

MAIZE AND
BIOSECURITY IN
MEXICO

DEBATE AND PRACTICE

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LIST OF ABBREVIATIONS

ACM	Mexican Academy of Science
ANEC	Asociación Nacional de Empresas Comercializadoras de Productos del Campo
ANEC	National Association of Campesino Marketing Organizations
Bt	Bacillus Thuringiensis
CBD	Convention on Biological Diversity
CEC	Commission for Environmental Cooperation
CECCAM	Centro de Estudios para el Cambio del Campo Mexicano
CEMDA	Centro Mexicano de Derecho Ambiental
CGIAR	Consultative Group of International Agricultural Research
CIBIOGEM	Commission on Biodiversity and Genetically Modified Organisms
CIMMYT	International Centre for the Improvement of Maize and Wheat
CINVESTAV	Centro de Investigaciones y Estudios Avanzados, UNAM
CONASUPO	Compañía Nacional de Subsistencias Populares
ECC	Peasant Commercializing Enterprises (Empresas Comercializadoras Campesinas)
ETC	Erosión, Concentración, Tecnología
FAO	UN Food and Agriculture Organization
FDA	US Food and Drug Administration
GATT	General Agreement on Tariffs and Trade
GEA	Grupo de Estudios Ambientales
GM	Genetically Modified
GMOs	Genetically Modified Organisms
GURTs	Genetic Use Restriction Technologies

ICESCR	International Covenant on Economic, Social and Cultural Rights
INE	National Institute of Ecology
INIFAP	National Institute for Forestry, Agriculture and Fisheries Research
IPN	Instituto Politécnico Nacional
IPRs	Intellectual Property Rights
LBOGM	Law on the Biosecurity of Genetically Modified Organisms
LBOGM	Ley de Bioseguridad de Organismos Genéticamente Modificados
MST	Movimiento Sim Terra
NAFTA	North Atlantic Free Trade Agreement
OECD	Organisation for Economic Cooperation and Development
PAN	Partido de Acción Nacional
PCR	Polymerase Chain Reaction
PRD	Partido de Revolución Democrática
PRI	Partido de la Revolución Institucional
PVEM	Partido Verde Ecologista de México
SAGARPA	Ministry of Agriculture, Livestock, Rural Development, Fishing and Food
SIACOMEX	Integrated Storage and Commercialization System of Mexico
UNORCA	Unión Nacional de Organizaciones Regionales Campesinas Autónomas
USDA	United States Department of Agriculture
WTO	World Trade Organization

INTRODUCTION

The aim of this study is to discuss the complex situation of Mexico with regard to the use of and access to food biotechnology in relation to trade and the preservation of biodiversity. This issue faithfully reflects the challenges of the type of development taking place that threatens to widen the technological divide and gives rise to an even larger income disparity, which may in turn confirm the duality of production systems and ways of living. The leading thread of this study is to discuss whether recent policies on biosecurity correspond with political-legal rhetoric that hides the progress of one single technological rationality, or whether these policies signify an authentic search for viable conviviality and coexistence between different strategies of production and life.

At the level of global governance Mexico is committed to liberalizing its trade under the terms set by the North Atlantic Free Trade Agreement (NAFTA) and the World Trade Organization (WTO). At the same time, the country is obliged to protect its exceptional biodiversity and has, as a place of origin of a series of species, to fulfil the clauses of the Convention on Biological Diversity (CBD). The issue of biodiversity is especially delicate due to the fact that it is closely linked to cultural diversity and the survival of poor *campesinos* and indigenous groups.

The complexity at the national level is compounded by the existence of the high proportion of the population that, despite adversities, still lives in the countryside and relies on subsistence agriculture. This group has little or no access to modern technology. In spite of the fact that it is estimated that there is a significant capacity in biotechnological research, this is certainly not always well channelled toward production needs.

If this were not enough, the unfortunate introduction of genetically modified organisms (GMOs) occurred precisely through imported

maize, a product that is the apple of discord in the discussion on biotechnology. Maize is the staple foodstuff, the holy object for ancestral cultures, the symbol of nationalism and the country's political and cultural resistance. These extra-economic factors make the origin and quality of maize extremely important for Mexicans, even more so than their cost and price. It is thought that if, in the short term, there are no new strategies of survival to be found that are also environmentally sustainable for the countryside, the still numerous rural subsistence farmers – the guardians of maize genetic diversity – will end up as undocumented immigrants in the United States. This is particularly a concern related to the youngest and most active sector of the population. The rich agrodiversity is threatened and could be to be lost due to lack of traditional knowledge.

The guiding research questions are:

- Is it possible to have one single food policy that responds both to the interest of the sectors linked to technological knowledge and those linked to traditional knowledge?
- If so, what are the political, social, legal and institutional conditions for developing it?
- In the complex Mexican context, can one efficiently promote the adoption of biotechnology and at the same time preserve biodiversity?
- Is it possible in practice to find a traditional food system that is economically viable within the scheme of coexistence between genetically modified (GM) and conventional crops?
- In the democratic and plural system that Mexico claims to be, who should pay the costs of technological development and the preservation of biodiversity?

The context and sources of controversy

The controversy sparked by NAFTA and the discovery of GM maize contains many elements connected in intricate ways. In this section we try to disentangle some of these connections by portraying the broader politico-economic, environmental and geo-political discussions that are feeding the controversy, as well as the main positions taken by the actors engaged in the imbroglio.

A first point that feeds the controversy concerns the liberalization of maize trade and attendant fears that the livelihoods of an estimated 15 million peasants who depend directly on maize production on plots of one hectare or less may be jeopardized. This fear is based on

the substantial productivity differential in maize production between NAFTA partners. When NAFTA was negotiated, US maize cost about 110 US dollars per ton at the border, while Mexican farmers received 240 US dollars per ton (Boyce, 1996). This differential has historical roots. Government involvement in the maize sector typified agricultural and development policies from the mid 1930s to the beginning of the 1990s. Involvement included guaranteed producer prices that were above world market levels, assistance for commercialization, and subsidized credit and insurance. The different administrations of the period were also involved in production and sale of subsidized fertilizers and high-yielding variety seeds. But all of this changed abruptly when NAFTA came into effect, especially because the treaty allowed for the imports of Canadian and especially US maize.

Immediately after NAFTA had been enforced, trade in maize seed was completely liberalized, but other maize products enjoyed protection through above-quota tariffs until 2008 – time enough, the designers of the treaty argued, for Mexican peasants to modernize their farms and prepare for open competition. These tariffs, however, have never been applied, even though imports of US (and Canadian) maize exceeded the quota from the start. As a result, US-based agribusiness increasingly cornered the Mexican market for maize, the domestic price for corn had fallen to half of pre-NAFTA levels by 2000, and the price of tortillas rose 483 per cent between 1994 and 1999 (Nadal, 2000). While many peasants continue to produce maize, an unknown but clearly substantial number of them are no longer able to sell the portion of their crops they had relied on for cash income (Weiner, 2002).

The overall impact of trade liberalization and the accompanying policy changes have raised concern about the country's ability to feed its rapidly growing population. In this context, those favouring NAFTA refer to the notion of food security. Increasingly however, those hurt by the free trade agreement are proposing to replace this term with that of food sovereignty. What is at stake? The national food security model posits that all individuals and social groups within the country should have guaranteed access to food in order to fulfil their nutritional requirements and lead a healthy and active life. To obtain this large amount of qualitatively good food, recourse can or should be made to the world market. In contrast, the food sovereignty model postulates that the country should have the capacity to guarantee production of, and access to, basic food needs in accordance with cultural specificities. In order not to depend on market pressures, this position implies that the country should strive for self-sufficiency in the production of

staple food crops. The food security model, then, emphasizes guaranteed access to food while the food sovereignty model focuses on the production side (Hernández, 2003).

A second and no less important point in the debate is the *in situ* conservation of maize landraces – of which Mexico is a Vavilov centre of diversity – that would be threatened. Indeed, *campesinos* in Mexico are known to cultivate thousands of maize varieties and it is on farmers' plots that maize and its wild relative, *teocintle*, continue to evolve through introversion and human-aided selection (Benz *et al.*, 2000; Louette and Smale, 1996). It is through the interaction between peasant management techniques and environmental changes that a stream of new, adapted varieties emerges (Bellon *et al.*, 2003). Peasants thus not only maintain and reproduce a vast stock of maize varieties; they also manage an ongoing evolutionary flow of new varieties (Boyce, 1996, p. 274). The preoccupation, then, was that these complex interactions would be curbed by massive imports of US seed. These imports, it was argued, would potentially erode genetic diversity of Mexican maize traditional varieties, or landraces, once the six or so maize varieties that account for almost half of US production came into direct contact with the varieties grown in Mexico.¹

In this context, the United States Department of Agriculture (USDA) allowed US farmers to commercially produce and export genetically modified maize in 1996.² By 1997 this maize found its way into Mexico. Because of the uncertainties involved like public health hazards, environmental risks, GM maize is allowed in Mexico under the strict condition that it is used for consumption – not production – purposes only. Regulatory frameworks failed and by March 1999 Greenpeace confirmed that genetically modified and unprocessed – and hence cultivable – maize seed was massively entering the country. Adding insult upon injury, maize and the peasant way of life received a further blow when, at the end of 2001, two Berkeley-based researchers confirmed suggestions in the journal *Nature* that transgenic DNA had contaminated local maize varieties in remote regions of Puebla and Oaxaca (Quist and Chapela, 2001).

This discovery ignited a scientific scandal³ of unprecedented magnitude that opened up a vicious controversy and rubbed salt into the wounds opened by NAFTA. Paradoxically, instead of inflicting the mortal blow on an already ailing economy and society, the discovery of genetic contamination pumped new life into a broad but fragmented and ill-defined social movement opposing genetic engineering. At first, the finding moved from the scientific community and more

specialized journals to newspapers and other mass media. However, *campesino* unions, indigenous communities and NGOs were quick to take up the issue, and soon genetically engineered maize became a high-profile topic within broader social movements opposing WTO and neoliberalism.

Anti-GM movements point to a number of studies that emphasize the uncertain environmental and health hazards related to the release of genetically engineered crops in general, and GM maize in particular. What these studies suggest is that, in the case of open-pollinating GM crops such as maize, crop-to-wild hybridization is bound to occur, diluting natural diversity to the point that wild populations of certain rare species are absorbed into the gene pool of the more common crop, essentially bringing the wild species to the brink of extinction (Ellstrand, 2003). Likewise, there is much scientific uncertainty concerning the impact of transgenic crops on non-target populations, which is the case for the Monarch butterfly that is affected by the insecticides produced by Bt⁴ maize. The same holds true for the evolution of resistant pests, as in the case of RoundUp-Ready™ varieties of maize, soya and wheat that have already begun to stimulate the evolution of glyphosate-tolerant weeds (Pollack 2003, cited in McAfee, 2003a). These fears are given an extra dimension by studies showing that transgenes travel farther and faster than was suspected only a few years ago.

Last but not least, additional uncertainties have been put into circulation through the discovery of two wholly new phenomena by geneticists as well as epigeneticists, who work with changes in gene function that do not involve changes in DNA sequence. The first is that the 98 per cent of human DNA not containing a blueprint for proteins – the so-called junk DNA discarded by geneticists for over 50 years – may actually express its traits in a digital way, i.e. directly through RNA and not through proteins, under specific environmental circumstances. The second is that a malleable layer of information enveloping the chromosomes, but outside the DNA sequence, is believed to affect inheritance, development and disease (Gibbs, 2003a and b). These findings have turned the central dogma in genetics and biotechnology i.e. DNA makes RNA, RNA makes protein, and proteins do almost all the real work of biology – upside down, and cast doubt on the confidence with which proponents of GM crops advertise their products.

A third category of elements that figure in the debate about GM maize is related to the nature of biotechnology and its insertion in national and international politics. Giving a full account of the issues

involved is outside the scope of this paper, but three issues merit attention as they are an important source of resistance.⁵

The first issue concerns intellectual property rights and the way in which these have been taken up in international regulatory frameworks – most notably the WTO. Since the Bayh-Doyle Act of 1980, patents in the US have been broadened to include living organisms such as plants and animals and parts thereof such as seeds, proteins and, importantly, genes and specific DNA sequences. This commoditization of the vast interior commons (Scott, 1998) boosted the expansion of life sciences and provided an incentive for industry to expand. In the 1990s, and under great pressure by the life-science industry and with the encouragement of the US government, the WTO initiated the Trade-Related Aspects of Intellectual Property Rights (TRIPS) – an avenue to introduce US patent law on a global scale. Mexican anti-GM circles however see TRIPS as a mechanism to give the market away to strong, US-based multinational biotech companies, thus effectively raising barriers to entry against smaller private enterprises or public research institutes. Closely related to this is the issue of biopiracy, i.e. the appropriation of indigenous knowledge and genetic material by biotech firms who later patent this knowledge and material, and resell it for profit to the communities it was originally stolen from. These developments run into direct collision with indigenous notions of intellectual property rights, and lead to resentment and conflicts with indigenous communities, who claim their rights against those of private plant breeders or corporations.

The second issue is the position taken by national and international public research institutes. For example, after the discovery of genetic pollution in Oaxaca and Puebla, the International Centre for the Improvement of Maize and Wheat (CIMMYT)⁶ reacted by doing absolutely nothing. This fuelled criticism because this Mexico-based Centre is home to the world's largest maize germplasm collection and delegated by the UN Food and Agriculture Organization (FAO) to conserve this patrimony of humankind. Since the CIMMYT systematically collects new maize varieties evolving under field circumstances, the possibility that genetically contaminated seed from farmers' fields entered the collection was seen as a real threat. By doing nothing the CIMMYT punched those concerned with agroecological diversity in the face, furthermore letting go an important opportunity to vindicate itself vis-à-vis *campesinos* that see this institute as the source of all evils associated with the Green Revolution. This initial position has changed, and the CIMMYT now publicly favours as well as carries out research

on genetic engineering of maize and wheat. This move is congruent with recent shifts in international institutions, from the FAO to the Consultative Group of International Agricultural Research (CGIAR) to complement private sector research in genetic modification. From the perspective of anti-GM movements in Mexico, this move clearly put the CIMMYT and the FAO in the camp of the five multinationals that hold a *de facto* monopoly on genetic engineering.

A third issue that has galvanized social resistance to GM maize concerns geo-politics and the subservient role played in this by the government. A crucial element here is the importance of agriculture and biotechnology for the USA that, in order to defend its comparative advantages, maintains an aggressive, worldwide campaign to bolster high-tech exports. To further this, it pursues a number of strategies. The main one concerns the provision of heavy subsidies to US farm products and industry. But other, more hidden practices are equally effective. For example, the USA requires trade partners to enforce its intellectual property rights, and expects them to harmonize their biosafety and certification procedures and standards with those of the international treaties it ratified. It promotes acceptance of genetically engineered crops through lobbying and all sorts of publicity campaigns and it strategically positions high-level officials and scientists in key international bodies to advance its interests (MacMillan, 2003).

Organization of the study

The first two studies analyse the debate on biosecurity and biodiversity, both in the formal political and in the public realm. From the conceptual perspective of science and technology governance, Antal's study focuses on the decision-making process, participation of the actors involved, and on the results of GMO regulation, while Verschoor deepens the analysis of the discourse and arguments used in the controversy over GM maize from the theoretical perspective of regimes of justification. The study by Baker analyses from the point of view of local production networks an alternative to the biotechnological response, the regeneration of local systems for food production, and the conservation of agrodiversity within the theoretical perspective of political ecology.

