THE UNITED STATES AND MEXICO IN THE FACE OF SCIENTIFIC UNCERTAINTY: REGULATING GENETICALLY MODIFIED ORGANISMS[1]

*Edit Antal**

This chapter addresses the topic of biosecurity and the regulation of genetically modified organisms (GMOs) in the United States and Mexico. What we find are two different conceptions, basically involving each society's degree of access to new technologies. In the United States the conditions needed for this access clearly exist, while in Mexico experience has been mixed and, thus, there is a tendency toward the defensive. This article analyzes the two different conceptions of risk assessment in the specific case of the use of transgenic seeds, focusing particularly on the case of corn. We can suppose that the deeper the roots of the differences between the two countries —absolute, unconditional acceptance in the United States, and selective, conditional acceptance in Mexico— the more likelihood that conflicts will arise in the future. In theory, the possibility also exists that the two positions are complementary, and therefore the conclusions of this analysis propose potential mechanisms, channels and concrete areas for cooperation between the two countries.

The differences in the conception of risk assessment between the United States and Mexico occur in the context of the North American Free Trade Agreement (NAFTA), which, while it does not directly regulate GMOs, does promote the harmonization of regulatory policies in many ways. Furthermore, and ultimately, national regulations exist in a globalized world in which the primary tendencies are defined by forces like the powerful influence of biotechnology companies and international institutions, for example, the World Trade Organization (WTO) and the Convention on Biological Diversity (CBD).

To establish the origins of the two positions, we will closely examine the comprehensive decision-making process, the regulatory system and the institutions and actors involved in the process in both countries. The primary aim is to establish how independent these processes are in terms of corresponding to each country's particular social interests. A basic premise is that regulations express the interests of organized social groups and clearly reflect the prevailing dominant discourses in each society, not only with regard to science and technology, but also to the issues that have been linked to the topic of GMOs. In the United States these issues are primarily eco-

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nomic growth, international competitiveness and the right to be informed, while in Mexico, the issues are the defense of biological diversity and of economic and food security.

From a global perspective, the acceptance of transgenic foods is a highly complex matter throughout the world. The main trade controversy is a formal U.S. complaint to the WTO made in May 2003 against the European Union for its foot dragging in authorizing commerce of genetically modified products. This trade controversy was finally resolved in favor of the United States in 2006. The U.S. viewpoint is that the rejection of transgenic food is a simple protectionist trade barrier, while Europe maintains it is freely exercising its right to choose, in this case expressing mistrust for science and using precaution as its primary guide for action.

The GMO issue is also multi-dimensional, as it involves the dynamics of scientific and industrial development, the structure of agriculture, protection of the environment and the nature of the predominant political system, culture and values in each country. Comparative studies on GMO regulations abound in the specialized literature in this area; however, most of these studies are comparisons of industrialized nations like the United States and European countries, or of various European countries.[2] Studies comparing the United States with Mexico are practically non-existent, possibly because comparing entities that are too significantly different is not viewed as methodologically useful or correct, since the reasons explaining the differences in positions and the potential variables would be so numerous that it would be impossible to indicate the ones directly responsible for the differences. Consequently, this article does not intend to be a comparative study, but rather proposes to simply present both cases, analyze and explain the origins of the positions and attempt to establish possible areas for cooperation, or as the case may be, detect the especially vulnerable points for conflict.

Theoretical Framework

Several theories and methodological resources are used in this article, in particular for explaining the differences in the two countries' positions, some combined with others. Some analytical elements from international political economy are nearly always present and are combined with comparative public policy and a new analytical tendency in this type of study: discourse analysis.

A *political economics* perspective poses the question of who benefits from the new technology, and points to a detailed study of the changing relationships between market actors, biotechnology companies (usually multinationals), government reg-

[2] To mention only some of the most recent comparative studies: Aseem Prakash, "Biopolitics in the EU and the U.S.: A Race to the Bottom or Convergence to the Top?" *International Studies Quarterly*, no. 47: 617-641; Dave Toke, *The Politics of GM Food. A Comparative Study of the UK, USA and EU*. (London: Routledge, 2004); Thomas Bernauer and Erika Meins, "Technological Revolution Meets Policy and the Market: Explaining Cross-national Differences in Agricultural Biotechnology Regulation," *European Journal of Political Research*, no. 42 (2003).

ulators and in some cases, international bodies.[3] This view considers biotechnology an industrial sector that has radically modified the conventional regulatory relationship between the state and private enterprise, specifically increasing the influence of private over public. A political economics approach also helps identify and discuss the roles played by producers and consumers in agricultural biotechnology based on the principle that the interests of producers, not consumers, take the lead in establishing the rules of the game.

Comparative public policy studies include varying explanatory factors such as: environmental groups' capability for collective action, for example; the characteristics of the regulatory institutions involved in public policies; and productive sectors' organizational form.[4] In this context, reference is made to a greater capacity of nongovernmental organizations (NGOs) and the decentralization of institutions in Europe as opposed to those in the United States, and in contrast, greater integration and cohesion in the organizing of and lobbying by productive sectors in the United States, in comparison to their European counterparts.

Supporters of deliberative democracy frequently use resources from discourse analysis, understood in terms of Foucault's *dominant discourse* or Kuhn's *paradigm*.[5] The basic assumption in this case is that none of the parties in conflict have an automatic right to know and possess the truth. It is maintained that in the presence of genuine uncertainty —as is the case in the debate on transgenics— a discourse analysis is the appropriate choice for discussing issues characterized by major polarization and radical opposition. This approach is based on a critique of the positivist conception of interaction between science and politics, which assumes that the truth can only be established in relation to a particular set of values. The incorporation of categories such as values, confidence and the interpretation of information tends to transform the analysis into a socially constructivist analysis, since it is taken for granted that the interests of the actors involved are not given but, rather, constructed. The primary proposals from this approach are collective reflection on preferences and the public presentation of views involved in the conflict as tools to manage it better.

The Case of the United States

The U.S. positive vision and stance —generally considered to be positivist— regarding the use of biotechnology in agriculture has been a determining factor in international forums related to the topic of biotechnology in the WTO and Organization for

[3] See Peter Newell and Dominic Glover, "Business and Biotechnology: Regulation and the Politics of Influence," IDS Working Paper 192 (2003), published by the Institute of Development Studies, England; and Peter Newell, "Globalization and the Governance of Biotechnology," *Global Environmental Politics*, 3, 2 (May 2003), published by MIT.

[4] See Bernauer and Meins, "Technological Revolution": 642-683.

[5] See Dave Toke, *The Politics of GM Food. A Comparative Study of the UK, USA and EU* (London: Routledge, 2004).

Economic Cooperation and Development (OECD), and in the various UN forums, and it has been a pattern reproduced in other countries of the world. Other countries' decision to adopt the U.S. position on GMOs without reflecting on their own local conditions has been highly criticized, with the argument that the U.S. stance is very specific to the particular conditions in that country. Despite this sharp criticism, the immense influence exerted by biotechnology companies in the international market is undeniably an obligatory point of reference in the study of the regulation of biotechnology.

