Biotech Crops, Biosafety Protocol: Genetically Modified Sustainability?

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The popular debate over the use of biotech crops is, at its core, a debate over sustainability. Critics of biotechnology argue that genetically modified (GM) crops (also referred to as transgenic crops) may pose various threats to human health or biodiversity. Advocates of biotechnology argue that GM crops allow for greater crop yield or reduced pesticide requirements without posing any significant threat to human health or the environment.

The reality is that GM crops are neither inherently "good" nor "bad" for the environment. Each GM crop has its own unique properties. To be properly evaluated, each crop must be analyzed on a case-by-case basis. The international community has attempted to strike a balance on trade in GM crops through adoption of the Cartagena Protocol on Biosafety (Cartagena Protocol). *See* Cartagena Protocol on Biosafety to Convention on Biological Diversity, *opened for signature* Jan. 29. 2000, 39 I.L.M. 1027 (*entered into force* Sept. 11, 2003). The protocol is available online at www.biodiv.org/doc/legal/cartagena-protocol-en.pdf. This article discusses the sustainability of certain GM crops currently in commercial production and analyzes the extent to which the Cartagena Protocol is likely to promote or inhibit sustainable agricultural production.

With respect to future production activity, the phrase most frequently applied to the concept of sustainability is "sustainable development." The most common definition of "sustainable development" is that established by the World Commission on Environment and Development in 1987: "[D]evelopment that meets the needs of the present without compromising the ability of future generations to meet their own needs." WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, OUR COMMON FUTURE (1987). In the context of agriculture, then, the question is whether an adequate food supply can be produced to meet current needs without compromising the ability of future generations to produce enough food.

The food-production needs of the present are extensive and they are growing rapidly. Although it was not until the early nineteenth century that the world's human population reached 1 billion for the first time, more than 6 billion people now inhabit the planet, with the most recent billion having been added in only twelve years. According to the United Nations, although an adequate amount of food is currently being produced to satisfy global nutritional needs, nearly 800 million people were undernourished in 1995 to 1997 due to poverty, political instability, and economic inefficiency. Long-term U.N. forecasts indicate that persistent and possibly worsening food insecurity is likely in many countries, particularly in sub-Saharan Africa.

Based on moderate assumptions about fertility in the coming decades, the United Nations forecasted in 2001 that the world's population would reach 9 billion by 2043. U.N. DEP'T OF ECONOMIC AND SOCIAL AFFAIRS, POPULATION DIVISION, POPULATION, ENVIRONMENT AND DEVELOPMENT: THE CONCISE REPORT, at 5, U.N. Doc. ST/ESA/SER.A/202, U.N. Sales No. E.01.XIII.15 (2001). According to the nonprofit AgBio World Foundation, absent increases in farm productivity, nearly 4 billion new acres of land would need to come under cultivation by 2050 to feed the world's projected population increase of more than 50 percent. Such a demand for arable land would create tremendous pressure to clear areas rich in biodiversity for agricultural production, not to mention pressure to clear land for competing uses such as housing, industry, and infrastructure. If future generations are to be able to produce an adequate food supply in an environmentally sustainable fashion, then it is imperative that the agricultural sector employs technology that can maximize efficiency and minimize environmental impact.

A Brief Overview of Genetically Modified Crops

One means by which agricultural production may be enhanced is through biotechnology, or the genetic modification of seeds and plants. GM plants are those in which one or more specific genes are transferred between organisms or "recombined" within an organism. Modern biotechnology allows new plant varieties to be produced far more precisely than they could be with conventional cross-breeding techniques and also allows for the introduction of genes that could not be introduced via conventional breeding practices.

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GM crops have considerable potential advantages compared with conventional crops. For example, they can provide increased crop yield, reduced pesticide use (which can decrease impacts on the environment and minimize farm worker exposure to agricultural chemicals), decreased pressure on land use, increased productivity of inhospitable or marginal lands, and decreased water and energy requirements. (This is not to suggest that all GM crops possess each of these characteristics but rather that certain GM crops provide improvements in one or more of these areas.) In addition to these potential environmental advantages, GM crops hold promise as vehicles for the production of new medical treatments and vaccines, new industrial products, and improved fuels and fibers.