The chapter by Antal, addresses the regulatory process for adopting biotechnology and preservation of biodiversity]in the light of international standards and agreements, including the political and public spheres and the effects of new technologies on society. It reviews the

main actors, their positions and form of participation in the process in order to define the scope and limits of the type of governance prevailing. To do so, it examines the comprehensive decision-making process, the public debate, and the interactions between institutions and actors involved in the regulation, such as corporations, environmental NGOs, indigenous and *campesino* communities and organizations, scientific community, governmental and regulatory agencies and regional organisms such as the Commission for Environmental Cooperation. It argues to what extent the decision-making processes corresponds to the particular social, economic and scientific conditions of the country. Antal concludes that the result of this process, the new Law on Biosecurity of Genetically Modified Organisms, is still ambiguous: on the one hand, it allows for a specific system for maize and opting to establish GMO-free zones, but on the other, up to now, the law does not define procedures or clear conditions under which the specific system and the GMO-free zones can be created. Therefore, there are still serious doubts about the possibility of coexistence between GMOs and traditional organisms, due to technical as well as social reasons. Analytically, it will use a theoretical-methodological combination based on governance in science and technology as well as some elements of social constructivism for risk assessment.

The chapter by Verschoor, focuses on the introduction of genetically modified maize in Mexico, and the accompanying intense disagreement among actors from the full political spectrum. Verschoor documents the articulation of the controversy between these actors, and argues that doing so is important as the introduction of transgenic maize was accompanied by a proliferation of uncertainties that could not be silenced through efficient (political, scientific, technocratic) solutions. This is illustrated by a detailed account of the plurality of the evaluation criteria the different actors deployed when determining whether or not GMOs serve the common interest. As a result new political spaces and new ecological identities emerged, allowing to come to the fore once again what had been pushed into the background before, i.e. traditional maize landraces and peasant forms of life.

Baker, details two grassroots responses to the threats of biotechnology and GM maize for peasant producers. Through these responses, small-scale farmers – the guardians of maize agrobiodiversity in Mexico – are supported to continue their production of maize landraces. The case studies illustrate the importance of growing and selecting seed and preparing and eating native maize varieties. These practices object to the notion of agrobiodiversity, food security and food sovereignty as static

and fixed. The projects reveal hybrid-rich landscapes and networked environments constantly adapting to the contemporary economic and social context, thereby challenging the notion that agrodiversity can be conserved in seed banks by international institutions working to preserve agricultural genetic diversity.

The two projects described by Baker, although locally focused, are networked horizontally and vertically. Horizontal networks link producers with consumers through local food networks. Vertical networks exist between regionally focused production-consumption chains and between international social movement actors addressing issues of agrodiversity and food security through policy processes and awareness-raising campaigns. This illustrates the diverse ways in which new actors are responding to address maize agrodiversity conservation and food security and sovereignty by using strategies that reclaim culinary practices, improve rural production methods, highlight the importance of the taste and quality of maize, while linking across international borders.

BETWEEN GLOBAL REGIMES AND LOCAL DEMANDS: THE REGULATION

EDIT ANTAL

The object of this first text is to analyse the public debate and political process which took place on the regulation of biotechnology in Mexico, especially GM maize that led to the legislation on the Biosecurity Law, in the conceptual framework of governance in science and technology (S and T). This includes the social, economic and cultural context, the forms of participation by the leading actors, their discourse and the decision-making process on the subject of biosecurity.

In the framework of globalization, according to the roles and norms of the competent international organizations – basically the World Trade Organization (WTO) and Convention on Biological Diversity (CBD) – the discussion on biosecurity was certainly not an isolated process; but was rather from the outs understood as the application of the international rules of the game to the national context. Another element that has been of influence regionally is the North American Free Trade Agreement (NAFTA), which, without directly regulating biosecurity, brought about significant consequences for the development of the debate.

Given the complexity of the situation on this issue, it was hoped that the decision-making would be a sufficiently inclusive and open mechanism to express the interests and the will of broad sectors of society and that the arguments used in the debate on the risks of technology would be varied enough to reflect the great diversity of Mexican society. The main objective of this chapter is to ascertain to what degree this expectation has been fulfilled.

The methodological framework of the analysis is based on the concept of governance in science and technology, which pinpoints at least six types of governance in S and T: discretionary, educational, corporatist, market or neoliberal, deliberative and agonistic. This typology is solely for analytical purposes since the categories are not exclusive; they frequently overlap and, in each case, there are elements of different types of governance (Hagendijk and Kallerud, 2003). At present, there is a clear tendency toward the institutionalization of the boundaries and the interaction between science and politics, and it is assumed that this institutionalization of S and T policies will lead to the homogenization of the decision-making processes in the different countries, which in turn will facilitate the existence of a common pattern making the convergence between the different positions adopted easier (Halfman and Hoppe, 2004).

The thesis this study intends to demonstrate is that in the Mexican case certain traits of discretionary governance mixed with the old-fashioned corporatist type are visible, with the negative effect of bringing about a strong and radical opposition that drives the case into a governance of an agonistic type. This makes it difficult for the practices of deliberative democracy to emerge. In spite of this basic characteristic, some elements of liberal and even deliberative governance are coming to the surface too, not as established practices but as models from other countries such as the USA or Canada.

The authors mentioned, Hagendijk and Kallerud, define the forms of governance considered of greatest influence in the debate and regulation on GMOs. The most elementary model of science governance is the discretionary one. Here the policy is made without the interaction of the public, without really consulting groups outside government. It is assumed that, in this case, there is widespread implicit public trust based on the image of science as something neutral that brings objective data to the policy. This conception is closely associated with the existence of universal values, such as progress, well-being and growth, which by their very nature are outside the political process. As a reaction to the imposition of discretionary governance another form of public participation may arise, the so-called agonistic one, which demonstrates the inefficiency and inappropriateness of the practices of discretionary governance.

In the traditional corporatist model the actors are formally accredited to take part in the decision-making process. The old corporatist systems are based on an established consensus among the elite of the relevant actors. What is typical in these schemes is to create specific

Advisory Boards for each sector or issue, but in the most modern versions one sees a marked tendency toward the professionalization of those involved and changes in the model of representation toward a form of mixed representation among the varied interests and those possessing knowledge. The intention is to create a certain degree of independence for the professional bodies and present them to society as neutral entities or third parties.

Agonistic governance occurs in circumstances of confrontation when a decision about S and T is taken in an atmosphere of strong opposition when there are no easy options for compromise and negotiation. In this case, there is fundamental disagreement regarding the way of conceiving the problem. Here, in fact, public opinion may be expressed in the form of boycotts and active protest. Thus, this form of governance arises in situations where dialogue seems to be blocked, generally due to the fact that the public is not apt to modify its position. In fact, public opinion adverse to technology does not take part in the deliberation process but makes its view heard with the aim of taking advantage of the opportunity to disseminate its ideas on the matter. In this case, although the confrontation does not take place within the formal political sphere but in the public one, it is able to exert a certain pressure on state policy. Sometimes this type of confrontation may be useful to achieve more accountability and to relate the technological issue to other more general ones of public interest such as privatization and deregulation. Here, the opposition functions as a counterweight to official policy considered to be excessively exclusive and corporatist while exerting pressure on the powerful market actors with the objective of making them more sensitive to the social, economic and environmental demands of society.

The context of the debate

The political controversy around GM maize has been deepened since the year 2001, when the discovery of transgenic sequences in traditional maize varieties – a phenomenon known as the contamination of maize – was made public. The most likely source of this contamination was maize imported from the United States. The fact that the Mexican public identifies the issue of regulating GMOs with what has occurred to a single crop – which is specifically maize – determines the public's perception of the issue to a large extent.

Maize is a basic food in Mexico, where it is consumed in unquestionably greater amounts than in the United States and Canada. It is

important to emphasize that the use and therefore the value attributed to maize in Mexico is very different from that generally found throughout the world and in particular to that in the USA and Canada, its main trade partners. The present trend in the growth of world demand is due to the fact that maize has become a many-sided industrial product from which alcohol, fructose, starches and polymers are obtained. Bioenergetic products such as ethanol are particularly relevant in the USA, where a fifth of all maize is destined for it due to the increasing demand for renewable and less contaminating sources of energy (La demanda, 2007). One should differentiate between white and yellow maize. The former is used directly as a foodstuff whereas the latter is for fodder and industrial use. This difference has repercussions on the value attached to and the acceptance of GM maize. Of course, when maize is used for preparing food such as the tortilla, it is more likely that there will be resistance to GM varieties.

Maize is intimately linked to the ancient culture of Meso-America. Throughout history it 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, teosintle. Maize has been grown in the country for at least 5,000 or up to 8,000 years, and dozens of local maize varieties, known as *criollo*⁷ varieties, proliferate the countryside. With genetic contamination, not only the genome of wild varieties of maize is exposed to risk but also the more than fifty *criollo* varieties selected over thousands of years to make up the national patrimony.

To identify the significance of the conflict in Mexican society, it is important to point out that, while agriculture generates only 5 per cent of Gross Domestic Product, 30 per cent of the labour force works in this sector (Ford Runge and Ryan, 2004, p.77). This single fact has the potential to transform the topic of agriculture into a highly sensitive issue that is very susceptible of becoming politicized.

Approximately 3.2 million *campesinos* grow maize, on which 12.5 million people depend directly or indirectly, equivalent to 55,2 per cent of the agricultural population (Cevallos, 2006) It is estimated that 35 per cent of the production is still for self-consumption (De Ita and López Sierra, 2004). The structure of production is a dual one: at one extreme is the large mass of 2.3 million maize producers having land lots smaller than five hectares (Vera Herrera, 2004) and at the other a small group of 500 producers with large extensions of irrigated land, basically in the northern state of Sinaloa.

The discussion around GMOs has taken place in a context that is completely different from that in the United States whose model of regulation permeated international organizations. The topic was linked to the effects from NAFTA and the opening of the agricultural sector in general. Both events are considered to be intrinsically connected with the loss of food sovereignty and the fate of the *campesino* sector.

In Mexico, a brusque change has taken place in the production and distribution of maize, which, due to the low-income levels in the country and the fact that maize is the main – and in many cases the only – food of the poor, has given rise to important political consequences. In the past, recognizing the enormous importance and political sensitivity of the maize issue encouraged production by means of the traditional model of guaranteed prices, credits and technical assistance. The Compañía Nacional de Subsistencias Populares (CONASUPO), a state monopoly, controlled the national market for maize and distributed it to remote communities to assure supply. It was considered vital for the social stability of the country that the government should sell tortillas at a subsidized price to the poorest levels of society.

Later on, with the liberal conception of NAFTA, the central idea of the new model was to permit ‘an orderly transition of production resources from traditional crops to export ones.’⁸ The reconversion of production implied that *campesinos* growing maize should give up the activity and that the production would be reduced to 30 per cent of farmers with greater resources. It was assumed that it was better to import cheaper maize to feed the growing urban population than to encourage domestic production.

During the Zedillo administration, in 1998, the control of the maize market passed into the hands of the big trading companies, such as Maseca connected with Archer Daniels Midland Company, Grupo Minsa S.A. de C.V. associated with Corn Products International, and Cargill fused with Continental. These same corporations, which from then on bought up the Mexican harvest, are also importers and owners of storehouses of grain. So they are in a strong position of control over maize and flour for tortillas. These private corporations, whose objective is to make a rapid profit, already control over half of the maize in Mexico. Hand in hand with privatization, the price of maize was liberalized and subsidy programmes, such as FIDELIST, which applied to the purchase of tortillas for 1.2 million families in marginalized urban areas, disappeared (Hernández Navarro, 2007).

The results of this change of model have been far-reaching for urban consumers as well as for agricultural producers. During the years after

NAFTA entered into force the price of maize dropped up to 50 per cent to its previous price*. Consequently consumption has declined, the quality of tortillas deteriorated, a large percentage of maize production was transferred to irrigated areas and poor *campesinos* emigrated massively to urban areas and the USA. There is no doubt that, in the midst of a process of large-scale impoverishment of the rural population and the concentration of income in the hands of a few,⁹ the producers of grains such as rice, beans, corn, sorghum and wheat, were the primary victims of the opening up of markets. By 2003 1,3 million *campesinos* had had to leave the land (Report, 2004). According to the peasant organization Central Campesina Cardenista, for each five tons of imported maize one *campesino* becomes a candidate for emigration (Erroneas, 2007). Despite these adverse market conditions, corn production has surprisingly been maintained, and according to some studies, even increased, since many small producers of other displaced products took refuge in corn production in order to guarantee their survival.

As for food sovereignty, after many years of self-sufficiency, the country has a deficit in maize. In 1993, the year before NAFTA, a small quantity of maize was imported, namely 500 thousand tons but by 2005 imports had risen up to 7,5 million tons, mainly from the USA. In this context of changes that produced too many losers and only a handful of winners, poor Mexican *campesinos* have taken up the cry of fervent refusal of GMO as an additional argument against the trend to privatize and liberalize the land.

In terms of experience with agricultural biotechnology, it is important to know that the country is currently not a generator and thus not a commercial producer of GM seeds. It is true that there are small areas with genetically modified soybeans and Bt cotton,¹⁰ since a number of genetically modified tomato, cotton and soybean varieties were authorized between 1995 and 1998. At least 33 field tests were conducted with a series of GM seeds, generally under contract from transnational corporations. The country has a scientific capacity that is estimated to function at a medium level for a developing country, signifying that it has approximately 100 scientists specializing in GMOs distributed throughout a number of private and public institutions and in all there is a community of 800 biotechnologists. 300 million US dollars are annually invested in agricultural biotechnological research (Ford Runge and Ryan, 2004, p. 77-78).

* Only in 2006 the price of maize suddenly increased as a result of greater demand for biofuel.

Recently, in 2005 and 2006, after the passing of the Biosecurity Law, the main agroindustrial firms present in the country, Dow, Monsanto and Pioneer have requested approval for 7 types of GM maize as an experiment in some states, such as Sinaloa, Sonora and Tamaulipas. For the moment, this is refused three times as no agreement could be reached on the geographical areas in which maize originated and the definition of 'special regime for the protection of maize' is still pending. These two items are required by law. However, at the present time the pressure exerted by large corporations such as Monsanto went even so far as to threaten to leave the country should such a permission not be granted.

An important factor that places Mexico in a different situation from that of the United States is its great biodiversity. The country is a mega-diverse country, and is the centre of origin and diversity for not only corn but also 80 other species. The protection of its biodiversity is not only an objective of national policies, but also international ones developed in the CBD. Mexico is the only country in North America that ratified the Cartagena Protocol, an international treaty that establishes the international rules of the game for the conservation of the world's biological diversity.

The triggering of GMO conflict

A centre for public research, the CIMMYT, together with Mexican organizations, already expressed concern in 1995 over the potential negative effects that Bt corn imported from the United States could have on rural areas and the environment. Consequently, in 1998 the planting of GM maize was prohibited, and the expectation was that imported corn would be used exclusively for consumption. From that time on, a national debate arose in the country on the conservation of local corn varieties and their wild relatives. Over time, the official position changed, leading to some confusion as to the exact nature and consequences of genetic modification. The governmental discourse initially appeared to encourage the defence of local corn in relation to GM corn, however it then took a more moderate stance and finally seemed to have reversed its position. This ambiguity and the lack of transparency and consistency on the part of the government clearly sparked mistrust, and encouraged doubts regarding genetically modified organisms.