In order to establish the importance of agricultural biotechnology in the United States, it is important to clarify the dimension represented by the agricultural sector overall, which corresponds to only 2 percent of gross domestic product (GDP) and 2.4 percent of the work force. This reduced importance of agriculture in relation to the rest of the economy contrasts with the great political influence exerted by the U.S. agricultural sector, considered to be over-represented in relation to its actual weight. The area in which biotechnological seeds are planted in the United States is 42.8 million hectares, 63 percent of the world's total. Four crops are planted: corn, cotton, soybeans and canola. These crops have an estimated market value of US$27.5 billion, compared to the world total of US$44 billion in 2003-2004.[6]

Regarding agricultural biotechnology results, it is important to make a distinction between facts and intentions, the latter expressed in the commercial propaganda of the biotechnology industry. The production of biotechnological varieties in the world is very highly concentrated geographically. The United States, Argentina and Canada produce 90 percent of the total, and together with three other countries (Brazil, China and South Africa), they produce 99 percent of all the world's GMOs.[7] Despite the long list of countries mentioned in promotional documents as those using this technology, the reality is that the current agricultural biotechnology industry is concentrated in only six countries, and there are only four major products involved.[8] Despite the industry's big promises to create more nutritious products that are more resistant to various soil conditions and extreme climates, to date, only two traits have been commercialized on a large scale around the world: tolerance to herbicides and resistance to insects, which turns the plant into an insecticide (the two traits are used individually or in combination).[9]

In the United States, the product we are the most interested in here, corn, is grown on 28.8 million hectares, with a production of 256.9 million tons, 40 per-

[6] C. Ford Runge and Barry Ryan, *The Global Diffusion of Plant Biotechnology. International Adoption and Research in 2004*, University of Minnesota, 6, at http://www.apec.umn.edu/faculty/frunge /globalbiotech04.pdf, accessed June 28, 2007.

[7] Pew Initiative on Food and Biotechnology, "Genetically Modified Crops in the United States" (2004), at http://pewagbiotech.org.

[8] Soybeans, corn, canola and cotton.

[9] Ann Clark, "Has Ag Biotech Lived Up to Its Promise?" (2004), at http://www.plant.uoguelph.ca/research/homepages/eclark.

cent of which corresponds to biotechnological varieties with a total estimated market value of US$10.3 billion.[10]

Regulation

Initially, in the 1980s, there was disagreement in both the United States and Europe as to whether the use of GMOs should be regulated on the basis of the product or the process through which the product is obtained. The U.S. quickly opted for product-oriented regulation, while Europe chose to use the process as the basis for assessment. These decisions had profound implications, since they established the foundations for two completely opposing philosophies for risk assessment that are currently dividing the world.

The option of product-based risk assessment meant nothing less than assuming that in the use of techniques for genetic modification, there is nothing new to regulate since the resulting agricultural product is essentially the same as that obtained through the traditional method. The alternative, chosen by Europe, with regulation based on the process whereby the product is obtained, implies the acknowledgement of a new type of risk potential generated precisely by the use of a new technology, and consequently, the establishment of a single, specific procedure for regulating GMOs, involving its own legislation in the area of biosecurity.

In the United States, government agencies involved in making the decision were initially divided: on the one hand, the Environmental Protection Agency (EPA) was in favor of the process-based method, while the Department of Agriculture (USDA), the Food and Drug Administration (FDA) and the White House Office on Science and Technology Policy (OSTP) were in favor of the product-based method.[11] The division between government agencies was due to the fact that the process-based orientation, defended by the EPA, involved a commitment to greater environmental sensitivity in evaluating the risks of GMOs, in addition to health-related risks.

It is important to note that in 1986, when the decision was made by the Reagan administration —which incidentally was in favor of deregulation— the EPA was virtually deprived of its authority, basically due to its being unanimously, insistently rejected by the biotechnology industry. Finally, a working group created by the president's office, including participation by 15 agencies, plus active intervention by Congress and public scrutiny, issued a document called the "Coordinated Framework for Regulation of Biotechnology," which clearly established the option in favor of the product-based method. From that time on, it was clear that according to the United States, GMOs should not be viewed as something that in and of themselves could represent a risk for health and the environment. Responsibility for GMOs, consequently, rested with the same agencies that had performed the

[10] Ibid.

[11] S. Jasanoff, "Product, Process or Programme: Three Cultures of Regulation of Biotechnology," in M. Bauer, ed., *Resistance to New Technology* (Cambridge: Cambridge University Press, 1995).

function of inspecting products in the past, specifically the EPA, USDA and FDA, originally created for conventional agriculture.

Throughout the 1990s, this procedure was simplified even more, to the extent that the FDA principle known as GRAS or "generally recognized as safe" has been assumed and institutionalized. This principle opened the way for biotechnology companies to self-regulate their own products, since the approval, or rather, the acknowledgement of the FDA, was based on consultations with the manufacturers, which provided a summary of tests carried out with the product.[12] The objective of the regulation was to diminish and simplify any potential burden and avoid anything that could complicate the process and impede progress in the new technology.

The concept of *familiarity* was created as the environmental counterpart to the concept of *substantial equivalence* for health. This concept has been widely debated, and it is not yet very clear exactly what it means. Its most controversial aspect involves defining what is comparable in ecological terms, and what is meant exactly by the notion of an element being sufficiently comparable with another within an ecosystem.[13] The most important practical implication of the concept of familiarity is that in the United States the environmental impact of GMOs is reduced to a simple notification that can be made in a period of up to 30 days.

During the years after the adoption of the document establishing the general rules, the EPA still tried to resist and introduce evidence in the defense of environmental protection. In 1994, it requested that pest-resistant transgenic varieties be treated as pesticides; however, although it was backed by the National Academy of Science, the proposal was rejected, since it was considered to represent an inclination toward process-based regulation.[14] In 1999, after a research report on the effect of Bt corn on Monarch butterflies, there were public debates once again about the need to exercise greater environmental control over GM seeds. The result was that the EPA asked corn producers to alternate buffer zones of conventional corn with transgenic corn fields.

In line with the logic that a transgenic product is substantially equivalent to a conventional product, labeling represents no significant problems, since there is no need for any additional information about a food product in terms of its composition and nutritional and safety factors. In order for a GM product to be accepted, it is not necessary to introduce a new label or present any scientific evidence, except in cases in which some commonly allergenic substance is added to the product through biotechnology.

However, labeling came under public scrutiny in 1998-1999. At that time, surveys indicated that approximately 80 to 90 percent of the population was in favor of mandatory labeling; however, the same reports also revealed that U.S. citizens'

[12] Bernauer and Meins, "Technological Revolution."
[13] Jan-Peter Nap et al., "The Release of Genetically Modified Crops into the Environment," *The Plant Journal* 33 (2003): 1-18.
[14] Ibid.: 9.

interest and concern about transgenic foods were not particularly strong.[15] In any case, NGOs launched various political initiatives for introducing mandatory labeling, which they presented to the Senate and the House of Representatives. Two bills promoting the labeling of transgenics were presented, plus two others for safety testing; in addition, NGOs filed court cases. The FDA has held public hearings on the need for labeling and stricter testing; however, only moderate results have been obtained: for example, making consultations mandatory and introducing voluntary labeling, a mechanism similar to that implemented for organic products. However, these results in no way questioned the approach of product-oriented assessment. Since then, discussion on the labeling issue has been passed to the state level.

The controversy over GM StarLink corn (which had a serious impact on trade, since it produced a temporary collapse in U.S. corn exports, due to the drop in the market in Japan, Korea and Europe) also failed to provoke radical changes in regulations. Even though Japan cut U.S. corn imports in half, and Korea totally banned them, U.S. producers did not rush to substantially modify their perception of the risks involved in transgenics; instead, their priorities focused on the high costs of segregation and of preserving the identity of the origin of corn.

In summary, GMO regulation in the United States is exclusively product-oriented and is based on a lack of distinction between conventional and transgenic products. Consequently, there are no specific regulations for GMOs, and the laws and procedures for already-existing institutions, primarily the FDA and the USDA, are the ones implemented.[16] The EPA has attempted several times to expand the spectrum of risks evaluated; however, modifications to the process have been minimal. The great majority of U.S. society pays little attention to transgenic foods, and at the federal level, the concern only materializes into support for voluntary labeling. The GMO issue is not very politicized, and thus does not capture the attention of NGOs, members of Congress or political parties.