Nevertheless, GM crops are not without potential disadvantages. The risks of GM crops include the potential for: adverse impacts on nontarget species; "weediness" (a plant that becomes more invasive than it would otherwise be); "gene flow" (the transfer of one or more novel genes to a related species in the wild); insect resistance (the development among insects of resistance to inserted genes intended to serve pest-control functions); and adverse impacts on food safety (such as allergenicity).

> *Risks of GM crops include potential adverse impacts on nontarget species, "weediness," "gene flow," insect resistance, and impacts on food safety.*

As for environmental risks of GM crops, it is important to note, as a preliminary matter, that such risks are no different in kind from those presented by new varieties of conventionally bred plants. As the U.S. National Academies' National Research Council found in a 2002 report on the environmental effects of GM plants, "[T]he transgenic process presents no new category of risk compared to conventional methods of crop improvement but . . . specific traits introduced by both approaches can pose unique risks." NATIONAL RESEARCH COUNCIL, ENVIRONMENTAL EFFECTS OF TRANSGENIC PLANTS: THE SCOPE AND ADEQUACY OF REGULATION (2002) (*Environmental Effects of Transgenic Plants*).

Although GM crops may pose certain risks, they are also subject to intense scientific and regulatory scrutiny designed to minimize and manage those risks. In the United States, for example, GM crops are subject to initial laboratory and field tests, as well as review by the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), or the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS). In a total of forty-five countries around the world over the last fifteen years, some twenty-five thousand field tests have been conducted of the efficacy, performance, and suitability for release of more than sixty GM crops.

Conventional crops, in contrast, are grown and sold around the world with little or no regulatory oversight. As the National Research Council found in its 2002 report, "There is currently no formal environmental regulation of most conventionally improved crops, so it is clear that the standards being set for transgenic crops are much higher than for their conventional counterparts." *Environmental Effects of Transgenic Plants* at 5. Advocates of GM crops contend that, moreover, any risks posed by properly regulated and managed GM crops are minimal compared with the very real dangers of food shortages in the developing world and environmental impacts associated with conventional farming practices.

With respect to human health concerns, GM food products have a proven track record; no adverse human health effects have been confirmed to date. A recent study conducted by the GM Science Review Panel, a panel of experts commissioned by the British government to review the health effects of GM foods, found that no verifiable ill effects have been reported from the consumption of products from GM crops and concluded, "[o]n balance, . . . the risks to human health are very low for GM crops currently on the market." GM SCIENCE REVIEW PANEL, AN OPEN REVIEW OF THE SCIENCE RELEVANT TO GM CROPS AND FOOD BASED ON THE INTERESTS AND CONCERNS OF THE PUBLIC (First Report, July 21, 2003).

Moreover, certain GM crops under development may provide important health or environmental benefits, such as: a rice variety enriched with Vitamin A, which has the potential to prevent blindness in millions of children whose diets are deficient in that vitamin; rice and corn varieties that are more tolerant of aluminum, a common soil toxin; a rice variety with increased iron content, which could provide an enormous benefit to the roughly 30 percent of the world's population that suffers from iron deficiency (which can cause impaired learning ability in children, increased susceptibility to infection, and reduced work capacity); plants that can tolerate increased salinity, reduced water availability, or extreme hot or cold temperatures; plants that can perform bioremediation functions, such as absorbing arsenic or mercury from soil; and locally grown crops that contain vaccines that would not otherwise be available in many parts of the world.

The use of GM crops, which were first introduced commercially in 1996, is increasing rapidly in the United States and around the world. According to the nonprofit International Service for the Acquisition of Agri-biotech Applications (ISAAA), in 2002, GM crops were grown by an estimated 6 million farmers on 145 million acres in 16 countries. *See* Clive James, *Preview: Global Status of Commercialized Transgenic Crops: 2002* (ISAAA Briefs No. 27) (2002) at iii, *at* www.isaaa.org. In 2003, an estimated 7 million farmers grew GM crops on 167 million acres (an increase of approximately 15 percent in both categories) in eighteen countries. *See* Clive James, *Preview: Global Status of Commercialized Transgenic Crops: 2003* (ISAAA Briefs No. 30) (2003) at 3, *at* www.isaaa.org. In the United States, 81 percent of the soybeans, 73 percent of the cotton, and 40 percent of the corn grown in 2003 were bioengineered. *See* Pew Initiative of Food and Biotechnology, *Factsheet: Genetically Modified Crops in the United States* (Aug. 2003), *at* http://pewagbiotech.org/resources/factsheets/display.php3?FactsheetID=2.