The crossing of biotechnological corn varieties and native ones was totally predictable, since non-segregated corn arrived from the USA

in increasingly larger amounts. Even in these conditions, the Mexican government has never made the decision to request segregation or the introduction of labelling for corn from the United States, despite the constant insistence by scientists and rural communities.

In 2001, *Nature* magazine published an article (Quist and Chapela, 2001) regarding the discovery of transgenic DNA sequences in *criollo* corn varieties in the Mexican states of Puebla and Oaxaca. This seriously compromised the Mexican government since it clearly revealed its inability to implement its own policy of prohibiting the planting of GM maize. The case of the contamination of Mexico's corn immediately became a global issue, and even the popular magazine *Newsweek* placed it on its cover page. It is interesting to observe that while the article in *Nature*, a recognized scientific magazine, referred to the phenomenon discovered as an introgression, or the introduction of a gene complex into another, the communication media immediately interpreted it as a matter of contamination with an obviously negative connotation.

It is important to point out that, up to now, there is a lack of consensus among scientists, and insufficient empirical data for evaluating the effects from crossed pollination or the concrete meaning of genetic flow. In particular what is unknown is the degree of spreading and permanence of GMOs in the environment – precisely what was denounced in *Nature* magazine. In these conditions it is believed that the most appropriate action is to assume there is a lack of information and that decisions should be postponed until research reveals the necessary data for making them.

Since 2002, a national campaign has been underway in the defence of native, locally selected corn, with the participation of 120 organizations, rural communities, NGOs, government agencies, scientists and distinguished individuals. From this campaign given the name of 'Without corn, there's no country' ('*no hay país sin maíz*'), a political slogan emerged, with the demand for a stop to the importing of corn, plus the payment of compensation to *campesinos* who plant traditional maize, in acknowledgment of their efforts to conserve biodiversity.

In reality, neither of the two proposed measures was realistic nor directly related to the matter of defending corn. However, they were not accidental, since they corresponded to the interests and viewpoints of the actors involved in the campaign. After the shift in the model of control of maize, the demand for a stop to the importing of corn was not a realistic one, since at the time it would have been impossible to guarantee the necessary amount of basic food for the Mexican society without imported corn. The second demand, to compensate *campesinos*

for protecting biodiversity, was inspired by abstract ideas that emerged from debates around the CBD but has not yet been translated 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.¹¹ In 2002, the issue was denounced at international protest forums: at the World Social Forum in Porto Alegre against globalization and at the Food Summit in Rome, where it was presented by the international movement *Vía Campesina*, a radical NGO demanding 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 manifested itself ambiguously, from denying contamination to considering it to be an irreversible fact. Meanwhile, international entities such as the FAO, CIMMYT¹² 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 transnational corporations, the Intersector 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 that denied the discovery, and at the same time, refused to publish an article from the Mexican government agency, the National Institute of Ecology (INE), which criticized the ideological content of the second article published.

By the year 2003 a process of distancing between *campesino* communities, the radical environmental NGOs, and Mexican government agencies, was clearly evident. 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, signifying the prohibition of introducing, planting or purchasing GMOs from governmental Diconsa stores (Vera Herrera, 2004).

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 forgo requesting compensation when the corn received contained GMOs at a level below 5 per cent or

when the contamination was unintentional – which in practice would probably mean it would never make such a request. In the opinion of those opposing GMOs this agreement failed to comply with the Cartagena Protocol, which requires compensation for harm caused, and it provoked a protest by 300 NGOs at the international level.

Legislation on GMOs

Parallel to the social actions just described, a legislative process was carried out in relation to the Law on the Biosecurity of Genetically Modified Organisms (LBOGM).¹³ It was passed in December 2004 with 319 votes in favour, 105 against and 17 abstentions, despite the opposition of one major political party, the Partido de Revolución Democrática (PRD), and one small party, the Partido Verde Ecologista de México (PVEM). As an antecedent to the passing of this law a long process of discussion on the proposal for another law took place, specifically that on access to genetic resources. This prior legislative initiative was conceived of in the terms established by the WTO *sui generis* system. However, its passage through the Senate was impeded by problems of lack of clarity in the legal framework for the ownership of communal and indigenous lands and the links with indigenous autonomy, which was under discussion at that time. Over the 5 years of debate prior to its approval, in total 8 initiatives have been presented for the Biosecurity Law by different political parties, specifically the Partido de Acción Nacional (PAN), the Partido de la Revolución Institucional (PRI), the PVEM and the PRD.

The last proposal made was designed by the Mexican Academy of Science (ACM), presented by the PAN, and discussed over a three-year period. The fact that the initiative was based on an original proposal by the ACM, which represents the elite of the scientific community interested above all in its own research, has a special connotation, which clearly gives priority to the scientific content and the role of experts rather than the political content of the GMO issue. This law defines the faculties of the Ministries of the Environment, Agriculture and Health, 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 doubt about risks to human health or to the environment. However, it does not include mechanisms for implementation.

In the opinion of one of the most notable analysts of the subject in Mexico ‘the reforms suggested during the far-reaching debate that

took place in the Chamber of Deputies were only partially taken up in the Law, and the final text was approved in a classic “dawn” session when discussion and consensus were still lacking; it is a combination of slight progress, inexactitudes and concessions to corporative interests’ (Masieu Trigo and San Vicente Tello, 2006, p. 40).

During the debate, the leftist party PRD was especially active in organizing a seminar and forum for researchers and different forums in the provinces to widen the debate and include the different social sectors affected. Taking part in these events were researchers in biotechnology and representatives from Chiapas, Baja California, Zacatecas and Michoacan. These events resulted in the publication of a book *GMOs: Who needs them* (Transgénicos, 2004) and the formulating of 11 points of agreement to be presented in the legislative debate reflecting a wide spectrum of opinion.

The parliamentary commissions in charge of the GMO issue also organized a symposium with the aim of disseminating scientific information and thus enabling deputies to come to a decision on biosecurity and GMOs. These same commissions promoted a wide-ranging consultation by Internet too, which recorded over 14,000 participatory hits by broad and very different sectors such as NGOs, corporations, researchers and government officials – *campesinos* being singularly lacking. From the very beginning of the debate one could see differing conceptions on the issue among the political parties: whereas the PAN focused on the scientific aspect, the PRI insisted on the producers’ needs, and the PRD on the fact that the objective of this law was not to promote biotechnology but biosecurity. The subcommissions formed interviewed agricultural producers and consulted with over 200 of them on the possibility of setting up GMO-free areas. The PRD in the meantime even drew up an alternative proposal (Masieu Trigo and San Vicente Tello, 2006, pp. 40-43).

This law creates a system of permits for experimenting and doing business with GMOs. The law has been met with mixed reactions on the part of specialists both inside and outside Mexico. There is agreement among many critics of the law that it contains more elements for promoting the biotechnological industry than for protecting biodiversity. In fact, this led to a formal protest by a group of 100 scientists, and caused Greenpeace to refer to the law as the Monsanto Law. There was also criticism of the origin and even of the process in which the proposal was discussed. As for the ACM, the president claimed that there is no consensus within this scientific entity, and accused those promoting the law of manipulation. (Nadal, 2005)

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

The two most interesting points of the law clearly signifying great progress are the establishment of a specific system of protection for maize and the possibility of opting for becoming a GMO-free zone. At the same time, these two points are the ones left in a not yet definitive form and will provoke great battles in the future, because the law does not establish procedures or clear conditions under which such procedures can be created. The special protection systems for maize and other crops having their centre of origin in the country are not defined by the law itself. Their concrete determination is left to secondary level regulations and it is feared these may be arbitrary and weak. In terms of GMO-free zones, there are at least five Mexican states that have proposed becoming GMO free, specifically Oaxaca, Puebla, Chiapas, Tlaxcala and Michoacan. The interpretation of the law and the construction of secondary regulations regarding the special protection systems and free zones may, in the future, provide a tough test of the effectiveness of the recently passed law on biosecurity (Nadal, 2005).

Among the primary criticisms are the following:

- one single law cannot at the same time 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 not be both judge and interested party;
- 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 harm caused and the establishment of funds for incidental expenses.

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

other hand, highly criticized by environmental groups and opposing scientists. The coin is still in the air.

Main actors involved

Lacking real participation in the decision-making process, the *campesinos*' and native Mexicans' main weapon was to draw up a discourse of strong resistance to GMOs in the name of the right to survival. The various *campesino* and indigenous organizations – now aggravated by the effects of the liberalization of the countryside – have incorporated a new element, specifically the rejection of GMOs through the defence of local maize, into their already established 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.¹⁴

The *campesino* and indigenous organizations had no direct participation in the legislative organs. It can be assumed that their interest will be somehow, but not completely nor systematically, represented by the positions of the leftist party PRD, and somewhat by the former ruling party PRI. In the forums associated with the parliamentary debates three *campesino* organizations were active: the Asociación Nacional de Empresas Comercializadoras de Productos del Campo (ANEC), the Unión Nacional de Organizaciones Regionales Campesinas Autónomas (UNORCA), and the Centro de Estudios para el Cambio del Campo Mexicano (CECCAM). These organizations called attention to the harmful economic, ecological, social and cultural effects of GMOs on the Mexican countryside. Later on, in 2005, the UNORCA demanded that the topic of sovereignty, a concept involving being free from transgenic seeds, be included as an issue in the 2006 electoral campaign (Buscará, 2005, p. 16).

The absence of *campesinos* and native Mexicans in the formal part of the legislative process was very obvious, especially in contrast with their activism in the public sphere. As shown above, the GM maize 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, but basically

around the right of poor *campesinos* to continue producing corn that is free from GMOs, despite trade liberalization. This adversity has been manifest 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 GM maize is an attempt to resist and to take a defensive position on the part of a considerable social sector on which a fifth of Mexican society depends economically. In order to survive, the *campesino* sector takes a radical stance in this struggle.

The significance of maize in Mexican history has deep historical roots. The book *¡Vivan los tamales! La comida y la construcción de la identidad mexicana* (Pilcher, 2001) illustrates in great detail the significance throughout the country's history of maize – as opposed to wheat, which was the food of the conquerors – in the formation of the national identity. Consequently, in the popular imagination, the transgenic contamination of corn – even worse since it came from the powerful neighbour to the North – signifies a threat to survival, and to the very existence of *campesinos* and indigenous people.

The problem of hunger, poverty and economic marginalization does not appear to be a matter that can be simply resolved by technological means but rather through income redistribution. 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 naïve’ (Toledo, 2005).

The Commission for Environmental Cooperation (CEC)

The CEC has taken part in the very interesting, novel and certainly informal and public – but institutional – process with great international impact and much influence on the political sector. Its behaviour has given the governance of GMOs and biodiversity a slightly deliberative touch in the sense that it creates a forum in which the opposing sectors directly involved in the controversy participated together for the first time and had the opportunity to expose, listen to and discuss the alternative arguments.

Disinformation and confusion about the nature of GMOs 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. In a study carried out in 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.

In 2004 *campesino*, indigenous communities and environmental groups requested an independent study by the CEC, which would be the first international entity to become directly involved in the issue of transgenic corn in Mexico. The intervention by this entity was especially significant since it is an institution created by the parallel agreements from NAFTA negotiations, and because it is financed by public funds from the three countries. There was great anticipation about the CEC recommendations for various reasons, including the following: it was the first international study that claimed to be independent and at the same time linked to the three governments, and it represented a way to make the case of Mexican maize known to the international public not necessarily in opposition to GMOs.

In addition, the CEC investigation was the first formal study with a methodological frame of reference that included not only scientific but also economic, social and cultural aspects among GMO risk factors. This change in research methodology was not merely a simple formal change, but extended much further since it implied a break with the philosophy adopted by US regulators that, as explained earlier, was exclusively based on scientifically-founded arguments.¹⁵ Consequently, the CEC conclusions included a series of topics that had not yet been legitimized as part of the problems about GMO regulation. The following excerpts from the recommendations made by the CEC for the North American governments clearly illustrate the new 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 modified gene in maize as an 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 significant harm to health or the environment in Canada, Mexico and the US. However, this has not been studied in the context of Mexican ecosystems’ (CEC, 2004).

In summary, the recommendations made by the CEC to the three governments are to maintain a moratorium on GM corn or postpone the decision until the necessary environmental studies are carried out, and to establish educational programmes and introduce labelling. The fact that representatives from indigenous organizations were formally included in discussions of the research documents also signified an

important step forward in the democratization of the regulatory process.

Environmental groups

In reality, just a few NGOs are involved in this issue – primarily Greenpeace-Mexico as the main actor, the Centro Mexicano de Derecho Ambiental (CEMDA), the Grupo de Estudios Ambientales (GEA) and Erosión, Concentración, Tecnología (ETC) – which conducted campaigns on GMOs – but they are very active, radical, well-linked and well-informed. They have carried out considerable work in publicizing the issue in the printed media and radio,¹⁶ which contrasts with the lack of efficiency and timely information on the part of government agencies. In addition to this, some of these groups such as Greenpeace, CEMDA and ETC lobbied very actively during the legislative process. The role played by environmental groups that operate in Mexico and are closely linked to global networks opposing globalization and free trade was a determining factor in publicizing the issue of the contamination of Mexican corn, not only in the country itself 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 element for food-safety and of having jeopardized the most precious heritage of Mexico’s indigenous peoples and peasants.’¹⁷

The most important element of its discourse was defending diversity and 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 form of rural life maintained by ethnic groups. One of the most important bridges between these two concepts is the anthropological concept of traditional knowledge regarding nature, agriculture and the environment, which has been conceived of, legitimized and discussed in various international forums such as the CBD.

According to the logic of radical environmental groups, traditional *campesinos* are the legitimate guardians of biodiversity. Based on this connection between biological and cultural diversity, *campesinos* have to use the implementation of recommendations from the CBD for national policies in their opposition to GMOs. *Campesinos* have to 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 objective of defending themselves from the expansion of GMOs that offer them nothing. The interpretation is made not only by Mexican *campesinos* but also by many other poor sectors around the world making their voices heard through networks against globalization. The logic of their interpretation can be explained as follows: whereas the effects from transgenic corn on biodiversity are unknown, the traditional methods used by local *campesinos* and indigenous peoples have proven to be effective over thousands of years. Therefore, these *campesino* and indigenous communities demand compensation in exchange for the work they carry out in environmental conservation.

The scientific community

The Mexican scientific community, as central element both in the political and the public sphere, expresses of itself the essence of agonistic governance of the problem of GMOs and its impact for the country. The Mexican scientific community, in its broadest sense, has split on the subject of GMOs. On one side of the balance are the biotechnologists from public and private research centres such as the Instituto de Biotecnología at UNAM, the Centro de Investigaciones y Estudios Avanzados (CINVESTAV) at the Instituto Politécnico Nacional (IPN), many members of the ACM and, on the other, the agronomists, plant improvers, biologists, ecologists and social scientists.