Actors

To explain the reasons for this permissive policy toward GMOs in the United States, we will apply two approaches mentioned in our introduction: the political economics approach to the nature of the actors involved, and the discourse approach. Both analyses complement and strengthen each other and lead to a single explanation.

The organized actors most interested in the GMO issue are the companies dedicated to agricultural biotechnology, plus producers, environmental NGOs and

[15] Center for Science in the Public Interest, *Food Labeling for the 21st Century. A Global Agenda for Action* (Washington, D.C.: Center for the Public Interest, 1998).

[16] The laws used for addressing transgenics are primarily: the Federal Plant Pest Act, the Federal Plant Quarantine Act and the Federal Insecticide, Fungicide and Rodenticide Act.

consumer groups. In the United States a strong, broad-based coalition has been formed to promote biotechnology, including the generators of technology, the seed-producing industry and agricultural export producers. Meanwhile, environmental NGOs and consumer groups, which are relatively weak, lobby against certain applications of biotechnology.

The coalition of actors in favor of biotechnology is very well organized and led by large agro-biotechnology companies that participate very actively in regulation. The generators of biotechnology have been on the receiving end of major governmental funds and large amounts of risk capital and have also benefited from close cooperation with universities.[17] For the purpose of recuperating enormous investments in scientific research and product development, this coalition intervenes in all matters relative to regulation, in order to achieve the formula most favorable to its interests. These companies are organized into a single association, the Biotechnology Industry Organization (BIO), while plant biotechnology companies are organized in the American Seed Trade Association (ASTA). In an attempt to strengthen even further the role played by these associations, the primary large companies like Monsanto, DuPont and Aventis tend to be even individually involved in the regulatory process.

BIO's immense capacity for collective action can be explained by the similarity of interests among its members, plus its scientific experience and the financial support it receives from large biotechnology companies. The BIO has sufficient resources and plans focusing on improving public acceptance of transgenic foods. It has an annual budget of US$50 million, and approximately US$250 million for the next three to five years.[18]

The scholars who study these companies frequently criticize the close ties — even personal ones— between BIO officials and regulating institutions, primarily the FDA. Many BIO officers are former government officials and the revolving door policy has been broadly documented, indicating the essence of the influence peddling between companies and government agencies, the FDA and the EPA.[19] Former officials have publicly declared that regulating agencies tend to do exactly what agro-biotechnology companies ask them to do.[20]

[17] Public financing of agricultural biotechnology in the United States remains very unclear. It is known that most financing is from private capital; however, the amount is confidential. Estimates suggest that developing a product requires approximately 10 years and costs about US$300 million. Since USDA spending for researching biotechnological plants does not appear in its budget under a separate category, the amount in this regard is unknown. Source: CRS Report for Congress, *Food Biotechnology in the United States: Science, Regulation, and Issues* (Washington, D.C.: Congressional Research Service/The Library of Congress, 2001), 25.

[18] Bernauer and Meins, "Technological Revolution": 668.

[19] Many published works reveal and criticize this close relationship, including: E. Moore, *Science, Internationalization and Policy Networks Regulating Genetically Engineered Food Crops in Canada and the United States, 1973-1998,* dissertation, University of Toronto, Political Sciences Department; W.T. Gormley, "Regulatory Issue Networks in a Federal System," *Polity*, vol. 18, no. 4 (Summer, 1986): 595-620; Helena Paul, Ricarda Steinbrecher, Luchy Michaels and Devlin Kuyek, *Hungry Corporations. Transnational Biotech Companies Colonize the Food Chain* (London: Zed Books, 2003).

[20] *The New York Times*, January 25, 2001.

Another criticism of regulations is the lack of independent investigation. The U.S. government has allowed biotechnology companies to be the ones to provide the required scientific information and even to implement security measures, precisely because it has failed in conducting its own studies and in financing independent investigation on the safety of GMO products.[21]

From the beginning, U.S. farmers have been very open to planting transgenic seeds, and this type of production has increased rapidly. A third of corn and more than 70 percent of soybeans produced are transgenic. The original promise from the agro-biotechnology industry was that one of the greatest benefits of transgenic crops would be higher yields that would lead to increased benefits for producers. Nevertheless, after 10 years of experience in commercial planting of transgenic crops since 1995-1996, the panorama in terms of benefits for farmers is currently mixed, if not negative.

In fact, the benefits for producers have not been those expected, and three factors (yields, the use of chemicals and low market prices) have played a part. Studies have proven that in the case of GM soybeans, yields have been between 5 and 10 percent lower on average than when conventional seeds are used.[22] Another promise from the industry was that less use of pesticides would be required; however, field studies demonstrate that even though during the first years of planting GMO crops fewer chemicals were actually used, the tendency toward decreasing use was not maintained during the following years.[23] Even USDA studies confirm that yields are not consistently higher than in the case of conventional seeds, except in the case of cotton.[24] There is another intervening factor in the calculation of benefits derived from products from GM seeds, specifically subsidies, the effects of which are under discussion. An analysis of agricultural subsidies is not the topic of this article, and it is therefore sufficient to mention here that the effects from technology and from subsidies are not considered separately, and this impedes arriving at precise calculations. For example, large producers believe they benefit from the new technology, although by a small margin; however, this benefit necessarily includes a large amount of subsidies they receive from public coffers.

Producers' attitudes and perceptions of benefits also depend on the amount of land they farm: specifically, large and medium-sized producers adopt the new technology more easily. Therefore, large producers tend to favor flexible rules, while small farmers tend to support stricter rules and mandatory labeling, in order to benefit

[21] Takahashi, Kelso, Dennis Doyle and Rachel A. Schurman, *Engineering Trouble: Biotechnology and Its Discontent* (Berkeley, CA: University of California Press, 2003), 243-245.

[22] C.M. Benbrook, *Troubled Times Amid Commercial Success for Roundup Ready Soybeans*, technical paper no. 4. Sandpoint, Idaho: Northwest Science and Environmental Policy Center (2001), at http://www.biotech-info.net/troubledtimesfinal-exsum.pdf; and M.A. Martinez-Ghersa et al., "Concerns a Weed Scientist Might Have about Herbicide-tolerant Crops: a Revisitation," *Weed Technology* no. 17 (2003): 202-210.

[23] J. Fernandez–Cornejo and W.D. McBride, *Adoption of Bioengineered Crops*, ERS Agricultural Economic Report No. AER810 (2002), cited in Ann Clark (2004): 12.

[24] J. Foster, *The Causes, Costs, and Benefits of Regulatory Diversity*, MIT, cited in Bernauer and Meins: 669.

from the separation of GM and conventional foods. The largest federation of farmers, the American Farm Bureau Federation (AFBF), which basically represents large producers, supports the FDA position on labeling, while the network of small producers, the National Family Farm Coalition (NFFC), is highly critical of the regulating agencies' permissive policies and advocates mandatory labeling.

Two other organizations, the American Soybean Association (ASA), and the National Corn Growers Association (NCGA), which represent export farmers, tend to demand regulations that are even more relaxed than those promoted by the AFBF. In contrast, the American Corn Growers Association (ACGA), which represents small producers, recommends mandatory labeling and strict approval policies in accordance with consumer rights, in other words, with the right for consumers to know what they are eating. Producer groups oriented toward the domestic market are generally not opposed to GMOs; however, they tend to advocate stricter regulations.

To summarize the behavior of farmers regarding GMOs, it is important to state that they are not homogeneous. Farmers' interests and positions vary according to the size of their production, and whether it is for export or domestic consumption. The fragmentation of this sector, of course, limits its capacity for collective action: large export-oriented producers build alliances with the biotechnology industry, while small producers, highly fragmented among themselves, are focused on specific issues, and have only recently started to become more involved in the matter of GMO crops and to build alliances with environmental NGOs and consumer groups.