The Sustainability of Leading GM Crops

Despite the fact that cultivation of GM crops has become commonplace in the past several years, analysis of their environmental sustainability is subject to dispute. Although numerous studies have been conducted, it is difficult to control for all potentially relevant variables such as year-to-year variations in weather, pest infestations, seeding rates, differences in farming practices, and other factors that may influence crop viability or environmental impacts. Even if all of these variables could be controlled, studies could still be called into question. For example, more than 250 pesticide active ingredients have been approved for commercial use in the United States, and they vary widely in toxicity and persistence in the environment. A comparison of the volume of pesticides applied to GM crops compared to their conventional counterparts, therefore, would be misleading unless the same pesticide is applied to both varieties (which is often not the case).

The most common GM crops in production worldwide today have one of two basic features: herbicide tolerance or pest resistance.

Notwithstanding their limitations, empirical analyses indicate that the leading commercially grown GM crops do provide environmental benefits. For example, a 2001 study by the National Center for Food and Agricultural Policy, a private nonprofit nonadvocacy research organization, found that eight major biotech crops cultivated in the United States increased crop yields by 2 million tons, saved farmers $1.2 billion by lowering production costs, and reduced pesticide use by 46 million pounds. According to a 2003 study funded by the German Research Council and the Rockefeller Foundation, insecticide use among farmers in Argentina cultivating a leading GM corn variety was roughly 50 percent lower than conventional corn over two seasons and the GM crop yield was approximately 32 percent higher during that time. M. Qaim, E.J. Cap & A. Janvry, *Agronomics and Sustainability of Transgenic Cotton in Argentina,* 6 AgBioForum 41–47 (2003), *at* www.agbioforum.org/v6n12/v6n12a10-qaim.htm.

The most common GM crops in production worldwide today have one of two basic features: herbicide tolerance or pest resistance. Genetically modified herbicide-tolerant (GMHT) crops are engineered to tolerate one of two "broad-spectrum" herbicides, which control a wide range of weeds. Farmers can use the appropriate broad-spectrum herbicide to control most of the weeds likely to be encountered without harming the GMHT crop. (Broad-spectrum herbicides cannot be used on conventional crops because they would destroy the crops along with the weeds). With conventional crops, farmers typically must use multiple herbicides to protect the crop.

An example of a GMHT crop is Monsanto's Roundup Ready Soybeans (RRS), which allow farmers to apply the broad-spectrum glyphosate-based Roundup brand herbicide to their fields without damaging soy crops. According to the USDA Economic Research Service, "the substitution enabled by genetic modifications conferring herbicide tolerance on soybeans results in glyphosate replacing other synthetic herbicides that are at least three times as toxic and that persist in the environment nearly twice as long as glyphosate." USDA Economic Research Service, *Genetically Engineered Crops: Has Adoption Reduced Pesticide Use?*, Agricultural Outlook at 17(Aug. 2000) (at www.ers.usda.gov/publications/agoutlook/aug2000/ao273f.pdf.

In addition, GMHT soybeans can be cultivated with significantly reduced tillage or plowing of farmland. Tillage is associated with various adverse environmental impacts, such as soil erosion, pesticide and fertilizer run-off (which contribute to nonpoint source water pollution), and air pollution emissions from petroleum-powered equipment. According to a study by the American Soybean Association, reduced tillage practices by U.S. soybean farmers conserved 247 million tons of topsoil and 234 million gallons of fuel in 2000.