There is no doubt that the elite of the scientific community, mainly a small group of biotechnologists, were the main protagonist in the legislative process. In their quality as experts, which is still widely recognized in conservative Mexican society, they have been very active lobbyists and have been presented, and on occasion used and abused, as the voice of infallible truth throughout the debate. This was precisely the case of the document presented on behalf of the AMC, which was the basis for the proposal of law that was finally approved, the authenticity of which was questioned as not representing the consensus of all members of this scientific organization. This group based its position as enthusiastic promoters of biotechnology on a radical separation between science and values, between truth and opinion, in an almost positivist fashion. This conception reinforced the government technocracy's idea of progress, the interests of exporters and also reflected the interest of the biotechnologists for investigating cutting-edge science.

Another part of the intellectual community has also been active on this issue, certainly not so much in the official and legislative sphere, but rather in the media and public debate. Beyond the arguments of an ethical and philosophical type, the defence of diversity be it cultural, social or biological, is also very attractive for intellectuals – rural sociologists, biologists, agronomists, ecologists – including numerous scientists critical of GMOs. They maintain that the right to choose what risk will be assumed corresponds to local communities, which are the users of technologies, in the same way as they recognize their right to choose their own lifestyle.

The part of the scientific-intellectual community that opposes GMOs, as expressed by one of its members, Victor 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 already-proven solutions to the problems to be solved – such as resistance to insects and tolerance to herbicides – which are less expensive, more accessible and with less or no risk involved. (Toledo, 2005) This type of intellectual criticizes scientists in favour of biotechnology for ethical reasons, above all, 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 in opposition to GMOs propose following agroecology, which is an approach based on a conception of science that is radically opposed to biotechnology, and they propose interdisciplinary research for rural modernization.

Corporations

The corporate sector, which in terms of corporative governance is one of the main interested parties, has acted in a very organized way through a political and public strategy that is well drawn up and carried out.

The Agrobio consortium is a civil association founded in 1999, which represents the interest of biotechnological agricultural corporations. It is made up mainly of Aventis, Syngenta, Dupont, Monsanto and Savia. Agrobio developed intensive propaganda in favour of GMOs and lobbied unceasingly throughout the formal legislative and political process of the Biosecurity Law. Agrobio's mission is to create a favourable atmosphere for the development of modern biotechnology. It

claims as its principal objectives: making society aware of the benefits of responsible application of biotechnology in agriculture through the flow of information with a solid scientific basis; representing the industry related to agricultural biotechnology in order to collaborate in the development of national policies and regulations encouraging the care of the environment and health, as well as investment and transfer of technology; promoting the link between the academic sector and the biotechnological industry with the aim of reinforcing training and strategic research in agricultural biotechnology.

The Agrobio website points out that among their main activities are:

- close cooperation with the centres for research and development in vegetal biotechnology in Mexico;
- organization and coordination of seminars on issues such as the evaluation of innocuousness, the regulation of GM crops and the socio-economic aspects associated with the application of biotechnology in Mexico;
- development of informational material to further knowledge of its present and potential applications and taking part in the most relevant events of the agricultural, industrial, governmental, academic and health sectors.¹⁸

It often acted in close collaboration with and was represented by scientists from biotechnological research centres such as the UNAM Instituto de Biotecnología and CINVESTAV, Irapuato campus.

Conclusions

The agonistic governance that characterizes the issue of biosecurity reflects the great disparity of income and ways of life in the country and, in particular the degree of access to resources, among which the products of modern science and technology.

Food production and consumption represent a much greater part of the economy than in industrialized countries, and topics such as nutrition and food security continue to be great challenges. People with low incomes spend up to 35 per cent and the better-off up to 10 per cent of their income on food. Therefore, control over the production, distribution and consumption of food continues to be enormously sensitive as a political issue. Those opposing GMOs should not be viewed as innate Luddites or technophobes, but rather, as rational persons who fear that, in a context of already highly unequal income levels, new technologies could even further aggravate such disparity.

The conceptions – one founded on the free market and economic growth and the other, by contrast, on food sovereignty and the recognition of the value of diversity in terms of both biology and culture in Mexico – tend to be extremely opposed. They are also related to the degree of confidence in science and, even more importantly, the authorities that administer science as well as access to new technologies.

The participation of the groups of actors reviewed in this chapter reveals the nature of the governance of technological science in Mexico, which can be considered as a transition between the agonistic and the corporative one. Two sectors – *campesinos* and native Mexicans – by their discourse and attitude of resistance, and the scientific community by reason of its radical division, reinforced the antagonism between the positions, with an enormous and significant difference between the two as to the way to act and the degree of access to the formal decision-making process. While the former acted basically in the public sphere and the political parties only partially managed to represent their interests, the latter, at least the part corresponding to the defenders of biotechnology, have participated very actively in the formal political process and were even the original authors of the proposed law.

The remarkable activism of the environmental groups against – and the corporations in favour – rather successfully lobbied in this process within the corporative scheme. The environmentalists, in spite of having obtained less than they would have wished, achieved successes such as the special regime for maize and the ecological study of zones of origin. Both actors can be considered as being part of transnational networks, since the biotechnology corporations with few exceptions are transnational and the environmental groups for the most part belong to worldwide antiglobalization networks. Compared with international practice, the lack of consumer participation in the Mexican process is extremely remarkable. This is explained by the absence of consumers as actors in the public realm.

The CEC was doubtless a singular and very positive actor in opening up the public process and bringing about a certain deliberative practice. As demonstrated in the CEC report, the simple fact that aspects other than those considered to be strictly scientific were legitimized as truly existing risk factors in Mexico's social and cultural context, and the fact that this information was publicized, lead to greater understanding between the two extreme positions on GMOs. The incorporation of *campesinos* and native Mexicans, as well as the emphasis on the lack of public dissemination of information on GMOs, is another of its valuable contributions. It is equally important that the CEC study made

the lack of scientific knowledge on GMOs evident and especially in the tests carried out regarding genetic flow on local ecosystems.

The above does not signify, however, that there is no room for cooperation and exchange between the two positions. The approved Biosecurity Law shows, despite all its inconclusive, ambiguous and pending aspects, the possibility for approach. Compromises are possible: segregating GM seeds from conventional seeds could be a positive measure, which would not radically affect the interests of either country, importers and exporters, but would, however, require a great deal more cooperation. This does not remove the possibility of using high technology for US producers, and offers an option – organic, transgenic-free production – to poor *campesinos* without access to technology.

For poor *campesinos*, GMOs do not represent a direct path to improving their social status, and not even to the possibility for survival: consequently their ongoing impoverishment will signify greater migratory flows to the United States and greater instability for Mexico. Greater cooperation in the area of science, but also in trade and environmental matters between the two countries will help to diminish GMO-related conflicts in the future.

FRAMING THE CONTROVERSY ABOUT GM MAIZE

GERARD M. VERSCHOOR

Introduction

The elements coming together in the controversy over genetically modified (GM) maize are many and varied. One of the main themes is that of the governance protocol to be followed in this controversy: should the wishes of industry prevail over those of vast parts of the population? There is no simple answer to this, and it is clear that in trying to garner support for their respective causes both proponents and opponents frame the controversy in different and often incommensurable ways. In this chapter I will maintain that, in the medium to longer term, the arguments of proponents will prevail as long as opponents reduce their points of view to received, modernist ways of justifying their claims, i.e. certainty about the relationship between means and ends, often by way of reference to scientific facts. If the broad social movement against GM maize wants to avoid the depolitization of their claims and be politically effective, they will have to start exploiting the uncertainties involved in the controversy.

The chapter is divided in seven sections. I first provide the analytical options available to study public disputes. Special attention is given to an alternative framework for understanding these debates, i.e. that of the regimes of justification used by actors engaged in moral and political struggle and developed by convention theory – an interesting but relatively new body of thought not well known outside French intellectual circles. A second section displays the way in which arguments related to market and industrial efficiencies are strategically build and

circulated by proponents of genetically engineered maize. This is followed by a paragraph on the broad coalition of farmer organizations, indigenous groups and NGOs opposing GM maize that evaluate and justify their actions by deploying arguments related to equality, solidarity, culture, tradition, and the environment. In a fourth section I elaborate on the commonalities between the contenders – that is, the reliance on certainty concerning the relationship between means and ends – and argue that, as long as the anti-GM movement sticks to well-established, received frames of justification their struggle runs the danger of being futile. This part is followed by a focus on some of the uncertainties inherent in crucial economic and ecological processes pointed at by opponents to GM maize. Finally by way of conclusion, I indicate some of the broader effects this circulation of uncertainties may have in terms of effectively re-politicizing the controversy about the protocol to follow concerning the role of GM maize.

Disentangling the controversy

The discovery by Greenpeace, in March 1999, that genetically modified, unprocessed and hence cultivable, maize seed was massively entering Mexico called the attention of many but was, as usual, ignored in the best depoliticizing tradition of the Zedillo Administration. The situation however imposed itself on the national agenda at the end of 2001 after two Berkeley-based researchers ignited a scientific scandal¹⁹ of unprecedented magnitude by confirming suggestions that transgenic DNA had contaminated local maize varieties in remote regions of Puebla and Oaxaca (Quist and Chapela, 2001). The discovery and subsequent, scientific confirmation of genetic contamination was first taken up by a relatively small number of NGOs, concerned scientists and specialized journals, but from there it slowly moved into newspapers and other mass media. Soon thereafter farmer unions, indigenous communities and a wide range of NGOs protested against genetically engineered maize, which itself becomes a high-profile topic within broader social movements such as *El Campo No Aguanta Más*²⁰ as well as movements specifically created for the purpose of strengthening local maize like *En Defensa del Maíz*²¹ or the recent *Foro Campesino por las Semillas y la Vida*²². By the end of 2002, a nation-wide controversy was born.

The controversy sparked by the discovery of GM maize contains many elements connected in complex ways. In this section I try to disentangle some of these connections by borrowing some of the ideas of the French Convention School. Of special interest is the model by

Boltanski and Thévenot (1991, 2005), who developed a framework designed to illuminate the most legitimate types of arguments, which they call justifications, actors use in public disputes to assess what benefits the common good. Justifications can involve positive arguments, claims, or position statements, but might also be critical denunciations of opposing views. A justification in this theoretical view is ‘an attempt to move beyond stating a particular or personal viewpoint towards proving that a statement is generalizeable and relevant for a common good, showing why or how this claim is legitimate’ (Thévenot *et al.*, 2000, p. 236). Actors engaged in argumentation are thus seen as mobilizing so-called grammars of worth or regimes of justification – each with its own way of separating good from bad, right from wrong, just from unjust. In this context, the most important grammars or regimes include: market performance; industrial efficiency based on technical competence and long-term planning; civic equality and solidarity; domestic and traditional trustworthiness entrenched in personal and local ties; and environmental friendliness. What is new in this model for the analysis of controversies is that the grammars or regimes of justification are quite independent from one another,²³ and each – and this is the great strength of the model – has the capacity to denounce the others because they lack morality or virtue (Latour, 1998, p. 224).²⁴ In the next section, these regimes of justification will be illustrated by way of a stylized account of arguments put into circulation by proponents and opponents of GM maize.

Justifying the common good

As we have seen in the previous section, actors deploy the strategic practice of building and using arguments of justification or denunciations to forward their version of what is good or bad in relation to a common good such as maize in this case. This entails an instrumental manipulation of arguments fitted to the controversy and aimed at advancing a strategic plan in the most legitimate terms that are culturally available (Boltanski and Thévenot, 2005). This section highlights some of the criteria that are utilized in this quest by pointing to a series of justifications and denunciations that are used by proponents and opponents of GM maize.²⁵

Justifications based on the industrial world: industrial worth

Probably the largest number arguments in favour of GM maize are based on justifications based on this order of worth. In this category arguments, persons, activities and objects are positively evaluated when they contribute to a very specific end: that of efficiency and productivity.²⁶ Boltanski and Thévenot: ‘In an industrial world the great persons are the experts. The words used to describe their personal qualities can also be used to qualify things. They are said to be worthy when they are efficient, productive, and operational. They implement tools, methods, criteria, plans, figures, graphs, etc. Their relationships can be said to be harmonious when organized, measurable, functional, standardized’ (1999, p. 373, italics by the author).

In Boltanski and Thévenot’s framework, experts (professionals, specialists, and all sorts of persons in charge often, if not always, obtain their strength from scientific evidence and certainty. There are three examples of ways in which this is made apparent. The first one can be seen at play when proponents of GM maize argue that food security can be achieved by engaging in a game of comparative advantages that will benefit all. It is for sure, proponents maintain, that under these circumstances rational Mexican farmers will seek to grow those products that fetch a higher price in open, perfect markets while at the same time guaranteeing that they have access to cheap maize.²⁷ This form of reasoning includes, by extension, trade in GM maize. The rhetoric utilized clearly is based on the universal applicability of a rational logic of comparative advantages that can be accurately implemented through all sorts of tools, methods, criteria, standards, regulations and the like. Among the most visible we have the enforcement of intellectual property rights, and the harmonization of biosafety and certification procedures and standards with those of the international treaties, especially those supported by the USA. In short, under the regime of industrial justification all organizational devices that are directed towards future, long-term planning and investment are seen to be worthy, while any move opposing this is seen and understood to be wrong, amoral or harmful.

The second example concerns the impact of genetically modified organisms (GMOs) on the environment. One recurrent issue here is the concern that genes from second-generation GMOs – such as pharmaceutical transgenic maize – might find their way to local landraces in, for example, Oaxaca. Here proponents of GM maize favour specific, scientifically sound methods to control the risks involved. A good example is Monsanto’s Robert Horsch on the issue of pharmaceutical

crops during an international forum on gene flow held in Mexico City in September 2003:²⁸

‘What I can tell you for the short term is: the pharmaceutical production in maize is handled in an extreme different way than commodity crops. In fact, it is not handled in any way like a commodity crop. And it would not be possible to accidentally stumble upon it. And yet there are quite a few safeguards in place to prevent deliberate mischief to try and misappropriate it. It is grown in great isolation, with only specific contracted growers, under a highly regimented set of standard operating procedures and quality control methods which are required for producing any pharmaceutical, but which go orders of magnitude beyond conventional seed quality control systems, for example, to prevent unintended movement....And I’ll stick my neck out here a little bit, and say that if somebody thought it ended up in Oaxaca, that we would take a very active interest in trying to track that down and put it to rest one way or the other. But by far the frontline of defence is systems that will prevent that from ever happening.’

What we can hear in Horsch’s position is the unbridled optimism of a scientist who is certain about two things at least: biopharm is a good thing in principle and – provided the right safeguards are in place – there is no risk that these transgenes might escape the scrupulous and vigilant eye of the system. In short: there is confidence that the means (a safety system) will be instrumental in reaching a stated end (efficient production of pharmaceuticals).