The huge processed food industry, represented by the Grocery Manufacturers of America (GMA) and the National Food Processors Association (NFPA), constitutes another important U.S. interest group. It has basically been in favor of GMOs; however, recently, its initial enthusiasm for the new technology has been fading, since to date it has not received any clear, direct benefits. The biotechnology industry has announced major improvements in its products for the direct benefit of consumers, in terms of nutrition and human health, however these promises have not been fulfilled. In contrast, processors and retailers, especially those dedicated to organic food, support mandatory labeling and more rigorous regulations and are lobbying in conjunction with consumer groups.[25]

Environmental groups have carried out campaigns against GMOs and have explicitly asked some food processing companies to eliminate the use of GMOs in the products they offer. In response, a number of major companies have reduced or eliminated the use of genetically modified agricultural products. These companies include Gerber, Heinz, McDonalds, McCain Foods, Frito-Lay, IAMS, Whole Food Market, Wild Oats Markets and Seagram. As a result of the StarLink corn controversy, the Archer Daniels Midland company, which commercializes a third of the grains (corn, soybeans and wheat) in the United States, requested the major grain elevators to separate GMOs from other products; and other processing companies like ConAgra and Cargill have already initiated this separation. The

[25] With groups such as the Consumers Union, Center for Food Safety and Alliance for Bio-Integrity.

measures taken by companies are promising; however, so far they have not been sufficient to provoke significant changes in the regulation of biotechnology.

The social actors (environmental and consumer groups) have been lobbying around GMO-related issues since the end of the 1990s. In comparison to European countries, for example, the approval process within the U.S. decision-making system is much more open to public consultation and NGO intervention.

In the United States, the proportion of NGOs opposed to GMOs is very low, and the radical groups tend to be very small. One of the outstanding radical groups is Jeremy Rifkin's Foundation on Economic Trends, due to the great influence it has exerted in campaigns against biotechnology around the world. Nevertheless, the immense majority of the relatively few NGOs active in the area of biotechnology hold moderate positions, and even though they advocate mandatory labeling, they absolutely do not question the usefulness and safety of genetically modified organisms. The Environmental Defense Fund (EDF) and the Union of Concerned Scientists (UCS) are good examples for illustrating critical but positive attitudes toward biotechnology. The groups that organized to defend public interests, such as the Center for Science in the Public Interest (CSPI), also tend to support GMOs.

NGO activities are basically lobbying politicians regarding points of debate that generally revolve around scientific arguments, and they also bring legal suits against regulatory agencies and biotechnology companies. Any direct action is insignificant. It may sound a bit inconsistent, but both the moderate criticism as well as lobbying in favor of mandatory labeling carried out by the large NGOs clearly express the somewhat contradictory trend in U.S. public opinion: on the one hand, in favor of GMOs, and on the other, defending the right to choose.[26]

The case of StarLink corn, which contains a protein that may cause allergies, illustrates very well interest groups and regulators' limited capacity to address the denunciation of imminent risks from transgenic foods. Although this corn variety had not been approved for human consumption, it was detected in food products in 2000. The discovery revealed two facts: producers' inability to segregate conventional corn from GM corn and the ineffectiveness of the so-called buffer zones in avoiding cross-pollination. On that occasion, farmers and those commercializing the corn had to pay a high price: withdrawing the product from the market and carrying out the necessary scientific tests. In addition, divisions emerged in the coalition with regard to the payment of compensations. A number of NGOs have used this issue to their advantage, launching new campaigns against current regulations.[27] However, since U.S. regulation of agricultural biotechnology is highly centralized and the industry holds the key to accessing the system, NGOs have been unable to modify the regulatory process.

[26] In 1998, 70 percent of U.S. citizens expressed a positive opinion. Source: G. Gaskell and M.W. Bauer, eds., *Biotechnology. The Making of a Global Controversy* (Cambridge: Cambridge University Press, 2002).

[27] Greenpeace, Friends of the Earth, Organic Consumer Association, Genetically Modified Food Alert, etc.

Nevertheless, the increasing commercial rejection of GMOs in international markets and the resulting introduction of voluntary standards are factors that tend to spark attitude changes in large corporations, which are reorienting their investments from food to the production of medications and materials with fewer risks.[28] As mentioned here, some large and many small food-distributing companies have already changed their activity profile in favor of GMO-free products.

Dominant Discourses

1. *Science and technology as promoters of development and economic growth*
The tendency to believe that science and technology are necessarily good and are the primary sources of economic growth —which ultimately leads to the well-being of the population and the world— has played a vital role in the assessment of GMOs in the United States. The socialization and institutionalization of this discourse there have significantly contributed to a situation wherein ignorance, scientific uncertainty and the lack of knowledge are translated into something considered natural and not very important. Long-term risks (those not yet evident or immediately subject to being quantitatively expressed) are extremely difficult to understand and to consider in the process of making decisions regarding GMOs.

The phenomena that present the greatest risks for ecosystems in the long term have not yet been sufficiently studied, such as, for example, the consequences of cross-pollination, genetic flows and an interruption in the cellular ecology of plants. Due to the adoption of the *substantial equivalence* principle applied to human health, and *familiarity* applied to ecology, this type of risk, even when the object of intense, scientific controversy, is simply not considered in GMO regulation in the United States.

Because of the one-dimensional, unquestionable discourse of science, a series of factors in the U.S.-type regulatory system that negatively influence the economy and ecology are ignored. The costs —both economic and ecological costs, which frequently go together— of this excessive regulatory flexibility can be very high. To illustrate this point, a good example is the price of what are known as superweeds. The generation of herbicide-tolerant super-weeds which arose, for example, in the case of GM canola, resulted in the need to us increasing amounts of chemicals in agriculture. This not only affects the ecosystem and biodiversity, but also completely eliminates the economic utility of GMO.[29]

2. *Public interest is substantially equivalent to private interests*
For a long time, policies on biotechnology were not the object of public debate in the United States. The issue was limited to the scientific community, companies

[28] Lisa N. Mills, "Terminating Agricultural Biotechnology? Hard Law, Voluntary Measures, and the Life Sciences Industry," in J. Kirton and M. Trebilcock, eds., *Hard Choices, Soft Law* (Burlington: Ashgate, 2004), 329-346.
[29] CRS Report, *Food Biotechnology*, 22.

and regulatory institutions. The common good as a concept was not conceived as something counter to the sum of public interests, as is the case, for example, in Europe.

Only later was the issue publicly discussed, and only when it became an issue relevant to human health, a religious matter,[30] something with economic impact, or relevant to international trade competition. Environmental risks, especially long-term ones, were generally not taken into consideration, and at any rate, they were subordinated to economic interests. The issue of risks inherent in science and technology did not, on its own, constitute an object of public debate, but rather a topic reserved for a limited circle of experts who typically work for private interests.

Labeling has been the object of public debate. However, consumer rights and the government's responsibility to inform society were blurred, and private interests won over such factors. It is interesting to observe that the food industry's argument was that the eventual introduction of a label stating that a product "contains GMOs" could be misunderstood, and interpreted as a warning and even a suggestion that the product was less healthy or less nutritious than a conventional food product. Those opposing labeling defended their position by arguing that FDA guidelines establish that labels should be free from values.

3. Free market and self-regulation

In the name of the free market principle, it is perfectly accepted in the United States that the government is not responsible for regulating the market, and instead, its responsibility is limited to assuring that the products circulating are safe. In other words, no type of permission is required for a product to be sold. The key concept in regulation is "safety," as a strictly technical term, and not "security," a term that involves a broader, social consideration.[31]

The main question posed by companies' quasi-self-regulation is whether it is possible to reconcile, to the benefit of society, corporations' primary objective, which is to make money, and governments' primary objective, which is to serve the people.