The British government, however, recently completed extensive "farm-scale" evaluations of three GMHT crops—beet, spring-sown oilseed rape (which is used to produce canola oil), and corn—that have raised questions about the environmental effects of GMHTs. The study, which was funded by the government and conducted by an independent panel of scientists, examined the difference in the abundance of wildlife between GMHT crop fields and conventional crop fields. (The full results of the farm-scale evaluations are published as a series of scientific papers in the independent journal *The Philosophical Transactions of the Royal Society (Biological Sciences)*, and are available at www.pubs.royalsoc.ac.uk. Nontechnical summaries and related publications are available at www.defra.gov.uk/environment/gm/fse.) The study concluded that GMHT beet and spring rape inhibited the growth of weeds, wildflowers, and other plants in and around cropped fields and, therefore, provided reduced habitat for farmland wildlife (such as birds, bees, and butterflies). In contrast, the study found that GMHT corn allowed for a greater abundance of flowering weeds, which was advantageous to farmland wildlife. On the basis of this study, on March 9, 2004, British Environment Secretary Margaret Beckett endorsed commercial cultivation of GMHT corn, while opposing commercialization of GMHT beet and spring rapeseed. The British farm-scale evaluations have been criticized by proponents of biotechnology for examining only the impact of GMHT crops on weeds and farmland wildlife, as opposed to other environmental impacts such as pesticide use and toxicity, energy consumption, and soil erosion.

Apart from herbicide tolerance, the other leading trait among GM crops is pest-resistance. Crops such as corn and cotton are commonly bioengineered to contain a gene for a toxic protein found in the soil bacterium Bacillus thuringiensis (Bt) that protects plants from certain insects such as the European Corn Borer and the Cotton Boll Worm. Because Bt crops have insect resistance "built in" to their genetic material, they require less insecticide per acre of crop compared with their conventional counterparts. According to a report published by the USDA's Economic Research Service, "Adoption of Bt cotton in the Southeast significantly increased [crop] yields . . . and significantly reduced insecticide use." Economic Research Service, USDA, Agricultural Economic Report No. 786, (Jorge Fernandez-Cornejo and William D. McBride), *Genetically Engineered Crops for Pest Management in the U.S.: Farm-Level Effects*, at 3 (Apr. 2000). The USDA report also noted that yields and pesticide use would vary based on pest infestation levels and other regional factors.

Advocates of GM crops contend that the risks posed are minimal compared with the dangers of food shortages in the developing world and environmental impacts of conventional farming practices.

More recently, the U.N. Food and Agriculture Organization (FAO) released a major study that concluded that the environmental impacts of the leading GM crops have been mostly positive to date. According to the report, "Farmers are using less pesticide and are replacing toxic chemicals with less harmful ones. As a result, farm workers and water supplies are protected from poisons, and beneficial insects and birds are returning to farmers' fields." FAO Agriculture Series No. 35, *The State of Food and Agriculture 2003-04*, at 76 (2004), *at* www.fao.org/docrep/006/Y5160E/Y5160E00.HTM. With respect to particular GM crops, the report finds that insecticide use on Bt cotton is "significantly lower than on conventional varieties," resulting in "strongly positive . . . environmental outcomes," and that GMHT soybeans allow for the use of less toxic and persistent herbicides, as well as reduced tillage in many cases. *Id.* at 105. The report concludes that although the environmental and other impacts of GM crops merit continued monitoring, biotechnology has the potential to improve the sustainability of agricultural production and to enhance food security in the developing world.

In defending the widespread adoption of the leading commercial GM crops around the world, biotech supporters argue that the proof is in the genetically modified pudding. That is, sales data regarding Roundup Ready and Bt products speak volumes to their effectiveness and utility from the farmer's perspective. Farmers are, of course, free to refrain from using these technologies or to switch back to conventional seeds in subsequent seasons after trying GM crops. Adoption rates of Roundup Ready and Bt technologies by U.S. farmers, however, are among the highest on record for any agricultural innovation. An increasingly large majority of U.S. soybean and cotton farmers are now growing GM varieties. The reason for the speed and extent of this change is that GM crops provide farmers with substantial economic benefits—such as reduced pesticide costs, improved crop yields, decreased labor costs, reduced tillage requirements, decreased equipment use—nearly all of which correspond directly to environmental benefits. Given that GM crops may provide important environmental benefits, advocates of GM crops contend that the key legal and policy issue is whether existing international and domestic regulatory regimes appropriately encourage the production of GM crops that promote sustainability.