Justifications based on the market: ‘market worth’

Justifications in this domain are almost exclusively made by defenders of GM maize, and refer to a market or commercial logic. From this point of view, important persons are buyers and sellers who compete with one another for an exclusive end: the acquisition of scarce goods. Within this frame of justification, the main qualities of these persons include their being ‘opportunistic in spotting and seizing the opportunities of the market, to be unhampered by any personal link and to be emotionally under control. They connect with one another through competitive relations’ (Boltanski and Thévenot, 1999, p. 372). In contrast, within this regime of justification the state of unworthiness ‘is one in which persons fail, stagnate, and lose out, and in which goods are rejected instead of desired’ (Boltanski and Thévenot, 2005, p. 197). Relevant pieces of evidence brought in support of market justifications only qualify as long as they can be treated as exchangeable goods or services. In the case of maize production, the worth of the

crop is only evaluated in terms of price and open market competition. Market arguments for the liberalization of maize trade might include, for example, claims that the free trade of the crop will boost revenue for NAFTA as a whole, or that it is the cheapest method of providing the product for which there is ample demand. In the case of GM maize, trade in the crop was conceived and defended by NAFTA as an integral part of the agreement intended to foster the free circulation of goods – which is the main point of reference in the construction of the North American market.

The rhetoric used in this form of justification clearly based on the universal applicability of the laws of neoliberal economics. A good example for this is provided by Major Goodman²⁹ during his contribution to the same international forum on gene flow mentioned above:

‘The key question that needs to be faced for Mexico and, by analogy, for other countries that are the centre of origin for the worlds’ crop species is whether Mexican farmers and Mexican citizens will be allowed the choice to profit from newer technologies and methods’ (italics by the author).

Choice in the exchange of objects with a clear market value is of fundamental importance within market justifications. Devices that are not directly related to a commercial logic are seen to be illegitimate – unless of course they are put in place to help support commoditization processes. A case in point are regulatory frameworks at state or international level that have turned all manner of genes into desirable, saleable, marketable things through intellectual property rights (IPRs), most notably though the intervention of the US government and the World Trade Organization (WTO). Giving a full account of the issues involved is outside the scope of this chapter,³⁰ but it is clear that the commoditization of the vast interior commons (Scott, 1998) did boost the expansion of the life-sciences like genomics, bioinformatics, and proteomics, and provided an incentive for industry to expand. To summarize, within a market regime of justification confidence hinges on the tautological and neoliberal premise that optimal welfare must by definition result from market exchange – in this case, of biotechnology and its food products – managed appropriately under the auspices of the WTO and implemented by the nation state.³¹

How opponents justify their arguments

Alternatives to industrial and market justifications abound. In fact, arguments denouncing the rationalities have always circulated in Mexi-

can society. In the recent past however these arguments have not been very strong. The reason for this is that they were effectively repressed by undemocratic decision-making. Contrary to Canada and the US, no important civil society groups in Mexico were consulted about the terms in which North Atlantic Free Trade Agreement (NAFTA) – and hence GM maize imports – should be implemented. Effective lobbying was curtailed by Salinas' autocratic administration (1988-94), and it is easy to understand that those who were not consulted were the first to experience the negative externalities of a neoliberal NAFTA run wild. Out of this misfortune however, a number of harmed groups arose. It took these groups a long time to identify, confirm and characterize the negative consequences of free trade, but it can now be safely stated that they constructed their identity vis-à-vis market coordination through NAFTA, articulating their own demands and requirements. These groups are increasingly refusing to buy into expert advice or adhere to commercial justifications and fight instead for their right to exercise their voice (Hirschmann, 1970), that is, they are now returning to the public dispute, expressing themselves eloquently and arguing, suggesting, criticizing and participating in a world prematurely robbed from them.

Justifications based on civic equality and solidarity: civic worth

One important type of variable that was excluded from NAFTA deliberations concerned food sovereignty. As we have seen above, market considerations emphasized food security and stressed market competition. In so doing considerations based on solidarity were auspiciously assumed to be irrelevant or of little concern. Yet these considerations, even though considered marginal by national or international political decision-makers, are crucial from the perspective of those whose livelihoods depend on notions of solidarity. It is no surprise that many of the concerns aired against NAFTA and its neoliberal development concept centre around issues of equal access to markets, collective welfare, or the protection of civic rights that were, and are, rapidly being dismantled. A parallel concern links the idea of solidarity to notions of equality. This is the case in situations where food sovereignty is coupled to farmers' right of access to land – an important issue because of the existing, generalized concern that neoliberalism is betraying the achievements of a hard-fought land reform that cost many lives. Various forms of

these civic justifications are found in relation to maize production, and equality or solidarity is often the guiding logic underlying them.

For example, attempts have been made by various farmers unions, producers associations and indigenous groups to connect their struggle against what they see as an unfair situation with similar disputes elsewhere, such as the Movimento Sim Terra (MST)³² in Brazil, *Vía Campesina*, or the wider concerns of the antiglobalization movement led by international high-profile figures like José Bové and Naomi Klein. These connections were especially visible before and during the Cancún Ministerial of the WTO in September 2003. What we see in these initiatives is an attempt by these groups to frame their cause in a language of solidarity between struggles. This is often done during meetings where spokespersons provide testimonies of comparable experiences. This language of solidarity and equality is also evident in local, regional or even national or international-level demonstrations organized against the inequalities and injustices originating in free trade. The high level of participation in these demonstrations, especially in international ones such as the World Social Forum in Porto Alegre, is used as proof that their local arguments are just and supported by citizens on a global scale. In the case of GM maize, farmers and indigenous groups are eager to prove that the public opinion is in their favour. They do so by circulating petitions among lists of groups. These petitions propose food policies that do not depend on imperialist pressures and cleverly articulate with arguments against GM maize, notions of unfair market organization and competition. The composition of these lists is as diverse as possible and the lists are often explicitly presented as silent witnesses of public support to a civic cause.

On other fronts too the importance of collective welfare is apparent. One recurrent issue, for example, is that of biopiracy.³³ Thus one may witness many occasions in which the appropriation of indigenous knowledge and genetic material by biotech firms is denounced. These developments run into direct collision with indigenous notions of intellectual property rights, and lead to resentment and conflicts with indigenous communities who claim their rights against those of private plant breeders or corporations. Closely related to this is the issue of farmers rights with respect to their maize varieties.³⁴ Here, the discontent of local communities, and that of their spokespersons, focuses on the injustice that is done through legislation that is seen to be closely attached to particular business interests, and thus not favourable for public collectivities. In the words of Aldo González, spokesperson for UNOSJO:

‘We have come to where we are thanks to the free production, reproduction and democratic access to the use of seeds; today this right is being crushed and threatened by the genetic manipulation carried out by transnational companies in their labs.’ (La Jornada, 27 October, 2004)

On the question of farmers’ rights, public research institutes also get a cut – as when Mooney, director of Erosión, Concentración, Tecnología (ETC), accused the scientists of the International Maize and Wheat Improvement Centre (CIMMYT)³⁵ of forgetting that their goal was to help farmers, and instead made their research subservient to transnational biotech companies (La Jornada, 27 November, 2004).³⁶

Justifications based on tradition and locality: domestic worth

Another important category of arguments concerns justifications in which traditions, locality and local ties to a specific place are highly valued. In evaluations of this type trust, personal relations, community, and proximity are all considered central building blocks of the common good. Arguments related to these topics are often found in the call by farmers and indigenous movements to protect national, regional or local culture and patrimony. Both food sovereignty and maize are instrumental to this.

Examples of domestic worth are easy to find. They are generally based on the rejection of non-local authority. Rich testimonials from people all over the country focus on the need to preserve a historical patrimony and way of life, and uphold in various ways existing traditions. A case in point is the joint Oaxaca declaration against GM maize, in March 2004, by farmers, indigenous groups, and civil and environmental organizations:

‘Here, in this part of the world, maize was born. Our grandfathers raised it, and were raised by it when they forged one of the greater civilizations of history. The oldest house of maize stands on our soils. From here it travelled to other parts of the world. We are maize people. The grain is our brother, it is the foundation of our culture, it is the basis of our here and now. It stands in the middle of our daily lives. It is in our dishes and in a quarter of all products we buy in the shop. It is the heart of rural life, and an important ingredient of the city. We are maize people. And we are so against all odds, always struggling against the dominant winds. Farmer and indigenous knowledge about maize has always been looked down upon, repressed and forgotten. This has led to the extinction of many native maize landraces developed through the patient experimentation of our ancestors... Blind,

official policy does not take account of the fact that, for us, maize is more than a cereal. Maize summarises our past, defines our present, and provides the basis for our common future.’

These statements linking maize to a common lineage can be heard over and over again, and they are easily associated to the notion of genetic contamination. For example, during a recent declaration on the Genetic Independence of Mexico that drew together social and farmers organizations, scientists and environmentalists, Pedro Turuseachi from the Sierra Tarahumara in Chihuahua proclaimed:

‘Maize is the basis of our life, our culture and our economies. With it, we are born, we grow, we die. Because it’s an open pollinating crop, transgenic maize necessarily threatens our traditional varieties. The contamination of our seed is an attack to the heart of Indian communities’.³⁷

Pedro is certainly not alone in establishing this relationship between transgenes and the threat to a way of life. Consider the words of Elizabeth Pérez, an indigenous woman from Veracruz, who attended the same declaration:

‘Men and women peasants: we have created thousands of varieties of maize of different colour, taste, and size that adapt to all maize fields, be they high, flat, dry, or humid. It has been a creation born out of love and care that we feed and that feeds us. It is the heart of what our ancestors have given us, as well as the main heritage that we have for our children. But now all is threatened by the greed of a few companies who want to appropriate this treasure in order to steal our seed.’³⁸

Implicit in the narratives depicted above there is a reference to ancient, local craftsmanship which gives life to local villages and that is in danger of extinction. As these and similar stories show, just beneath the surface of the account is a rich array of distinct cultures, traditions, and crafts that are highly differentiated across regions. These domestic types of evaluatory frameworks furthermore accentuate the harmonious, quasi-romantic experience of living off the land – that is, a close connection between people and their area, a relationship mediated by maize. This treasured local area is a valued piece of collective heritage, as well as a location of special meaning for the personal biography of those who live there. This pronounced attachment to place gives rise to notions of tradition, *la patria*, or nationalism, and is often presented as equivalent or corresponding to maize and food sovereignty. It does not take much imagination to realize that this type of domestic justifications may also accommodate bellicose tones or outright calls

for resistance, the social movement *En Defensa del Maíz* being a good example for this.

Justifications based on greenness and environmentalism: green worth

Actions and things are worthy in this green regime of justification, when they maintain or reflect the principles of environmentalism. This may include notions relating to cleanliness, non-polluting, renewable, recyclable, sustainable, or in harmony with nature. Justifications based on these notions consider the common good to be intricately linked to awareness and sensitivity to environmental or ecological issues, protection of wilderness, stewardship of environmental resources, and cultivation of various attachments to nature, the land, or the wild (Lamont and Thévenot, 2000). Often, explicit reference is made to future generations, as in the case of indigenous groups that have been living in a specific region for long, and want to preserve their way of life so that their grandchildren can have the same attachment to it. The green order of worth is revealed in distinct ecological qualifications, such as the *criollo*³⁹ varieties of maize which are valued as something that is good for the people growing it, but also for nature as they are important building blocks of special ecosystems not found anywhere else.

At a further level, some environmental justifications depart from the political and moral requirements which are shared by e.g. market, civic, or domestic orders of worth – where common humanity is the group of reference for the evaluation – and propose an extension of the community of reference to include non-humans. An example of this move from anthropocentrism to ecocentrism can be observed in the deep ecology-like arguments used by certain environmental NGOs that value traditional land-use practices not because of their benefit for humanity but because these practices help sustain agrobiodiversity that is worthy to conserve for its own sake. Closely related to this position are the claims often made by local indigenous associations in the states of Oaxaca, Chiapas and Guerrero that it is not so much the uniqueness of native maize that is at stake, but rather the singularity of the entire landscape, wherein maize plays a distinct role – including of course its inhabitants and the special relation these have to the land. This nature/culture continuum is most evident in arguments that ecosystems in which maize plays a vital role are, to a great extent, man-made. Hence, like in the notion of agri/culture, what is conveyed is the idea that the survival of whole ecosystems depends on the ever-

lasting continuation of traditional practices such as shifting cultivation based on indigenous knowledge and culture – a culture that uses but at the same time loves and respects nature. Man and woman, in this ecological portrayal, have metamorphosed from wrong-doers to do-gooders: they are now the noble savage, the guardian of biodiversity! This flirting of indigenous groups with what is perceived as indigenous knowledge and culture is important because of its political appeal in some circles; some local and national left-wing politicians are known to be sensitive to native issues, especially since the Zapatista Revolt in 1994. However, also indigenous groups' special attachment to the land makes them the most legitimate spokespersons for the land and the maize with which it is associated.

Why certainties may be misplaced

The arguments about the role of maize and the people associated with it in Mexican society all involved some type of justification. These justifications illustrated the general value of an argument by strategically articulating with culturally legitimate standards of what is to count as a public good and referring to evaluative frameworks based on equality, free market, green, industrial, or domestic orders of worth, depending on who was making the argument. As argued, these grammars are incommensurable, each one providing the possibility to denounce opposing points of view. This incommensurability does not mean however that differences will subsist, or that reconciliation is forever ruled out. The literature about public controversies speculates that disputes will converge to closure once a best way, an economic optimum or an efficient solution is found, which often means once sound science technology is thrown in.

But how exactly are closure and consensus reached? Here the literature on the topic is less clear, i.e. normativity is given priority over empirical evidence. The pragmatic approach of Boltanski and Thévenot can offer some clues though. Indeed, one of the main pillars in their model is precisely the possibility of reaching agreement between conflicting orders of worth. Following Boltanski and Thévenot, the prospect of finding a middle ground derives from the empirical observation that 'all persons have, on the same day and in the same social space, to use different devices for assessment, including the reference to different types of worth, when they shift from one situation to another' (1999, p. 369). To illustrate this point, let us take the case of, for example, a molecular biochemist who during the same day can have to design

an experimental laboratory test of a new bio-assay, then carry out a discussion with commercial managers about the best technical arguments which can be used to sell a new laboratory protocol, then go to a lunch where a *diputado* is invited, and, at the end of the day, take off his tie and attend the union meeting of the University Union's executives. The same individual can later come back home, be taken to task by his wife for being late and, after that, go to a movie made of a newly discovered, inspired, young director.⁴⁰ As we see in this little example, agents face in their daily lives a whole range of situations in which assessments and moral evaluations need to be continuously made. Interestingly, situations close to one another in space and time must be justified according to different principles. Contrary to the sociology of for example Bourdieu (1984), Boltanski and Thévenot suggest that agents requested to justify their position are fully aware of what they are doing and why. Actors are thus not seen as cultural dopes (Garfinkel, 1967) moved about by forces outside of their understanding. Rather, actors are seen to be competent and capable to draw on different and sometimes opposing regimes of justification in the space of a single day. In the chaotic context of everyday life, it is easy to see that not all justifications fit easily into one and only one order of worth – thus giving rise to the possibility, both theoretically and empirically, of compromise (Thévenot *et al.*, 2000). Compromise is thus based on agents' fundamental capacity to critically but also constructively engage with opposing points of view. Quite simply because they themselves are acquainted with and mobilize the principles of these opposing points of view in their daily lives.

However, nothing seems further from reconciliation than the opposing positions partaking in the debate about GM maize. On the contrary, the last years have shown a harsh polarization between contenders and constructive negotiations or possible compromise seem far-fetched. This is not because of a lack of understanding of each other's positions (all parties involved are acquainted with their rivals' arguments) but rather because the controversy about GM maize is relatively novel, with the parties involved still very busy deploying their arguments. In fact, polarization is taking place precisely because more and more arguments are circulated by the day, each one based on its specific regime of justification.