One of the most discussed issues in this regard is establishing liability for damages caused by GMOs. Since these potential damages are not incorporated into the U.S. regulatory system, it is difficult to establish who will be held responsible, and ultimately, who will pay when, for example, a harvest is ruined due to cross-pollination with new weeds. So far, companies have not been able to find a legal solution to this problem and have even attempted to offer technological answers to this legal problem. This is the case in justifying the acceptance of terminator seeds, which do not reproduce themselves, as a solution to put an end, once and for all, to the matter of responsibility. This suggestion is equivalent to offering a technological solution —which furthermore, is very costly, and ultimately will be

[30] The case of whether food is kosher or *halal* when a gene from an animal prohibited by a certain religion is transplanted in a plant that is the basis for a food product. Ibid., 19.

[31] In English the term "safety" is used, while the term used in Spanish is "seguridad," which has a different conceptual connotation.

paid for by the taxpayers— for a problem that is legal in nature, since companies are attempting to avoid being sued for compensation.[32]

The Case of Mexico

In Mexico, political controversy around transgenic corn has been especially sharp since 2001, when the discovery of transgenic sequences in traditional corn varieties —a phenomenon known in Mexico as the contamination of corn— became public. The most likely source of this contamination was corn imported from the United States. The fact that the Mexican public identifies regulating GMOs with what has happened for a single crop, corn, to a large extent determines its perception of the issue.

Corn is a basic food in Mexico, where it is consumed in unquestionably greater amounts than in the United States. Corn is intimately linked to the ancient culture of Meso-America, and throughout history has become one of the symbols of Mexican nationalism and is particularly significant for the indigenous population. Mexico is the place where cultivated corn was developed from its wild relative, *teozinte*. Corn has been grown in Mexico for at least 5,000 or up to 8,000 years, and dozens of local corn varieties, known as *criollo* varieties, proliferate in the countryside.

To understand the significance of this issue for Mexican society, it is important to point out that while in 1995 agriculture only generated 5 percent of GDP, it employed 22.4 percent of wage earners, a very significant part. This fact alone has the potential to turn the topic of agriculture into a highly sensitive issue susceptible to politization. With NAFTA, this picture has become even more distorted: in 2004, agriculture only generated 3.5 percent of GDP, but still employed 20.3 percent of wage earners.[33] Furthermore, even nowadays, between 3.1 and 3.3 million *campesinos* grow corn, and the very livelihood of 12.5 million people in the countryside depends on this activity, which corresponds to 55.2 percent of the nation's agricultural production.[34] An estimated 2.1 million *campesinos* are still subsistence farmers, representing between 44 and 55 percent of total production.[35]

In terms of productivity, the asymmetries among the three NAFTA countries were —and still are— very marked: between 1997 and 2001, 2.4 tons of corn were har-

[32] Jeremy de Beer, "The Rights and Responsibilities of GMO Patent Owners" (paper, "The Right to Food at the Nexus of Trade and Technology" conference, University of Ottawa, Ontario, October 15, 2005).

[33] Data on employment and participation in GDP were obtained by Marcela Osnaya. Other information, Instituto Nacional de Estadística, Geografía e Informática (INEGI), Sistema de Cuentas Nacionales de México, Cuenta de Bienes y Servicios, http://www.inegi.gob.mx/est/contenidos/espanol/rutinas/apt.asp?t=cuna12&c=6614 (April 2008).

[34] Sergio R. Márquez Berber, Alma Velia Ayala Garay, Rita Schwentesius Rindermann and Gustavo Almaguer Vargas, "El maíz en México ante la apertura comercial," *Extensión al campo*, no. 3, Universidad Autónoma de Chapingo (March 2007): 5-7.

[35] Ibid.

vested per hectare in Mexico, as opposed to 8.4 in the U.S. and 7.3 in Canada. Per worker employed, the gap is even larger: in 2001 the net value of agricultural production was US$3,758.90, while in the U.S. it was US$67,871.30 and in Canada it was US$54,081.60.[36]

In Mexico discussion around GMOs has taken place in a context that is completely different from that of the United States. It has been linked to the effects of NAFTA and the opening of the agricultural sector in general. Both are considered intrinsically linked to the loss of food sovereignty and the fate of the *campesino* sector.

Effects of NAFTA have varied according to sector. Since agricultural production multiplied by 1.5 at the same time that workers' pay dropped by 50 percent, sector-based data reveals large-scale impoverishment of the rural population, and the concentration of income in the hands of a few.[37] Producers of grains like rice, beans, corn, sorghum and wheat were the primary victims of the market opening, which endangered the survival of 2.3 million corn producers with parcels of land smaller than five hectares.[38] Since the commercial opening of the sector, initiated before NAFTA, the price of corn has dropped by a total of 48 percent.[39] Despite these adverse market conditions, surprisingly, corn production has been maintained, and according to some studies, has even increased, since many small producers of other displaced products have taken refuge in corn production to guarantee their survival.

In terms of experience with agricultural biotechnology, it is important to know that Mexico is currently not a large-scale generator, and thus not a commercial producer, of transgenic seeds. It is true that small areas are planted with genetically modified soybeans and Bt cotton,[40] since between 1995 and 1998 a number of genetically modified tomato, cotton and soybean varieties were authorized.[41] At least 33 field tests have been conducted with a series of GM seeds, generally under contract from multinational corporations. The country has an estimated medium-level scientific capacity for a developing country, meaning that it has approximately 100 scientists specialized in GMOs distributed throughout a number of private and public institutions, with a total community of 800 biotechnologists.

An important factor that makes Mexico's situation different from that of the United States is its great biodiversity. Mexico is a mega-diverse country, and the original birthplace not only of corn but also of 80 other species. The protection

[36] José Luis Calva, "Ajuste estructural y el TLCAN: efectos en la agricultura mexicana y reflexiones sobre el ALCA," *El Cotidiano*, vol. 19, no. 124 (2004): 17.

[37] Víctor M. Quintana, "La insoportable falta de equidad en la agricultura," *La Jornada* (May 14, 2005). The author quotes the Ministry of Agriculture (SAGARPA) report *El ingreso rural y la producción agropecuaria en México (1989-2002)* based on INEGI data.

[38] Ramón Vera Herrera, *En defensa del maíz (y el futuro). Una autogestión invisible*, Interhemispheric Resource Center (2004), at www.americaspolicy.org.

[39] Edit Antal, "Who Should Tell Me What to Eat?" *Voices of Mexico*, no. 68 (July-September 2004): 113-117.

[40] GM soybeans have been planted since 1996, the same year as in the United States. A third of cotton planted is GM cotton.

[41] Runge and Ryan, *Global Diffusion*.

of its biodiversity is not only an aim of national policies, but also international policies developed in the Convention on Biological Diversity (CBD). Mexico is the only country in North America that has ratified the Cartagena Protocol, which establishes the international rules of the game for the conservation of the world's biological diversity.[42]

Regulation

The National Committee for Agricultural Biosecurity (CNBA), the first body dedicated to the evaluation of transgenics in Mexico, in collaboration with an international public research center, the International Center for the Improvement of Maize and Wheat (CIMMYT), already expressed concern in 1995 over the potential negative effects that Bt corn imported from the U.S. could have on Mexico's rural areas and environment. Consequently, in 1998, planting transgenic corn was prohibited in Mexico, and the expectation was that imported corn would be used exclusively for consumption. From this initial radical position, the Mexican government's attitude has changed, going through a period of lack of definition, to the current active promotion of the introduction of GMOs under the conditions set out in the Biosecurity Law. Without a doubt, these changes, added to the government's lack of transparency and consistency, sparked mistrust and encouraged doubts regarding genetically modified organisms.