The Cartagena Protocol and the Precautionary Approach

Although international trade in GM crops and food or feed containing GMOs has been taking place for nearly a decade, an international regulatory infrastructure governing trade in biotech crops is just beginning to take effect. The Cartagena Protocol governs certain transboundary movements of GM products involving any of the ninety-seven nations that (as of April 30, 2004) are party to the protocol. The protocol, which was adopted in January 2000 under the auspices of the United Nations' Convention on Biological Diversity (Biodiversity Convention) and which entered into force in September 2003, contains a number of provisions that will have a major impact on whether trade in environmentally sustainable GM crops is encouraged or inhibited. Convention on Biological Diversity, June 5, 1992, 31 I.L.M. 818. If the protocol is implemented in a transparent, predictable, and effective manner, and if science-based risk assessment and risk management techniques are employed, properly regulated trade in GM products could provide a much-needed boost to sustainability in the agricultural sector.

Sustainable development is a fundamental unifying principle in both the Biodiversity Convention and the Cartagena Protocol. Article 1 of the convention calls upon parties to conserve biodiversity for future generations, make "sustainable use" of its components, and share equitably the benefits arising from the use of genetic resources. Likewise, Article 1 of the protocol requires parties to ensure the safe transfer, handling, and use of genetically modified organisms "that may have adverse effects on the conservation and sustainable use of biological diversity."

Although the protocol is now in effect, numerous details regarding its implementation remain to be determined, both at the international and domestic levels. The parties to the protocol met for the first time in Kuala Lumpur, Malaysia, in late February 2004 to negotiate some of those details and begin the process of clarifying and better defining some of the protocol's key terms. While several protocol provisions will likely have a significant impact on agricultural practices in the twenty-first century, the so-called precautionary approach is the aspect of the protocol that is likely to be most relevant to the sustainable development debate over GM crops.

The precautionary approach is implicated when a party makes a decision regarding the first-time import of a living modified organism (LMO) (i.e., a genetically modified organism or (GMO) that is capable of reproducing, such as GM seeds) intended for introduction to the environment. The protocol establishes an advance informed agreement (AIA) procedure intended to ensure that countries are provided with the information necessary to make informed decisions on whether to allow the import of such LMOs into their territory. AIA involves four basic components: (1) notification by the exporter of intent to export LMOs; (2) acknowledgment of receipt of the notification by the prospective importing country; (3) decision procedure regarding whether to allow the import; and (4) review of decisions, where appropriate. The purpose of this procedure is to ensure that the importing country has both the opportunity and capacity to conduct a scientific risk assessment of the LMO and its potential impact on the environment before authorizing the import.

The application of the precautionary approach in the context of decisions on first-time imports of LMOs is one of the more controversial portions of the protocol, and one of the primary means by which the protocol endeavors to promote sustainability. The protocol's language on precaution is rooted in the Rio Declaration on Environment and Development (Rio Declaration), one of the principal documents agreed upon during the 1992 United Nations Conference on Environment and Development (UNCED or Earth Summit). The Rio Declaration is available at www.unep.org/Documents/Default.asp?DocumentID=78&ArticleID=1163. The Rio Declaration contains twenty-seven principles regarding the environmental rights and responsibilities of nations. Principle 15 provides, "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

The protocol, in both its preamble and its first article, reaffirms the precautionary approach contained in Principle 15 of the Rio Declaration. In addition, Articles 10 and 11 represent the protocol's core articulation of the precautionary approach in the context of international trade in LMOs. Articles 10 and 11 provide, in relevant part:

The precautionary approach is implicated when a party makes a decision regarding the first-time import of a living modified organism intended for introduction to the environment.

> Lack of scientific certainty due to insufficient relevant scientific information and knowledge regarding the extent of the potential adverse effects of a living modified organism on the conservation and sustainable use of biological diversity in the Party of import, taking also into account risks to human health, shall not prevent that Party from taking a decision, as appropriate, with regard to the import of that living modified organism . . . [whether intended for intentional release to the environment or for direct use as food or feed, or for processing], in order to avoid or minimize such potential adverse effects.

Cartagena Protocol, arts. 10, 11.