Yet it would not be surprising if on the middle to longer term some rapprochement takes place. This will not be based on 'letting go of ones ideals', but rather through assimilation of one or more different orders of worth by way of scientific argument and technological prowess.

And herein lies the danger for the anti-GM movement. As the records show usually domestic, civic, or environmental concerns are reduced, de-politicized and made compatible with industrial or commercial goals logics. Although this may arguably point to closure or the reaching of compromise, it would in effect mean that alternative logics have been repressed. How can this be possible? How can seemingly incommensurable orders of worth be joined? To understand the mechanism involved we need to turn not to what makes regimes of justification different, i.e. the principles of moral and political philosophy invoked, but to a specific feature they have in common: their modernist dependence on certainty about the relationship between ends and means.

It is especially this means/ends rationality that is important for my argument here. Following Latour (1998), it would indeed be easy to show how each particular order of worth defines a scale of rights and wrongs on the basis of an instrumental rationality. For example, for proponents of GM maize who frame their argument in terms of a market justification the main issue is that all market participants become rich. The only way to achieve this, they would assert, is through a set of legitimate means: the free and unhampered circulation of goods (among which, of course, GM maize) and services among producers, consumers, and merchants, who enter into a relation with one another as businessmen competing in a globalized market open to all. For them, the final test to determine if the end has been achieved is to assess whether or not additional wealth has been created. Did economic agents seize the opportunities entailed in GM maize through sanctioned means? If so, the common good has been served. If not, market imperfections or state failures are to blame, and precious time and money will have been squandered. As this short example shows, a nearly absolute certainty that a set of means will lead to a final end. But this notion of certainty about the connection between ends and means permeates all regimes of justification. Witness for example the green lobby's conviction that only the noble savage will salvage the purity of Mexico's maize landraces, thus helping bring about a desired end: environmental sustainability.

The present situation thus appears to involve a plurality of certainties on which contenders base their justifications and denunciations. Yet the question is: will this plurality prevail, or will it be ultimately assimilated by some final certainty? Will the arguments of the ill-defined movement against GM maize be reduced, domesticated and absorbed within industrial or commercial frameworks? At first glance, the answer seems clear. The movement against GM maize cannot survive as long

as it clings to the certainties they seem to be so fond of. This would be so, as it is easy to show that a majority of their certainties can easily be assimilated by proponents of GM maize. The easiest certainties to assimilate/absorb are those that are circulated in denunciations made on the basis of an environmental regime of justification. Indeed, many of the denunciations made from the point of view of the environment can easily be accommodated within the industrial regime, making important means such as traditional or indigenous practices and local knowledge and culture quite superfluous for the attainment of environmental sustainability. Thus, for example, the claims and certainties of environmentally-oriented opponents of transgenic maize may rapidly disappear in favour of technologies, equipment, or regulations designed to end or reduce genetic pollution. Genetic Use Restriction Technologies (GURTs)⁴¹ immediately come to mind here, as well as risk assessment criteria and test methods such as polymerase chain reactions (PCRs)⁴² based on the science-based, and thus industrial, justification provided by the concept of substantial equivalence⁴³. As Latour (1998, p. 225) beautifully summarizes it: ‘After the initial cries of horror at the accounts to be balanced, the costs to be met and the equipment to be installed, it is “business as usual” for ecology in the “industrial regime”. Indeed, all the certainties used by the green lobby in launching their criticisms become bleak once the captains of industry can show that potential genetic flow can be managed like any other environmental problem by simply extending the production process and monitoring the “health” of the environment’.

Relatively easy to assimilate, though not uncontested, are certainties involved in the denunciations made on the basis of a civic regime of justification. Stating, as opponents of GM maize do, that collective welfare is the highest goal and that this end can only be achieved through specific means like public institutions, committees, representatives, delegates, or elected officials equipped with forms, decrees, procedures, or any sort of legal criteria, does not automatically imply that those in favour of GM maize will be shunted. After all, those dismissing transgenic maize are among many other lobbyists and their definition of what the highest end of collective welfare or the General Good should be can easily be contested by the general will of democratically elected local, regional or national authorities who claim to speak in the name of all, thereby utilizing the same means as those that are advocated by opponents to biotechnology.

More problematic, but not at all impossible to absorb into an industrial or market logic are the certainties that are cherished within the

domestic regime. The belief that a territory, a heritage, a patrimony, or a local tradition, can best be defended against the evil nature of a deterritorialized, commercial enterprise through the virtues of anything or anyone reliably attached to the locality – ancestors, local *caudillos*, kinship relations, regionalism – has provided some bargaining power vis-à-vis commercial endeavours. Yet the bizarre alliance between conservatives, nature conservationists and conservationists of folklore under the banner of the domestic regime is evidently not infallible. By attacking transgenes one can be at the same time reactionary and modern. The same goes for proponents of GM maize, who can likewise assimilate old and new within an industrial regime. Witness for example the possibility to allow for the experimentation and cultivation of transgenic maize under the framework of the Ley de Bioseguridad de Organismos Genéticamente Modificados (LBOGM).⁴⁴ According to this framework, GM maize can be authorized in geographical areas that fall outside of the areas of origin of the crop.⁴⁵ Notwithstanding the difficulty to establish these areas, science-based zonation in effect squares the arguments of GMO opponents by countering *regionalismo* with even more *regionalismo* in the form of zonation. But other examples come to mind evident in the regulation and certification of some of the products of locality, patrimony or heritage. Examples of this are regional delicatessen with a geographic indication and tortillas sold at Nuestro Maíz or Itanoní outlets. However praiseworthy these initiatives are, it is not unthinkable that in the foreseeable future they too will have to prove through technical or scientific means that they are GM-free.⁴⁶ Perhaps recourse to non-binding international treaties to help protect traditional knowledge and resource rights such as Article 8g of the Convention on Biological Diversity (CBD) or its clearing house mechanism, International Covenant on Economic, Social and Cultural Rights (ICESCR), ILO Convention 169⁴⁷, or Unesco's World Heritage Convention might provide some solace, but evidence suggests that these types of soft law generally do little to nothing in countering commercially-oriented, science-based WTO regulations that are locally sanctioned.⁴⁸

Creative uncertainties

If the broad social movement wishes to escape the fate of being reduced into a commercial or industrial logic then probably the best way to do so would be to abandon the central axiom that it has in common with them: the relationship between ends and means. Indeed, in all the dif-

ferent regimes of justification the main point of reference is common humanity. The main end of all logics that are utilized to distinguish between right and wrong is always an end that is good for humans, according to humans. This common anthropocentric truism makes it possible in all grammars of worth to state with certainty that everything in creation, whether people or things, can be used merely as a means and that only man is an end in himself. That is exactly why the pro-GM lobby has, or will soon have, no problem with their opponents' claims: these can easily be accommodated within their logics because, in the end, it is all about to make the world a better place for humans. Becoming rich (the market regime), taking science-based decisions to reach efficiency and productivity (the industrial regime), professing the significance of collective welfare (the civic regime), emphasizing the importance of whatever is local (the domestic regime), or searching for environmental friendliness so that future generations can make use of finite resources (the green regime). These ends are all compatible i.e. reducible to one another as long as it is humans who will benefit.

The danger of remaining marginal thus looms large for opponents of GM maize. As long as they adhere to modernist certainties favouring a common humanity, their arguments can be reduced and depoliticized. Yet there is hope. Their originality lies not so much in the denunciation of market or industrial forms of reasoning, but rather in the bringing to attention of complex associations between all sorts of beings: beliefs, institutions, politics, regulations, consumers, environments, markets, sciences, traditions, biotechnology, not to mention transgenes. In mobilizing a language of certainty, the social movement against GM maize unfortunately risks being reduced. However, through their practices, fortunately differing from their discourse, the movement adds something new to the controversy, which is difficult to ignore, reduce or accept by those in the business of simplifying: the interrelatedness between all humans and non-human participants in the dispute. More accurately: the originality lies in the impossibility to decide beforehand and without shortcutting due political process what are ends, what are means, and in what form they may be related to one another. In other words, the great novelty of the movement is their ecologizing (Latour, 1998), their practice of deploying uncertainty in the relationship between means and ends – in opening the question, that is, of the status of complex imbroglios in which humans and non-humans become progressively entangled without assuming, *a priori*, that only humans can aspire to the prerogative of ends. Regrettably, opponents of GM maize seem to be hesitant about their practices. They believe these are

denouncing a market, a neoliberal system, or the science of economics, but it is precisely this self-righteous certainty that marginalizes it. As Latour (1998, p. 230) observes more generally about ecological movements, a better grasping of the meaning of their practices would perhaps permit them to finally attain political maturity.

The point here is that the anti-GM coalition could circumvent the potential reduction and de-politicization of their position if they would more resolutely turn to and exploit the many uncertainties attached to the GM maize controversy. In practice they are already doing so, but their over-lucid indictment of all that is morally objectionable has hindered their cause. So what are these practices in which uncertainty is deployed beyond the possibility of reduction? Let us turn to two examples from the introduction of this volume.

The first example concerns the field covered by agricultural policies, peasant livelihoods, and trade liberalization. When GM maize was first launched proponents presumed, backed by the successive Zedillo and Fox Administrations, they would have it their way i.e. hands down. Soon after the discovery of transgenic contamination of local maize landraces however expectations by the pro-lobby turned awry. Before long, the seemingly simple proposition 'GM maize is good for the economy' appeared a fully-fledged nightmare for its advocates. Complexity was growing by the day as opponents countered – term for term – the arguments with accusations that were often based on modernist certainties. Next to these predictable denunciations those countering transgenes started airing a number of anxieties that turned GM maize into an increasingly uncertain enterprise. What to do with the livelihoods of millions of *campesinos* once the market would be flooded with cheap, imported, American GM maize? What to do with the legacy of the Revolution once its ideals – land and liberty – were betrayed? What to do with lost agricultural knowledge once its owners migrated to the U.S.A. for good? How could Mexican *campesinos* compete with American farmers if the USA was heavily subsidizing its agriculture, while the Mexican Administration of the moment was busy dismantling the little subsidy schemes that were left? Why had tariffs not been levied on US maize imports – as NAFTA allowed? Who was benefiting from this? What would happen to the right to food once the country became dependent on its Northern neighbour for its main staple crop? How about food sovereignty instead of food security? What about democracy? Why did Mexican farmers never get access to the negotiations that were preliminary to the signing of NAFTA? What if *campesinos* would betray the corporatist institutions

of the PRI, because the PRI did not care about farmers anymore? What if maize was indeed the capillary system of Mexican culture? These and many more questions arose simultaneously in many corners of the country and soon taken-for-granted matters of fact turned into hotly debated matters of concern. Who would have expected these developments barely half a decade ago? The ingenuity, the creativity of a broad coalition of farmers, scientists, intellectuals, consumers and left-wing politicians made this possible, precisely because they did not buy into the modernist means-ends rationality so heavily defended by GM maize promoters.

The terrain of scientific facts about maize diversity, transgenes, and genetic complexity provides a second good example of the novelty and the creativity with which the anti-GM movement raised a further set of concerns. What is at issue here is that what the scientific certainty proponents of bio-industry wish to achieve comes at a cost opponents are not willing to bear since it frames the controversy in too narrow a way. Here, too, a new set of questions is opened. What is the meaning of the relationship between means and ends when one is talking about maize in a Vavilov centre of diversity? What if the millenary process of fine-tuning and adaptation between farmers, maize and the environments they help sustain is abruptly severed by transgenes? How fit are transgenic maize varieties? What if genetic diversity erodes as a result of the introgression of transgenes? What if it is not the transgenes themselves that bring about genetic erosion, but rather farmers' and consumers' perceptions that landraces could be contaminated, thus possibly causing rejection of these varieties and thus triggering a direct loss of biodiversity?⁴⁹ Will Monarch butterflies, which feed on maize pollen, still have a place to live, or will they have to succumb to Bt insecticides in order to satisfy the wishes of an industry? What happens if travel-happy transgenes cross over and affect *teocintles*, the wild relatives of maize? How to deal with super weeds that have become resistant to RoundUp herbicide? And what if assessing the dangers involved, e.g. through risk management processes, is inadequate because the principles of US agriculture, upon which these assessments are based, do not apply to Mexican agriculture, where genetic, ecological, economic, social and cultural issues and factors are completely different?⁵⁰ Are transgenes as safe as some scientists or the US Food and Drug Administration (FDA) tell us, or are they a cause for cancer and other degenerative and possibly hereditary diseases?

What we see in this stylized presentation of creative but uncomfortable questions is that novel associations between previously uncon-

nected entities attain, once connected, a force of their own. Providing an objective scientific answer to this type of questions will prove difficult if not outright impossible, not solely because scientific evidence about the pros and cons of GMOs is controversial but also because answers involve fundamental political issues that boil down to the question: are means just that, means, or do means have the right to be seen as ends in themselves? It is not easy to decide on these complicated matters, but it is clear that whatever answer is given in the near future will involve a more fair representation of those, both humans and non-humans, who have thus far been repressed by the overpowering certainties of modernity.

Conclusion

In stable situations, different regimes of justification may be alluded to in order to reach closure through compromise. When no compromise can be reached, it is often by means of reduction, depoliticization and assimilation that one grammar of worth achieves worthiness and imposes itself upon others. But in circumstances where innovations proliferate, the number of items to be taken into consideration changes continually and while many of them invoke concerns that cannot be contained by scientific risk assessment a new language, a creative rhetoric, novel forms of justification emerge (Callon, 1998). This is particularly so in the virulent disputes surrounding genetically modified organisms (GMOs). A typical example is the controversy over GM maize in Mexico. Since the social movement against transgenic maize does not know how genes, environments, policies or people will behave in gene flow situations, a re-politicization of the debate has ensued. Indeed, in the dispute clashes between certainty and uncertainty proliferate, and what is at stake is not a mere settling of issues on which there is no previous, generalized consent. Rather, the controversy involves the political and moral question of who and what may aspire to the prerogative of ends. That is, whether or not previously marginalized farmers, consumers, genes, or ecosystems are something more than merely a means in the achievement of a particular collective good, commercial or industrial. What we are witnessing is thus the emergence of an entirely different playing field as anything done involves unexpected consequences.

Interestingly, the completely unexpected feature in this controversy is an outright attack on the idea that science, technology or economics will provide the certainties needed, e.g. in the form of efficient

end-of-pipe technologies, economic optima or means for ends. This is very problematic in cases with high moral and political content such as genetic modification, as Latour (1999, p. 243) argues ‘if there is one thing that does not require an expert and cannot be taken out of the hands of [the lay people], it is deciding what is right and wrong, what is good and bad.’ Expert knowledge may indeed be an effective instrument to shortcut due political process and keep the crowds at bay, but it does not provide any guidance whatsoever on the issue of how to live one’s life, or in what world one wishes to live. Indeed, and so the practices of opponents to transgenic maize show, the problem with proponents’ views is that just around the corner of every scientific, technical or economic certainty there is an uncertainty looming large. As the GM maize controversy suggests, such situations are probably the rule and not the exception. Instead of extinguishing moral and political fires science, technology and economics generate uncertainty and even outright ignorance.⁵¹ But ignorance, uncertainty, or a lack of consensus does not necessarily lead to paralysis.

