA) initiative,

funded in 2007 by the Bill and Melinda Gates Foundation and the Howard G. Buffet Foundation, is designed to accelerate the breeding of non-GMO drought tolerant varieties of maize, both hybrids and open pollinated varieties (OPVs) in 13 countries in Sub-Saharan Africa. This initiative will use conventional and marker-assisted selection breeding but no transgenic techniques. Other initiatives, however, use GMO techniques. One example is the Water Efficient Maize for Africa (WEMA) project, funded in 2008 by the Bill and Melinda Gates Foundation and operated in Africa by the African Agricultural Technology Foundation (AATF). CIMMYT is a partner in this project, as is the Monsanto Company. This initiative will use transgenic techniques in addition to conventional and marker-assisted selection.

Regulatory requirements in Africa for GMOs are emerging as a crucial consideration here. WEMA's genetically engineered (GE) varieties of drought tolerant (DT) maize will deliver benefits to African farmers only if African regulators first allow the technology to be tested in open field trials in Africa and then approve the technology for commercial release to farmers. The regulatory gauntlet for this technology will be long and difficult because in Africa, just as in Europe, transgenic technologies are screened using separate and much higher regulatory standards. In each separate African country, technology developers such as AATF will not be allowed to conduct research on a WEMA variety (e.g. conduct a field trial) without explicit prior approval from a national biosafety committee (NBC). Giving or selling the seed to farmers will not be permitted in any country until the NBC has granted a formal commercial release.

Before they grant a commercial release, NBCs typically require technology developers to compile and submit a substantial dossier of data – including the molecular characterization of the variety, the results of lab tests for food safety and the results of field trials for efficacy and biosafety. Once these data are in hand, the NBC can either grant a commercial release promptly, or refuse to approve, or ask for more data, or do nothing at all, in which case the technology cannot be legally sold or distributed to farmers. In the hands of highly precautionary regulators, this system tends to keep new technologies out of the fields indefinitely. So far, 15 years after GMO crops were first planted commercially in the United States, only two governments in Sub-Saharan Africa have given a commercial release to any GMO crops, the Republic of South Africa (for maize, soybean, and cotton) and Burkina Faso (only for cotton).

Why have so many governments in Africa chosen to follow this highly precautionary European approach toward regulating GMO foods and crops, despite the technology blockages and extended delays nearly certain to result? Five separate channels of external influence on Africa have led to this choice of Europe's regulatory approach over the approach of the United States.

Bilateral foreign assistance is the first channel of external influence on Africa. Governments in Africa are still significantly dependent on foreign assistance. On average, they are four times as aid-dependent relative to GDP as the rest of the developing world. For this reason, much that takes place in Africa today remains 'donor driven'. Since Africa's official development assistance from Europe is three times as large as ODA from the United States, the voice of European donors in Africa tends to be louder than any American voice. Governments in Europe have used their ODA to encourage African governments to draft and implement highly precautionary European-style regulatory systems for agricultural GMOs.

A second channel of external influence has been multilateral technical assistance through the UNEP/GEF Global Project for Development of National Biosafety Frameworks (NBFs). Of 23 African governments that had completed a NBF under this UNEP program by October 2006, all but the Republic of South Africa had no previous regulations in place for agricultural GMOs, so UNEP was in effect writing on a blank slate. In the end, 21 of these 23 countries embraced the strongest possible approach (the 'Level One' approach), requiring regulations through binding legal instruments approved by the legislative branch of government (parliament), parallel to the European approach. Europe had greater influence than the United States over this UNEP/GEF program because European governments contribute roughly three times as much to the GEF trust fund as does the United States.

A third channel of external influence has been advocacy campaigns against GMOs from international non-governmental organizations (INGOs), the most active of which are headquartered in Europe. Greenpeace International and Friends of the Earth International, both based in Amsterdam, have campaigned heavily in Africa against agricultural GMOs. Zambian officials were told by Greenpeace that if GMOs were let into their country, organic produce sales to Europe would collapse. An organization named Genetic Food Alert warned Zambia in 2002 of the 'unknown and unassessed implications' of eating GM foods, and a British group named Farming and Livestock Concern warned them that GM corn could form a retrovirus similar to HIV. These assertions were not backed by any evidence, but they frightened the Zambians into banning GMOs completely.

A group of mostly European NGOs continued this campaign against GMOs at the 2002 World Summit on Sustainable Development in Johannesburg. Led by Friends of the Earth International, they coached their African partners into signing an open letter warning that GMOs might cause allergies, chronic toxic effects and cancers, despite the absence of any scientific evidence for these risks. At this same meeting in 2002, two Dutch organizations, HIVOS and NOVIB, joined with partner groups from Belgium, Germany and the UK to finance a 'small farmers march' on Johannesburg (led by a non-farmer) that ended with a pronouncement that Africans 'say NO to genetically modified foods.'

A fourth channel of external influence has been commercial agricultural trade. Africa's farm exports to Europe are six times as large as exports to the United States, so it is European consumer tastes and European regulatory systems that Africans most often must adjust to. In 2000, private European buyers stopped importing beef from Namibia because it had been fed on GMO maize from the Republic of South Africa, and then in 2002, Zambia rejected GMO maize as food aid in part because an export company (Agriflora Ltd.) and the export-oriented national farmers union

(ZNFU) were anxious that exports of organic baby corn to Europe not be compromised. The risks of export rejections from African countries that plant GMOs are actually quite small, as evidenced by the continued growth of food sales to Europe from the Republic of South Africa, yet anxieties surrounding export loss continues to play a political role.

The final channel of external influence is cultural. Most policy-making elites in Africa have much closer cultural ties to Europe than to the United States, so they are naturally inclined to view European practices as the best practices. For example, the Kenyan author of a 2004 article (published by a European-financed NGO, PELUM) that was titled 'Twelve Reasons for Africa to Reject GM Crops,' <http://www.grain.org/seedling/?id=294> later explained to a newspaper reporter, 'Europe has more knowledge, education. So why are they refusing [GMO foods]? That is the question everybody is asking.' Policy-making elites in Africa have often been educated in Europe, they send their children to European schools, and they travel to Europe frequently both on official and unofficial business. It is not surprising that they would be inclined to adopt European-style regulations for GMOs, despite the fact that Africa's needs and circumstances are so different from those of Europe.

External influence of this kind is not unique to Africa, of course. In Latin America, which lies within the traditional sphere of influence of the United States, government policies toward GMO crops have usually been closer to the American approach than to the European approach. As of 2008, seven out of the top ten countries around the world with significant plantings of GMOs were Western Hemisphere countries. It is also telling that the only Asian country to have approved GMO maize, the Philippines, is a former American colony.

Political leaders in Africa pay a price for simply 'doing what Europeans do.' Europe imposes stifling regulations on GMO foods and crops because Europeans have little need for this new technology. European farmers are already highly productive without it and European consumers are already well-fed. Indeed, like consumers in the United States Europeans are increasingly over-fed. In Africa, however, where farmers are not yet productive and where so many consumers are not yet well fed, the potential gains GMO crops can provide are more costly to do without.

Rather than deferring to outsiders, either Europeans or Americans, Africans might usefully look for ways to make independent judgments of their own regarding how to regulate GMO crops. Other countries in the developing world have managed to operate relatively free from external influence – for example, the People's Republic of China. The PRC has seen a strong value in this new technology, and has invested significant public budget resources to develop the technology for Chinese use. Africa has a choice to make independent decisions regarding GMO foods and crops as well.

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