The crossing of biotechnological corn varieties and native corn varieties was totally predictable, since non-segregated corn arrived in Mexico from the United States in increasing amounts. Even in these conditions, despite constant insistence by scientists and rural communities, the Mexican government has never made the decision to request segregation or the introduction of labeling for corn from the United States.

In 2001, *Nature* magazine published an article about the discovery of transgenic DNA sequences in *criollo* corn varieties in the Mexican states of Puebla and Oaxaca.[43] This seriously compromised the Mexican government, clearly revealing its inability to implement its own policy of prohibiting the planting of transgenic corn. The case of the contamination of Mexico's corn immediately became a global issue, and even the popular *Newsweek* magazine placed the issue on its cover. It is interesting to observe that while the article in *Nature*, a recognized scientific magazine, referred to the phenomenon discovered as an "introgression," the communications media immediately interpreted it as a matter of contamination with an obviously negative connotation.

[42] Miguel Altieri, "The Myth of Coexistence: Why Transgenic Crops Are Not Compatible with Agroecologically Based Systems of Production," *Bulletin of Science, Technology & Society*, vol. 25, no. 4 (2005): 361-371. The case of canola in Canada seems to be a good example for demonstrating that, in the long run, it is not possible to cultivate both varieties in the same place.

[43] David Quist and Ignacio Chapela, "Transgenic DNA Introgressed into Traditional Maize Landraces in Oaxaca and Puebla," *Nature*, vol. 414, no. 29 (November 2001).

It is important to point out that for now, scientists have not reached any consensus, and there is insufficient empirical data for evaluating the effects of crossed pollination or the concrete meaning of genetic flow. What is specifically unknown is the degree of spreading and permanence of transgenes in the environment, precisely what was denounced in the *Nature* magazine. Under these conditions, it is believed the most appropriate action is to assume there is a lack of information and that decisions should be postponed until research provides the necessary data for making them.

Since 2002, a national campaign has been underway in the defense of native, locally selected corn, with the participation of 120 organizations, rural communities, NGOs, scientists and distinguished individuals. From this campaign, called "Without corn, there's no country," a political slogan emerged, with the demand for putting an end to corn imports, plus the payment of compensation to *campesinos* who plant traditional corn, in acknowledgement of their efforts to conserve biodiversity.

By that time, after having dismantled production capacity based on a complex system of subsidies, satisfying the first demand was no longer easy, as Mexico depended on an average of 7 million tons of imported corn, mostly for fodder. The second demand was inspired by a suggestion from the Convention on Biological Diversity, but Mexico had not, and has yet to translate this into concrete rules and established policies.

The Mexican incident, interpreted as the contamination of Mexican corn, was also added to the agenda of global networks organized against free trade.[44] In 2002, the issue was denounced at international protest forums: the World Social Forum in Porto Alegre against globalization, and the Food Summit in Rome, where it was presented by the Vía Campesina international movement, a radical NGO that demands food sovereignty and the rights of farmers to collect, save, select and improve their corn.

Later, the Mexican government hesitated to state its opinion on the phenomenon and was ambiguous, going from denying the contamination to considering it an irreversible fact of life. Meanwhile, international bodies such as the Food and Agriculture Organization (FAO), CIMMYT[45] and the Consulting Group on International Agricultural Research (CGIAR) initially attempted to avoid making a statement on the issue, and later expressed support for the use of GMOs. Some government agencies such as the Ministry of Agriculture, Livestock, Rural Development, Fishing and Food (Sagarpa), as well as multinational corporations, the Inter-sector Commission on Biodiversity and Genetically Modified Organisms (CIBIOGEM), plus distinguished individuals from Mexico's scientific community argued that one cannot speak of contamination, but rather of a natural genetic flow. Even *Nature* magazine published another article denying the discovery, and at the same time, refused

[44] Represented by groups such as Greenpeace, ETC, GRAIN, Vía Campesina, etc.

[45] The public position taken by the CIMMYT was very important, since it had the world's largest public bank of corn genes.

to publish an article from the Mexican government agency, the National Institute of Ecology (INE), criticizing the ideological content of the second article published.

By the year 2003, *campesino* communities, the radical environmental NGOs and Mexican government agencies were clearly distanced from each other. The rural communities, with support from scientists in opposition, began to speak of self-management. This implied taking steps in their own communities, such as introducing a *de facto* moratorium on GMOs, which would mean the prohibition of introducing, planting or purchasing GMOs from government DICONSA stores.[46] Disinformation and confusion around the nature of GMOs have led *campesino* and indigenous groups, such as UNOSJO of the Sierra de Juárez and many others, to decide to conduct their own diagnostic assessment of the contamination of their corn.[47]

At another level, the government had to continue with its international commitments. In the midst of the conflict, it was necessary to reach an agreement with the United States and Canada regarding shipments of GM corn. Mexico agreed to not request compensation when the corn received contained less than 5 percent GMOs, or when the contamination was unintentional —which in practice would probably mean it would never make such a request. In the opinion of GMO opponents, this agreement failed to comply with the Cartagena Protocol, which demanded including compensation for damages caused, and sparked a protest by 300 NGOS at the international level.

Parallel to these societal actions, the legislature passed the Law on the Biosecurity of Genetically Modified Organisms (LBOGM) in December 2004, despite the opposition of one major political party, the Party of the Democratic Revolution (PRD), and one small one, the Green Party of Mexico (PVEM).[48] Beforehand, different political parties made eight different proposals for the Law on Biosecurity, specifically the National Action Party (PAN), the Institutional Revolutionary Party (PRI), the PVEM and the PRD. The bill that ultimately passed was designed by the Mexican Academy of Sciences (ACM) and discussed over a three-year period. This law defines the faculties of the Ministries of the Environment and Natural Resources (Semarnat), Agriculture (Sagarpa) and Health (SS), on the basis of scientific evidence and case-by-case risk assessment studies. The text of the law suggests using the precautionary principle and establishing reasonable doubt in the absence of studies, and when there is any doubt about risks to human health or to the environment. However, it does not include mechanisms for implementation.

The law creates a system of permits for experimenting and doing business with GMOs. It has met with mixed reactions by specialists both inside and outside of Mexico. Many critics of the law agree that it promotes the biotechnology industry more

[46] Vera Herrera, *En defensa del maíz*.

[47] In a study of 138 communities in nine states, contamination was found in 33 of them, and even a third type of GMO was found. Not only were herbicide-tolerant corn and Bt insecticide corn found, but StarLink corn, which has not been authorized for human consumption in the United States, was also detected.

[48] *Ley sobre Bioseguridad de Organismos Genéticamente Modificados* (2005), http://www.senado.gob.mx/sgsp/gaceta?sesion=2005/02/15/1&documento=25.

than it protects biodiversity. In fact, this led to a formal protest by a group of 100 scientists, and prompted Greenpeace to refer to it as "the Monsanto Law". There has also been criticism of the origin of and even the process whereby the proposal was discussed. As for the Mexican Academy of Sciences (ACM), its president has denied his organization has a consensus and has accused proponents of the law of manipulation.[49]

On the positive side, the law contains a series of new and important general affirmations. For example, it recognizes that Mexico is the place of origin for 80 plants including corn, and this means that if they are lost in this country, they are lost for the entire world. And, the fact that the law establishes mandatory labeling for non-processed agricultural foods and prohibits GMOs in protected zones is an enormous step forward.