On the contrary, as in the case of opposing GM maize, uncertainty opens up a range of new moral, ethical and political spaces. What I mean to say here is that the politics of the anti-GM movement change indeed by aligning against the marginalizing closures of modernist epistemological certainty. While proponents of genetic engineering had certainty and objectivity on their side, those hostile to GM mobilize all the opposites: uncertainty, open-endedness, and the inability to differentiate between subjective and objective. The broad coalition against GM is practically turning these qualities into their guiding principles. Although they do not do this yet self-consciously, it shapes an order of justification and allows its participants to foreground what was put on the backburner or repressed before. In so doing, they are stirring up politics by the simple fact that many important actors like consumers, academics and farmers, are now keeping up sufficient doubt about the assurances of the pro-GM lobby. Indeed, the neoliberal tendency to justify the elimination of Mexico’s cultural and agrobiological diversity on the basis of the assumption that they are hindering development is slowly but steadily making way for alternatives demanding that maize and the peasant way of life be respected and assessed through evaluative frameworks that do not take market values as the only benchmark. In these alternatives, farmers and their beliefs are not anymore an anachronism. Local maize landraces and the environments they are a part of cannot be seen as part of a natural history museum and genes are not anymore entities one can switch on and off at will. Rather, these

elements have become virtuous, a collective good worthy of a place of their own.

In contrasting their practices with commercial justifications, the social movement against GM maize shows that farmers, genes and a host of other entities that have become progressively entangled in the controversy attain a new identity once it becomes uncertain whether they are simply means in the schemes of others, or fully-fledged ends in themselves. These more ecological identities contrast sharply with neoliberal and reductionist narratives and prevent that cultural and agrobiodiversity be treated as contingent externalities of an inevitable process of technical and economic development. Instead, by putting uncertainty on the agenda, collective ecological identities demand renewed attention and political space. What was repressed through simplification, peasants, maize, genes, beliefs and so on, forcefully returns on the national and international agenda. By attaching their destiny to the principle of uncertainty, the repressed may be able to construct for themselves a new collective identity. In the process they may achieve a complete metamorphosis, and evolve from what had to be given up to what has to be cherished and respected on its own terms. The repressed have returned, and they are here to recover their future.

REGIONAL MAIZE MARKETING INITIATIVES

LAUREN BAKER

Introduction

Walking through the door of the Itanoní Tortillería in Oaxaca, the first thing to notice is the large *comal*, or clay stove. On the *comal*, maize landraces⁵² grown by regional farmers are prepared into culinary specialities. On the menu are tacos, *quesadillas* and *memelas*, dishes commonly found in other tortillerías. More unique are dishes such as the *tetela espirituosa*, a tortilla folded into a triangle and filled with beans, cream and *oja de santa*,⁵³ inspired by the snacks made by the grandmother of one of the restaurant's owners. Maize drinks such as *atole* and *tascalate* highlight the distinct flavours of maize grown by farmers in four regions of the state. The Itanoní Tortillería is reclaiming and recreating the cultural and culinary food practices of Oaxaca through a focus on maize landraces prepared into regional specialities. The menu items are designed so that the consumers taste the different flavours of maize used in each dish – flavours that embody the cultural and ecological niches that have allowed maize diversity to flourish in Mexico.

The Itanoní Tortillería is one family's effort to address the loss of maize agrodiversity. The *tortillería* owners believe that through the act of eating and the experience of tasting maize's diversity, urban consciousness about agrodiversity and the plight of Mexican maize producers can be raised. By educating customers about the individual characteristics of maize landraces, the restaurant aims to develop an appreciation and

market for agrodiversity. Through these efforts, a group of Oaxacan farmers is supported to continue producing the maize landraces they have grown for decades, shift to organic and ecological farming practices, and diversify their production to grow other products needed by the restaurant.

Nuestro Maíz is a rural development project coordinated by a national producer network, the National Association of *Campesino* Marketing Organizations (ANEC)⁵⁴. The project adds value to maize grown by around 200 small and medium scale producers by making tortillas, which are then sold to local communities. ANEC, through projects like Nuestro Maíz, seeks ways to make peasant agriculture economically and socially viable and engage in policy processes that affect the lives and livelihoods of small and medium scale producers (Acuña Rodarte, 2003). Both the Itanoní Tortillería and Nuestro Maíz try to extend the once-daily household practice of making tortillas into the local market through community-based enterprises as a way to create viable livelihoods for Mexican maize producers and protect maize agrodiversity.⁵⁵

The Itanoní Tortillería and Nuestro Maíz initiatives are local food networks linked to broader agro-food movements. These movements use multi-scalar strategies to address the social, economic and environmental costs of the industrial food system and global trade regimes, as well as to regenerate local food systems. Diverse in their focus, they encompass efforts to improve food safety, link consumers to producers, encourage local food consumption and greater food self-sufficiency, address hunger and poverty, and promote sustainable agriculture (Pretty, 2002). Food movements have been described as political spaces that engage people in democratic, everyday and counterhegemonic practices (Escobar, 2004). Articulated as struggles for community food security (primarily in North America) and food sovereignty (primarily in the global south),⁵⁶ agro-food movements expand conventional definitions of food security from a focus on access to nutritional requirements to include the importance of culturally appropriate, sustainable produced, socially just food production, procurement and consumption.

As has been illustrated in the two previous chapters of this book, the discovery of transgenic maize and the resulting public debate have been a catalyst for both farmer groups and civil society organizations to organize local, national and international campaigns that address the intersecting issues of biotechnology, biodiversity and food security. New biotechnologies and global trade relations have impacted the most marginalized sectors of society and have, in some instances, resulted in

creative strategies to mitigate these impacts. This chapter examines two initiatives undertaken in the states of Oaxaca and Puebla to build local markets for traditional varieties of maize, or landraces. These initiatives combine strategies to conserve maize agrodiversity, sustain ecologically viable livelihoods, and improve food security at the household, regional and national levels.

The Itanoní Tortillería and Nuestro Maíz link maize producers to consumers in their region through a local food network. They illustrate the diverse ways in which new actors are responding to address maize agrodiversity conservation and food security by using strategies that reclaim culinary practices, improve rural production methods and focus on taste and quality. Both projects are examples of how commodity markets are not homogeneous, how the commodification of food is contested by everyday practices, and how people are claiming space for alternative economic activity (Leyshon and Lee, p. 2003) that embodies social and environmental values. At the same time, their activities are embedded in global capitalist processes that are shaping, for example, grassroots responses.

In this chapter the author draws on the political ecology literature to theorize the case studies and their agrodiversity conservation and food security. Political ecology offers new prisms through which to tell stories about the ways humans and the environment intertwine and co-create one another as well as interesting possibilities for describing global-local complexities. Cultural politics of agrodiversity conservation and food security are of interest as they are enacted at the level of daily life, and result in new political cultures and public domains (Escobar, 1992, p. 83). The spaces in which these actors articulate their demands have stretched beyond traditional civil society-state realms of interaction. The local food networks described in this chapter are examples of new spaces where organizing and acting to address issues of agricultural and dietary transformation occurs. The diverse actors involved in these efforts, including local communities, civil society organizations, government policy and non-human actors, articulate the cultural and ecological importance of maize. First, the political ecology of maize agrodiversity conservation are discussed. Next, the case studies with a focus on the networks created will be described and the strategies contributing to the preservation and politicization of maize agrodiversity. Finally, the potential for and challenges faced by these efforts will be discussed.

The Political Ecology of Maize Agrodiversity and Local Food Networks

Maize in Mexico is a highly politicized food item with deep cultural and spiritual meaning, intricately connected to the colonial history, as well as to culinary and agronomic resistance (Lind and Barham, 2004). Tortillas made from maize are a staple part of the Mexican diet. The shifting politics of maize has been called the tortilla discourse and encompasses nutrition, agriculture, trade and urban food security policy as it has changed and been adapted over time. As Jeffery Pilcher states in *Que Viven los Tamales, Food and the Making of Mexican Identity*:

The tortilla discourse correctly recognized maize as the root of self-supporting communal life, and thus a barrier to modernization, although for cultural rather than nutritional reasons. Nevertheless, the ultimate incorporation of peasants into the national economy came not through the elimination of maize, but rather through its commodification. Once maize had changed from subsistence crop to market commodity, *campesinos* had no choice but to follow it into the modern world (1998, p. 97).

As Pilcher describes, Mexican producers are following their maize into the modern world. An examination of these paths illustrates the ways that policy processes, social relations, farmer management practices, culinary traditions, cultural significance and civil society organizations, among others, are entangled and interrelated in the story of maize.

Mexico is the centre of origin for the agricultural biodiversity of maize. This leaves the country with the responsibility to conserve and protect maize diversity for global food security, and the government has acknowledged this responsibility by signing global agreements such as the Convention for Biological Diversity (CBD). This does not mean that there are not conflicting approaches to biodiversity conservation, as well as conflicting notions of the importance of maize agrodiversity to global food security. These conflicts are widespread, and can perhaps most clearly be seen in the disconnect between agrodiversity conservation programmes and trade policy.

The centre-of-origin concept links ethnocultural diversity to the diversity of cultivated plants. A dense and complex web of social and ecological relations support and nurture food crop agrodiversity. Central to this web of relations is the knowledge, preferences and practices of Mexican farmers who developed and maintain maize diversity, as well as the political factors that shape global food security (Fowler and Mooney, 1996).

Maize cultivation is varied and diverse. The geography plays a central role in determining the ways that maize is cultivated. Small plots of land from 3-5 hectares large cultivated by small-scale farmers represent an incredible resource of agricultural biodiversity. These small-scale farmers manage the 59 maize landraces and produce about half of the national demand for maize. Maize production differs from farm to farm and region to region reflecting farm size; geographic location and climate; access to inputs; market access; farmers' choices; agricultural policy; access to irrigation; as well as cultural, and religious and culinary practices. Maize diversity is conserved and perpetuated by small – and medium-scale farmers in ecologically diverse regions. Central to the agrodiversity conservation are the many household and culinary uses for maize that depend on varietal diversity, as well as national and international ex-situ and in-situ conservation strategies.

Maize diversity has shown to be extremely important for global agriculture through its ability to supply germplasm or genetic resources that contribute to modern plant breeding and the development of hybrid varieties (Fowler and Mooney 1990). It is particularly important for improving the yield or supply of maize, as well as for selection for resistance to drought, disease, and nutritional deficiencies. This importance is compounded by the global importance of maize as a cereal crop, attributed to the high levels of yield that can be achieved per plant or per hectare. Maize is adaptable to diverse environmental and agronomic conditions, which led to its relatively easy spread and acceptance globally. An equally important characteristic of maize is the number of ways it can be adapted to different culinary and industrial applications. Maize diversity continues to evolve under the management of small-scale producers. In this sense, maize agrodiversity is not fixed or static, but can best be described as a flow of genetic resources (Paczka, 2003, p. 125-27).

Reflecting the management practices of the farmer and community, as well as the local ecology of the farm field, maize agrodiversity expresses astounding genetic variability. For at least 9,000 years farmers have been selecting maize seed in their field and storage houses to express traits that include disease resistance, colour and taste, grain quality, tolerance to acid or saline soils, resistance to drought, freezes or strong winds, and variable harvest time. Maize is an open-pollinated crop. Maize pollen can be spread easily by the wind, and has been found kilometres from the field in which it is grown. For this reason, maize is said to be promiscuous. Because of this, tendency of maize is to revert to a homogeneous entity through cross-pollination. Farmer

management practices – the act of carefully sorting through seeds from year to year, avoiding hybrid varieties and selecting certain traits – has ensured on-going diversity and distinction between landraces. The open-pollinated, promiscuous nature of maize ensures gene flow among landraces that strengthens the genetic diversity. These counter-acting agronomic characteristics of maize (flow) and farmer management practices (selection) work together to manage the gene flow and maintain diversity (Mann, 2005, p. 219).

The co-evolution of maize and Mesoamerican cultures has led some to call maize a cultural artefact (Warman, 2003, p. 233). Unlike most other crops in their centre of origin, maize is dependent on humans for seed propagation. This has been described as a mutually beneficial partnership between farmers and maize (Pollan, 2005). Broad ethnocultural differences across regions of Mexico, as well as the specific contributions of communities, families, farmers, and women contribute to maize agrodiversity. Community and individual practices surrounding seed selection and sharing play an important role in maize agrodiversity. For example, women's attention to the culinary qualities of maize means that their seed selection favours specific traits and characteristics. Different communities and families grow specific varieties and colours of maize for tortillas, animal forage, snacks, etc. Distinct culinary and agricultural use is often related to cultural and ecological diversity. Different regions, as well as farmers, have become known for excellent seed. These seeds are shared outside that region. The contribution of cultural diversity to maize agrodiversity can be seen in terms of the general characteristics and practices of distinct ethnocultural groups across the country, but also as the diverse practices within and across these communities as individuals and families adapt maize usage to their particular farming systems and social relations.

Simultaneous to the physical evolution of maize in Mesoamerica, was the invention and experimentation with numerous uses for maize. The tortilla is just one culinary example of the many ways maize is transformed into food and drink. 'Only recently have we started to explore, through research and production, the enormous richness of traditional uses of maize that are fundamental to the survival and flourishing of our culture and conditions of life. Mexico is not only the centre of diversity for the biological forms of maize, but also its ways of use, which need to receive more attention' (Paczka, 2003, p. 128). Culinary practice is related to cultural diversity. However, the specific culinary techniques invented and used by Mesoamerican cultures and their continual adaptation throughout history has perpetuated maize agrodiversity.

The connections between culinary use and diversity have been largely ignored in agrobiodiversity conservation strategies, and are beginning to be recognized as important. These culinary practices are threatened by the global industrial food system that tends toward the homogenization of agricultural products through monoculture agricultural production and long-distance, standardized distribution systems.

Maize diversity is also dependent on culinary and agricultural practices that span different scales of ethnocultural and ecological difference. On the one hand, diversity is managed by farmers who understand the maize varieties that produce well in their region and fields. Neighbouring communities, however, often trade and share seeds, resulting in new mixtures and varieties. Farmers state the importance of introducing new genetic resources into their fields from time to time. Populations of maize, however, despite these practices, are kept distinct through rigorous seed selection practices in the field. This practice of mixing and selection has played an important role in maize agrobiodiversity. The traditional intercropping system of the *milpa* and the use of maize as a subsistence crop results in particular practices unique to small and medium scale farms. The micro-diversity across a farmer's land is a contributing factor. For example, a farmer might have several plots of land where different varieties of maize are grown depending on agro-ecological conditions. Farmers grow different maize varieties in case of drought or excessive rains. Often several varieties of maize will be grown by one farm family – for daily culinary use, special culinary use (for festivals and celebrations), for forage and for construction materials. The productive area surrounding the farmer's house represents another ecological niche, and is managed and planted differently than plots farther away. Niche environments across regions and scales, in combination with broad topological diversity, have led to the conservation and improvement of maize diversity over time.