The protocol's precautionary approach is inherently vague, which is perhaps the inevitable result of a process that required compromise between, on the one hand, parties that primarily export biotech crops and wish to expand trade in them and, on the other, those that are reluctant to embrace genetic engineering and may wish to limit their imports of GMOs. (The United States is not a party to the Convention on Biodiversity and therefore it cannot be a party to the protocol; it did, however, collaborate with a group of biotech-exporting parties during the negotiation of the protocol.) Indeed, the ambiguity inherent in the protocol's statement of precaution is one of the primary sources of confusion among parties to the protocol and the biotech industry. According to Calestous Juma of the Harvard Center for International Development, "It is evident that there is no real agreement on what the [Protocol's] precautionary principle means and how it should be applied." *See* Colin Macilwain, *Experts Question Precautionary Approach*, 407 NATURE 551 (2000), *at* www.biotech-info.net/question_PP.html.

Many biotech-importing nations have interpreted the precautionary approach to place an enormous burden of proof on the exporter. Notwithstanding the "lack of scientific certainty" phrase in Articles 10 and 11, the precautionary approach has been relied upon by some importing nations to require a degree of safety-assurance that may not be realistic given the number of variables involved and the difficulty in controlling for all of them.

The European Union, for example, has delayed the process of approving agricultural biotech products for planting or import for more than seven years. In August 2003, the United States filed a challenge to the E.U.'s *de facto* moratorium on GMO imports as an illegal trade barrier, requesting that the matter be resolved by a World Trade Organization dispute-settlement panel. The European Union's ongoing limitations on the use of GM crops could well lead to adverse environmental impacts in the European Union and around the world due to the unnecessary pesticide use, energy use, and topsoil loss that could result from continued reliance on conventional industrial agriculture, impacts that could be alleviated through increased planting of Bt and GMHT crops.

More tragically, human lives can be imperiled if food security is hampered in certain developing nations due to an overly conservative application of the precautionary approach. For example, the Government of Zambia recently rejected desperately needed food aid from the United States because the food contained GM corn. In the midst of a crisis in which some 2 million Zambians faced starvation or severe malnourishment, the Zambian government, with the support of many Zambian nongovernmental organizations (NGOs), took the position that it could not accept the GM food within its borders because it might be "poison." BBC News, *Zambia Refuses GM 'Poison,'* (Sept. 3, 2002), *at* http://news.bbc.co.uk/1/hi/world/africa/2233839.stm.

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Invoking the precautionary principle, Zambian NGOs urged their government to reject U.S. food aid because "GMO 'relief' maize raises the clear and present danger of introducing GMOs into our agricultural system, with consequences for small-scale farmers' ability to maintain their contribution to Zambia's food security, destruction of organic farming capabilities, and loss of European markets." Pete Henriot, *What Is the Impact of GMOs on Sustainable Agriculture In Zambia?* (Aug.26, 2002), *at* www.jctr.org.zm/gmos.htm. The Government of Zambia confirmed that the Cartagena Protocol—which it had not yet ratified—influenced its decision to reject the food aid. The government's position, however, may have been based more on national economic interests than any genuine fear of human health effects, as evidenced by statements regarding corn exports to the European Union as a basis for rejecting the U.S. food aid. Zambian officials expressed concerns that E.U. nations might reject such exports if Zambia could not assure its status as a "GMO-free" zone.

Zambia may have had reason to fear the economic impact of a decision to allow GM corn within its borders. Although a representative of the European Commission tried to reassure Zambia that the European Union would not ban corn imports from Zambia if the donated GM corn were milled instead of planted, the European Commission does not have complete control over decisions made by its member states on imports. Nevertheless, regardless of the motivation for its decision and the merits of the decision as a matter of economic or trade policy, the Zambian case provides an example of the harm that can be caused to human health by a rigid interpretation of the precautionary approach.

To the extent that certain GMOs have a proven track record of safety for human consumption, a fair reading of the precautionary approach would seem to *require* that such crops be approved for import expeditiously where food security is a concern. Likewise, where biotech crops are shown through scientifically sound analysis to have identifiable environmental benefits—such as reduced pesticide use and increased soil conservation—in comparison to their conventional counterparts, approval for import under the terms of the Cartagena protocol should also be encouraged. Advocates of GM crops contend that the approval and cultivation of relatively beneficial GM crops would represent both a sensible interpretation of the precautionary approach as well as a concrete way in which parties to the protocol could take action to avoid or minimize potentially adverse human health and environmental effects within their borders.