The law's two most interesting points that clearly represent great progress are the establishment of a specific system for corn and the possibility of opting to become a transgenic-free zone. At the same time, these two points are not left in a definitive form; they will be the subject of great battles in the future, because the law does not establish procedures or clear conditions under which procedures can be created. The law itself does not define special protection systems for corn and other crops originating in Mexico and their concrete implementation is left to secondary level regulations.

At least five Mexican states have proposed becoming GMO-free, specifically Oaxaca, Puebla, Chiapas, Tlaxcala and Michoacan. The interpretation of the law and the design of secondary regulations regarding special protection systems and free zones may in the future provide a tough test of the effectiveness of the recently-passed law on biosecurity.[50]

Among the primary criticisms are the following:

- A single law cannot simultaneously promote a technology and establish mechanisms for biosecurity;
- The law provides for very little public participation;
- It does not establish mechanisms for implementing the precautionary principle;
- There are serious doubts as to the possibility of coexistence between GMOs and traditional organisms, especially in the case of corn, given open pollination;
- The burden of proof rests with the industry, which can be both judge and jury;
- The law does not include mechanisms for avoiding conflicts of interest, for example in the forming of CIBIOGEM, which is responsible for risk assessment;
- It does not respect the Cartagena Protocol because it fails to include compensation for damages caused and the establishment of funds for incidental expenses.

It is still early to gauge the implications of this law, which in the highly polarized Mexican context was well received by government regulators, corporations and

[49] Alejandro Nadal, "El senado de los pollos," *La Jornada*, February 16, 2005.
[50] Ibid.

leading biotechnology scientists, and on the other hand, highly criticized by environmental groups and opposing scientists. The Semarnat published regulations in 2008, more than three years after the law was passed, establishing the type of information, risk assessments and monitoring mechanisms industries must submit.[51] However, these regulations have still not resolved one of the most delicate points: the special regime for the protection of maize. They were immediately criticized by GMO opponents who believe it leaves risk control up to the industries, which they believe is a government responsibility.[52]

Actors

The main Mexican rural and indigenous organizations who demonstrated against GMOs were not directly involved in drafting or passing the Law on Biosecurity. The various *campesino* and indigenous organizations have incorporated a new element, the rejection of GMOs through the defense of local corn, into their existing discourse based on their historic concerns. The National Indigenista Council declared that corn is a fundamental part of Mexican culture. Organizations of producers, poor *campesinos* and large *campesino* federations formed an alliance known as *El Campo No Aguanta Más* ("The Countryside Can't Take Any More"), and they have demanded the renegotiation of NAFTA's chapter on agriculture and the exclusion of corn and beans from the trade agreement, as well as food sovereignty, and the revision of Article 27 of the Mexican Constitution. In forums related to the congressional debates, three rural organizations were the most active: the National Association of Agricultural Product Commercialization Companies (*Asociación Nacional de Empresas Comercializadoras de Productos del Campo*, or ANEC), the National Union of Autonomous *Campesino* Regional Organizations (*Unión Nacional de Organizaciones Regionales Campesinas Autónomas*, or UNORCA) and the Study Center for Change in the Mexican Countryside (*Centro de Estudios para el Cambio del Campo Mexicano*, or CECCAM). They pointed out the negative economic, ecological, social and cultural effects of GMOs in the Mexican countryside.

In 2004 campesino and indigenous communities and environmental groups requested an independent study by the Commission for Environmental Cooperation (CEC), which would be the first international body to become directly involved in the issue of transgenic corn in Mexico. Its intervention was especially significant since it is an institution created by the NAFTA parallel agreements, and because it is financed by public funds from the three countries. Great anticipation was generated around the CEC recommendations for various reasons, including the following: it was the first international study that was presumed independent and at the same time linked to

[51] *Reglamento de la Ley de Bioseguridad de Organismos Genéticamente Modificados,* April 10, 2008, http://www.dof.gob.mx/nota_detalle.php?codigo=5019199.

[52] Nadal, "El senado de los pollos" and Greenpeace, *Insuficiente reglamento de la ley de bioseguridad* (March 11, 2008), at http://imagenagropecuaria.com/articulos.php?id_sec=27&id_art=371.

the three governments, and it represented a way to make the case of Mexico corn known to the international public not necessarily opposed to GMOs.

In addition, the CEC investigation was the first formal study with a methodological frame of reference that included not only scientific aspects but also economic, social and cultural elements among GMO risk factors. This change in research methodology was not merely a formal change, but went much farther, since it implied a break with the philosophy adopted by U.S. regulators, as explained earlier, exclusively based on scientifically-founded arguments.[53] Consequently, the CEC conclusions included a series of topics that had not yet been legitimized as part of the problems around GMO regulation. The following excerpts from the CEC recommendations to the North American governments clearly illustrate the types of risks that were considered for the first time in relation to GMOs:

> Because of its cultural, spiritual status in Mexico, campesinos in Mexico consider the presence of any transgene in maize as unacceptable risk… and… a "contamination"….Risk assessment of transgenic maize in Mexico is inextricably linked to the central role of maize.

Finally, the CEC investigation recognizes that:

> So far there is no evidence that introgression of today's GM maize traits poses a significant harm to health or the environment in Canada, Mexico and the U.S. However, this has not been studied in the context of Mexican ecosystems.[54]

In summary, the CEC recommended the three governments maintain a moratorium on GM corn or postpone the decision until the necessary environmental studies are conducted, establish educational programs and introduce labeling. The fact that representatives from indigenous organizations were formally included in discussions of the research documents was also an important step forward in the democratization of the regulatory process.

In reality, few NGOs are involved in this issue —primarily Greenpeace-Mexico, GEA and ETC, which carried out campaigns on GMOs— but the ones that do are very active, radical, well-connected and well-informed. They have carried out considerable work in publicizing the issue in the print media and radio,[55] contrasting with the inefficiency and lack of timely information on the part of government agencies. The role played by environmental groups operating in Mexico and closely linked with global networks opposing globalization and free trade has been a

[53] This is also the primary reason that governments, mainly of the United States and Canada, have not viewed the study positively and have publicly criticized it.

[54] CEC, *Maize and Biodiversity: The Effects of Transgenic Maize in Mexico* (2004), at http://www.cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=1647.

[55] Especially noteworthy is the coverage provided by the left-leaning *La Jornada* newspaper as well as *Radio Educación* programs and the CD produced by the Environmental Studies Group (GEA) entitled *Los transgénicos ¡hoy, hoy, hoy!*

determining factor in publicizing the issue of the contamination of Mexican corn, not only in Mexico but around the world. The following quote illustrates the tone of the protest by networks leading the movement against globalization and involved in international negotiations on the topic of GMOs:

> The Mexican Government takes on the tragic historical role of having permitted the destruction of a critical reason for food safety and having jeopardized the most precious heritage of Mexico's indigenous peoples and peasants.[56]

The part of the scientific-intellectual community in Mexico that opposes GMOs, as expressed by one of its members, Víctor Toledo, maintains that GMOs are not attractive to *campesinos* for a number of reasons: either they are unable to buy them, or they do not need them since they were developed to attack specific problems in large monocultures in other parts of the world, or they already have a series of proven solutions to the problems (such as resistance to insects and tolerance to herbicides) that are less expensive, more accessible and involve less or no risk at all.[57] This type of intellectual criticizes scientists who favor biotechnology above all for ethical reasons, accusing them of being personally and institutionally interested in obtaining financing from corporations.

In their view, moving a gene from one organism to another, from one species to another, is not a natural process and lacks the most basic elements of biosecurity. Scientists who oppose GMOs propose following agro-ecology, an approach based on a conception of science radically opposed to biotechnology, and interdisciplinary research for rural modernization.

Dominant Discourses

1. *The right to survival*

In Mexico the transgenic corn debate does not revolve around the right demanded by consumers to choose the food they eat or know what it is, nor around the benefits promised by the production and planting of GMO seeds. Rather, it revolves basically around the right of poor *campesinos* to continue to produce corn free from transgenics, despite totally adverse conditions. This adversity is manifested in their lack of access to expensive, sophisticated technology and their lack of competitiveness in a market filled with cheap, imported corn. The attack on transgenic corn is an attempt to resist, to take a defensive position, by a considerable social sector on which one-fifth of Mexican society depends economically. Given the controversy over whether the coexistence of GM and conventional seeds is possible in the long term —since

[56] This quote is from the protest letter published with signatures from 300 organizations after the agreement was reached accepting a 5-percent transgenic seed ceiling on corn exported from the United States to Mexico.

[57] Víctor M. Toledo, "Los biotecnólogos y el mito del científico objetivo," *La Jornada,* April 6 and 7, 2005.

experience appears to demonstrate that if not impossible, it will at least be extremely difficult to achieve— the struggle by the still-considerable *campesino* sector for its survival has radical aspects.

The significance of corn in Mexico has deep historical roots. The book entitled *¡Vivan los tamales! La comida y la construcción de la identidad mexicana* (Long Live Tamales! Food and the Construction of Mexican Identity), by Jeffrey M. Pilcher illustrates in great detail the enormous significance of corn —as opposed to wheat, the food of the conquerors— throughout the country's history in forming Mexico's identity.[58] Consequently, in the popular imagination, the transgenic contamination of corn —even worse since it came from the powerful neighbor to the North— represents a threat to survival, and to the very existence of Mexico's *campesinos* and indigenous people.

The problem of hunger, poverty and economic marginalization in Mexico, as in any other part of the world, does not appear to be a matter that can be simply resolved by technological means, but rather through income distribution depending on a set of highly complex social and political factors. At any rate, "to think that a gene… or a molecule of nucleic acid will be able to resolve a problem as complex as hunger in the world… is amazingly naive."[59]

2. *Defending diversity: the connection between biodiversity and cultural diversity*

In Mexico, the concepts of biological diversity and cultural or ethnic diversity are closely linked. The conservation of biological diversity as a part of modern environmental discourse is reflected in the preservation of the rural way of life led by ethnic groups. One of the most important bridges between these two ideas is the anthropological concept of traditional knowledge about nature, agriculture and the environment which has been conceived of, legitimized and discussed in various international forums such as the CBD.

Based on this connection between biological and cultural diversity, *campesinos* use the implementation of recommendations from the Convention on Biological Diversity for national policies in their opposition to GMOs. *Campesinos* demand moral and material recognition of their role (through their use of local, traditional knowledge accumulated over many generations) in the conservation of biodiversity. This is a specific interpretation by farmers who lack access to high technology, with the aim of defending themselves from the expansion of GMOs that offer them nothing. This interpretation is made not only by Mexican *campesinos* but also by many other poor sectors around the world who make their voices heard through networks against globalization. The logic of their interpretation can be explained as follows: while the effects of transgenic corn on biodiversity are unknown, the traditional methods used by local *campesinos* and indigenous people have proven to be effective over thousands of years. Therefore, these *campesino* and indige-

[58] Jeffrey M. Pilcher, *¡Vivan los tamales! La comida y la construcción de la identidad mexicana* (Mexico City: Ediciones de la Reina Roja/CIESAS/Conaculta, 2001).
[59] Ibid.

nous communities demand compensation in exchange for the work they carry out in environmental conservation.

The defense of diversity is also very attractive for intellectuals (rural sociologists, biologists, agronomists, ecologists) including numerous scientists critical of GMOs. They maintain that the right to choose which risk will be assumed corresponds to local communities, which are the users of technologies, in the same way they recognize their right to choose their own lifestyle.

3. *Sovereignty and control over food*

In Mexico, food production and consumption represents a much greater part of the economy than in industrialized countries, and topics like nutrition and food security continue to be great challenges. Therefore, control over the production, distribution and consumption of food continues to be an enormously sensitive political issue. Those opposing GMOs should not be viewed as innate Luddites, but rather, as rational people who fear that, in a context of already highly unequal income levels, new technologies could aggravate the disparity even further.

In Mexico the rejection of any mechanism leading to a loss of control over food can be a very popular argument, and even more so when control passes into the hands of only a few foreign corporations, in this case five mega-companies.[60] In the opinion of GMO opponents, the acceptance of the Law on Biosecurity is the legitimization of contamination and the introduction of corporations into the agricultural sector market in Mexico.[61]

Conclusions

The case of GMO regulation provides various lessons for future cooperation among NAFTA members. In addition to environmental cooperation through the CEC, commercial cooperation through the North American Biotechnology Initiative and the Security and Prosperity Partnership of North America (SPP), the case study demonstrates the need for further cooperation in science and technology and even offers certain specific fields in which to do so.

Generally speaking, one can say that there has been some sort of trade-off in terms of GMO experiences. Mexico could teach the U.S. that, if science is exclusively at the service of economic interests, it is highly probable that it will not serve the interests of humanity in the long run, and, for its part, the U.S. could show Mexico how to acquire greater confidence in science and new technologies, opening up channels for diverse interests to gain access to the decision-making process, without trampling society's fundamental rights.

[60] The same companies that previously promoted the use of pesticides and currently control 70 percent of agrochemicals.

[61] Nadal, "El senado de los pollos."

The arguments made by various actors in both countries should be understood as interpretations in line with their vision, discourses and concrete interests. We have seen that the dominant and traditional discourses exerting influence in the United States and in Mexico are different, and sometimes even contradictory. This is the case of the concept of the free market and economic growth in the United States, in contrast to food sovereignty and recognition of the value of both biological and cultural diversity in Mexico. The degree of confidence in science, and even more importantly, in the authorities who administer science, as well as access to new technologies, constitute other issues that notably differentiate the two countries.

Of course, making advances in Mexico in the field of access to technology on the one hand, and in the trust in regulators, on the other, requires a major effort at national level. This does not mean, however, that there is no room for cooperation and exchange between the two countries. The case of the CEC report, despite being criticized by the three governments, has demonstrated the virtue of dialogue and deliberation: to bring together all the parties, explain and listen to the each other's arguments.

With regard to specific issues of scientific cooperation, we know that no studies on gene flow from GMOs to wild varieties have been conducted in the context of Mexico's biosystems. Furthermore, the toxicological tests relative to human health (presented in the United States by transgenic seed generators to get authorization) are not valid in local Mexican conditions, since they do not correspond to Mexicans' essentially different diet.[62] In the field of both health and environmental risk assessment, U.S. public agencies have much more experience and technology than their Mexican counterparts. Cooperation in science and technology between the two countries could clear up the doubts as to what is definitively known and not known regarding GMOs, since currently in Mexico there is a lot of fear, partly due to uncertainty over the real risks and partly to the lack of specific studies conducted in Mexico's ecological and social context.

Another specific topic of desirable cooperation is the genetic identification and possible segregation of GM seeds from conventional seeds. This could be a positive measure that would not radically affect the interests of either country, but would, nevertheless, require a great deal more cooperation. This does not remove the possibility of U.S. producers using sophisticated technology, or of offering an option (organic, transgenic-free production) to poor *campesinos* in Mexico without access to technology.

Scientific and technological cooperation in the aforementioned fields requires the building of new channels, in addition to the SPP, which aims at defining the issues of cooperation among the three NAFTA counties and which, in fact, includes a series of biosecurity issues. It could be expanded to include Mexican society's specific concerns on biosecurity.

[62] Sheldon Krimsky and Peter Shorett, eds., *Rights and Liberties in the Biotech Age. Why We Need a Genetic Bill of Rights* (London: Rowman & Littlefield, 2005), 73.

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