The Sustainability Implications of Other Protocol Provisions

In addition to the precautionary approach, protocol terms or provisions that will likely affect the sustainability of agricultural practices in the coming years include "capacity building," the Biosafety Clearing-House (BCH), and a possible regime regarding liability and redress. Parties to the protocol that participate in international trade in GMOs must have the capacity to implement the protocol. A principal element of such capacity is a comprehensive regulatory regime that provides a framework for conducting risk assessments, making informed decisions about approval of imports, and managing risks to avoid any potential adverse effects. In addition, countries that trade in GMOs need to have the resources, including necessary equipment and well-trained regulators, to conduct risk assessments and make the decisions contemplated by the protocol.

Article 22 of the protocol calls for parties to the protocol to cooperate in developing and strengthening the human resource and institutional capacities necessary to implement the protocol, especially in developing countries. The protocol further urges parties that already have sufficient regulatory and technical ability to contribute financial resources and transfer technology to developing countries so that they may participate, as appropriate, in international biotech trade. It is imperative that each country develop the capacity to properly regulate biotech products so that they may evaluate potentially relevant variables that may be unique to their territory (such as geography, climate, soil, and presence of wild relatives of the GM crop). Under a project launched in 2001 by the U.N. Environment Program and funded by the Global Environment Facility, $43 million has been made available to 123 countries to help them develop legal frameworks to manage LMOs. The capacity-building measures called for in the protocol will enhance sustainability because they will allow developing countries to evaluate GM crops scientifically and establish appropriate risk management regimes to minimize any potential adverse environmental impacts.

The information and transparency provided by the Biosafety Clearing-House will help ensure that any unsustainable biotech crops are denied access to the global marketplace.

Likewise, the BCH, a compendium of shared information on biotech products, could help improve sustainability by facilitating sound, scientific decision-making. Article 20 of the protocol calls for the establishment of a BCH as a repository for information regarding national legislative and regulatory requirements; the regulatory status of LMOs; risk assessments, field trials, and other scientific and technical inquiries; and points of contact for more information. The BCH will provide a lasting benefit to all stakeholders—importers, exporters, environmentalists, and industry—as it will provide greater information and transparency than exists for international trade in nearly any other class of products.

The information and transparency provided by the BCH cannot help but promote sustainability. If science-based risk assessments show that a particular GM crop poses a significant environmental threat, or if a problematic incident involving gene flow, weediness or other adverse and unintended consequence arises, then that information can be posted and disseminated to all interested parties nearly instantaneously. The BCH will help ensure that any unsustainable biotech crops are denied access to the global marketplace and the most advantageous biotech crops are used most widely. At the Kuala Lumpur meetings in February, the parties to the protocol agreed to transition from the pilot phase to the operational phase of the BCH, meaning that more data will soon be available and the BCH therefore will become an increasingly powerful tool in support of sustainability. The BCH, which has been developed primarily as an Internet-based resource, can be found at http://bch.biodiv.org.

In contrast to the protocol's capacity-building measures and the BCH, the prospect of a liability regime unique to biotechnology could inhibit environmental sustainability. During the Kuala Lumpur meetings, the parties to the protocol established a working group of legal and technical experts and charged it with elaborating, by 2007, international rules and procedures governing liability and redress for any damages resulting from trade in GMOs. Biotech advocates have questioned the need for a separate system of liability pertaining specifically to GMOs. Companies that manufacture GM crops are already liable under traditional nuisance and product liability laws for damage they may cause. Creating a liability regime specific to biotechnology would likely impede the use of environmentally sustainable GM technologies by making them more expensive and difficult to insure and implement. Given that, to date, agricultural biotechnology has not been shown to cause harms different in kind from conventional agricultural practices, a separate liability regime does not appear necessary. Moreover, to the extent such a regime might inhibit beneficial technologies from reaching the market, it could be counterproductive.

If the protocol is implemented in a transparent, predictable, and effective manner, and if science-based risk assessment and risk management standards are adopted, increased use of GM crops could provide a much-needed boost to sustainability in the agricultural sector. In particular, if the precautionary approach is applied by governments in a manner that allows for properly regulated trade in genetically improved crops, then the Cartagena Protocol may provide a gateway to a future of increased agricultural efficiency, environmental sustainability, and food security.