Zimmerer describes regions where cultural diversity and biodiversity thrive as 'hybrid-rich landscapes' (Zimmerer, 2000, p. 360). These landscapes are networks of people, plants, animals, economic activities, and conservation processes and policies. Invoking the metaphor of overlapping patchworks Zimmerer illustrates how concepts from non-equilibrium ecological science such as flux challenge more static concepts such as scale. Zimmerer's work demonstrates how current conservation strategies are proliferating nature-society hybrids and can be seen as reworking capitalist modernity in the sense that they often promote market-oriented solutions to conservation. Looking to landscapes-in-use that are 'suited to social and political movements', Zimmer

suggests 'the making of today's conservation territories belongs fully to the production of nature and space. The environmental politics of social and political movements considered in conservation, such as the peasants leagues and indigenous organizations... must be appreciated in these transitions' (Zimmerer, 2000, p. 360). The examples of Itanóni Tortillería and Nuestro Maíz reflect the proliferation of nature-society hybrids, simultaneously contesting and reflecting dominant models of economic organization.

The socio-cultural importance of maize, and the agroecological importance of maize diversity for global agriculture, have meant that agronomists, geneticists, crop improvement specialists, ethno-botanists, farmers, activists and rural development workers have been working to document, categorize, conserve and promote maize agrobiodiversity since the early 1900s (Paczka, 2003). The Green Revolution, representing a key moment in this history, was initiated in Mexico by the Rockefeller Foundation to improve agricultural efficiency. The focus on developing high-yielding varieties of maize (and wheat), led to the intensification and industrialization of agriculture around the world. In the 1970s, following several decades of systemic collection and documentation of maize, there was a renewed interest in maize agrodiversity. This interest had its roots in three issues. First, a blight attacked maize in the United States leading researchers to seek resistant varieties of maize from Mexico's enormous reservoir of maize genetic diversity. Second, maize improvement programmes were seeking to improve the production of small-scale producers in rural Mexico, as part of a political programme to address social and economic transformation in the Mexican countryside. This led to recognition that Mexico's genetic resources were not adequately represented in the germplasm banks. Third, there was a resurgence of interest in maize agrodiversity and ethnobotany due to the work of Hernández Xolocotzi at the Universidad de Chapingo (Paczka, 2003, p. 125). The work of Xolocotzi inspired a new generation of research on maize agrodiversity, and a renewed interest in the importance of small-scale farmer's agricultural practices among researchers.

This renewed interest in maize agrodiversity led to the development of in-situ (in the field, managed by farmers in partnership with researchers) and ex-situ (seed bank) conservation strategies. The characteristics of maize, if conceived of as a flow of farmer knowledge and genetic resources, begs the question of the appropriateness of seed banks as a way to conserve maize diversity. Indigenous communities have criticized seed banks as a technical and scientific solution that leads to the

dependency and alienation of these communities (Ribeiro, 2004, p. 9). Collections of maize samples have been shown to be ineffective over time. Indeed, Arragon Cuevas, a maize agrodiversity specialist at the National Institute for Agricultural and Forestry Research told the story of how several varieties, taken from seed banks back to where they had been collected, failed to germinate and produce due to changes in the environmental conditions of the area (personal communication, 8 February, 2006).

The impact of neoliberal economic policy on the agricultural sector has been extensive and far-reaching. Agriculture and food policies have always had an impact on maize agrodiversity. In the post-revolution era, the administration by the Partido de la Revolución Institucional (PRI) pursued economic policies based on self-sufficiency and national food security. The rural vote was linked to policies that subsidized subsistence food production (Fitting, 2006; Appendini, 1996). The programmes put in place since 1940, however, were dismantled with the embrace of the neoliberal agenda in the early 1980s. Free trade and neoliberal policy can be traced to 1982 and the policies of the Miguel de la Madrid government (Fitting, 2006, p. 16). When Mexico defaulted on its foreign debt payments in 1982, a neoliberal policy framework, characterized by privatization, deregulation and trade liberalization, was imposed by international lending institutions. Under the administration of Salinas de Gortari (1988-94) the agricultural sector underwent reform. These reforms radically restructured the Mexican countryside by eliminating food and agricultural-input subsidies, liberalizing imports of agricultural goods, reducing the scale of publicly funded farm credit and technological assistance, and privatizing communally held *ejido* lands (Preibisch *et al.*, 2002, p. 69). By signing the General Agreement on Tariffs and Trade (GATT) in 1987, joining the Organization for Economic Cooperation and Development (OECD) and signing the North Atlantic Free Trade Agreement (NAFTA) in 1994, the country consolidated its neoliberal agenda.

Despite what some have called the assault on Mexican *campesinos*, subsistence production and maize production has remained stable since 1994. This paradox speaks to the many extra-economic reasons that people produce maize in the Mexican countryside. Maize is valued for cultural and spiritual reasons – for example, its taste, use, and agroecological contribution in the field. As rural people become more economically insecure, they grow maize for its contribution to household food security (Escobar Moreno, 2005).

Henriques and Patel, researchers at Food First, The Institute for Food and Development Policy, explain this paradox in the following way (Henriques and Patel, 2004, p. 5). Small-scale producers lack options and resources making it very difficult to consider changing their production practices. Instead of diversifying their crops, farmers tend to intensify their production practices, putting additional pressures on the land and labour. Not only is the land under cultivation used more intensively, but farmers apply more pesticides and fertilizers to increase yields. More land is sought to cultivate, placing pressure on the surrounding environment. Farmers recognize maize as a risk-adverse crop – one that is safe to grow with predictable harvests – another reason maize production has remained stable. In addition to being a reliable crop, maize is also a staple food in the diets of rural Mexicans. If small-scale producers have limited money to purchase food in the market they will continue to grow their own maize. Because different varieties of maize are used in community and family celebrations, rituals and ceremonies, as well as for distinct dishes, rural families choose to grow specific varieties of maize, many of which are not available at the market. Finally, farmers choose to continue growing maize because there are few viable crops that will fetch a good price at the market. This is because there is wide availability of imported crops available for a relatively inexpensive cost.

The case studies I describe in the following section are two of many initiatives being implemented by civil society actors to mitigate the impact of neoliberal policy and free trade on agrobiodiversity and food security. Activists have created networks ‘in defence of maize’ and campaigns to educate Mexicans about genetically modified maize. Maize producers have diversified their production, organized collectively, made contracts with the maize processing industry and are creating value added initiatives. Advocates such as Victor Suarez, executive director of ANEC are working in the Camara de Diputados to implement laws that protect and mobilize maize producers (Perez, 2006, p. 58). The economic and social impacts of neoliberal economic policy and the corresponding changes in Mexican agricultural policy has led to some creative efforts to mitigate the impacts.

Two Regional Maize Marketing Initiatives

Itanoní Tortillería and Nuestro Maíz politicize, engage with, and reveal different aspects of agricultural and dietary transformation. The practice of making tortillas, once a daily household activity in much

of the country, has been largely replaced by tortillas made from maize flour, as opposed to *masa*, or maize dough. As the tortilla making process was industrialized, tortillerías stopped using the Nixtamal process, a Mesoamerican culinary invention that transforms the nutrient content of maize to enable nutrients to be better absorbed by the human digestive system. The Nixtamal process involves soaking maize with lime⁵⁷ which separates the exterior layer of the grain, plays an important role in the breakdown of lipid content of the maize, and releases fatty acids and proteins for human consumption. The soaked maize is ground into *masa* or maize dough, which is used to make a variety of dishes and drinks. Tortilla production, since the mid 1970s, has replaced the *masa* with ground maize flour, which is nutritionally inferior (Rivera, *et al.*, 2004). The informal market has responded to the Mexican people's ongoing appreciation for maize products made with *masa*. *Tortilleras* can be found in all markets and sometimes outside of supermarkets, offering homemade tortillas. However, as people's consumption practices become integrated into the global economy and they shop more frequently at supermarket chains, the purchase of tortillas made from maize flour has increased. Currently, 49 per cent of tortillas consumed are made with maize flour, the rest are made with *masa* (Ocampo, 2007).

Itanoní and Nuestro Maíz, in different ways, are catering to, and attempting to nurture, a market that appreciates Mexican maize, a trend that has connected culinary and nationalist discourses since the 1940s (Pilcher, 1998). Pilcher describes how urban interest in regional Mexican culinary specialties is related to the emergence of post-colonial nationalism and Mexican identity. Both initiatives are reclaiming the Nixtamal process in their tortilla production. In the case of Itanoní, this is being done through small-scale technology and traditional methods. In the case of Nuestro Maíz, this is being done through the industrialization of the process.

In the era of free trade, corporate globalization, and genetically modified maize, it is interesting to find evidence of the re-emergence of this trend in the tortilla sector. The trend, however, represents a small niche market when compared to the tortilla sector's domination by large corporations such as Maseca. Itanoní and Nuestro Maíz are not alone in their promotion of tortillas made from Mexican maize. It is not difficult to find neighbourhood Tortillerías advertising that they use '100 per cent maíz mexicano.' Even larger corporations use images of the *milpa* in their advertising, as the concept has strong cultural symbolism.

Itanoní and Nuestro Maíz are examples of local food networks. These networks are described and elaborated in the following description of the projects. Separate from the network linking producers to consumers, both of these initiatives are strengthening networks with broader social movements, civil society organizations and researchers. In particular, Itanoní and Nuestro Maíz are loosely connected to other biodiversity conservation efforts, such as seed banking, agrodiversity education, networks of agronomists and plant geneticists and anti-GM social movements.

Nuestro Maíz

Nuestro Maíz is a project of ANEC, which has two goals. The first is to revalue peasant agriculture, a goal that ANEC views as economically and socially viable, essential for national food security and for the conservation of biodiversity. The second is to engage in policy-making processes that affect the lives and livelihoods of small and medium scale producers (Acuña Rodarte, 2003, 142-43).

ANEC is a direct response to the structural changes that took place as neoliberal economic policies were implemented in the rural sector. As the Mexican government withdrew its support of agricultural activity and rural economic development from 1985 to 1994, producer groups and organizations began organizing in the vacuum of this withdrawal. The *Compañía Nacional de Subsistencias Populares* (CONASUPO), the state-run agency that monitored and supported the basic grain market was dismantled by 1998, forcing producers to create their own channels to market their harvest. The enterprises that emerged from this process are known as Peasant Commercializing Enterprises (ECC). These enterprises addressed social and economic issues arising for producers including mutual support, democratic participation, leadership training, cooperative management as well as seeking out the best market prices for grain, interest rates for producer credit, and programmes to increase efficiency (Acuña Rodarte, 2003, p. 139). In 1995, as leaders from the ECC were mobilizing to address agricultural policy, ANEC was formed to coordinate the dispersed activities of the ECCs around the country and to produce coherent policy proposals to be presented to the government.

The ECCs develop commercial channels for basic grains including maize, sorghum, beans, wheat and some other crops from production to processing. For example, the ECCs purchase maize from associate producers, pool it with the maize of other producer groups in local

and regional ECCs around the country, and sell it on the market when prices are at their highest. Credit is secured and agricultural inputs are also purchased in bulk for the participating producers.

A substantial infrastructure is required for this activity, and through ANEC's political connections and lobbying efforts, this infrastructure has grown. Approximately 180,000 small and medium scale grain producers are members of over 220 ECCs in 20 Mexican states. In recent years, 600,000 tons of maize was collected and traded through 135 grain warehouses. In total, ANEC trades an estimate of 10 per cent of Mexico's production of basic grains, earning producers a price premium of 10-15 per cent (Acuña Rodarte 2003, p. 141). This activity is dependent on suitable storage and warehouse facilities and 110 collection centres were acquired from the federal government as CONASUPO was dismantled.

An umbrella enterprise Integrated Storage and Commercialization System of Mexico (SIACOMEX) has been created by ANEC to coordinate grain collection and trade at the national level and to facilitate access to larger markets. Leadership training, commercial support, market information, technical assistance is provided along with grain marketing. ANEC's producers have created an alternative market for their agricultural products, as well as developed some innovative programmes to support producers.

One example of this is solidarity markets, which support regions that are experiencing production shortfalls due to drought or other environmental or social factors (Aguirre Alonso, personal communication, March 2006). Grain is supplied directly to those regions from ECCs with a surplus to ensure regional food security. This solidarity work expands from across Mexico into the international realm with ANEC's affiliations and collaboration with national and international producer and rural organizations including Mexican coffee farmer and rural credit organizations, producer groups across the Americas, and transnational organizations such as La Via Campesina, the InterAmerican Agriculture and Democracy Network and the Global Peasant Agriculture and Globalization Network (Proceros, personal communication, February 2006; Acuña Rodarte, 2003, p. 142).

ANEC has also had some success in influencing Mexican agricultural and rural policy decisions, although the overall direction of government policy has not been shifted. Most significantly, ANEC convinced the government to charge tariffs on above-quota imports of maize, beans and sorghum from 2000-2006 and defeated a Fox administration motion to decrease the agriculture budget, winning an increase of

more than \$400 million (Acuña Rodarte, 2003, p. 144). Perhaps most importantly are the numerous policy documents and proposals written and put forward by ANEC to influence agricultural and rural policy. These documents might not be accepted by federal policy makers, but widen the dialogue. The internal challenges faced by ANEC as an underfunded, non-profit organization working to support small and medium scale farmers are dwarfed by the formidable challenge of renegotiating NAFTA, addressing the dumping of US grain on international markets and shifting Mexican agricultural and rural policy.

In 2002 a group was created to look at various ways to add value to the maize produced by member producers (Jeffre Proceros, personal communication, February 2006). Studies of various sectors were conducted including ethanol production, maize oil and syrup. ANEC established that they did not have the technical capacity, the necessary financial capital, nor the organizational capacity to start a project of this scale. Instead, they decided to start a tortilla project. This was the birth of *Nuestro Maíz*. In Mexico, the tortilla market has a value of four million dollars annually, and the project represented a way to develop ANEC's rural development and agroindustrial objectives.

The *Nuestro Maíz* project has established producer-owned facilities that industrialize the traditional tortilla making process, including the Nixtamal process. *Nuestro Maíz* works with nine organizations that are part of ANEC's wider network in as many Mexican states, involving approximately 2200 associate maize producers. Tortilla production began in 2003 and adds value to the producers' maize by transforming it into *masa* that is distributed daily to a network of tortillerías that sell freshly produced tortillas to the surrounding communities. For ANEC, *Nuestro Maíz* is a rural enterprise development project that addresses a number of social and economic issues. For the producer organizations, the project represents a way to add value to their maize crop, enabling them to continue maize production. For the tortilla customers, the tortillas made from local maize allow them to support the farmers in their community.

Nuestro Maíz has 17 Nixtamal plants and a corresponding network of over 200 Tortillerías. 600 workers are employed by the project, 70 per cent of whom are family members of the producer groups. 'It is a circle involving *campesino* organizations, a commercial project, the generation of added value for maize and the creation of employment, all in the same community.' The project is primarily funded by the government programme *Allianza Para el Campo* (Alliance for the

Countryside) with loans to build the necessary infrastructure and grants for capacity building and technical assistance.

Each producer group grows maize that it sells to its own central warehouse. Instead of selling the maize as grain, it is processed and sold as tortillas. A kilo of maize is worth 1.5 pesos on the market. If the same kilo of maize is made into tortillas it can be sold for 10 pesos. The goal of the project is to add value to 50 per cent of the associate producer's maize. Right now, the volume is still quite small, most of the maize produced goes to the conventional market.

Nuestro Maíz distinguishes itself in the competitive tortilla market by focusing on branding the tortillas as 100 per cent Mexican maize, and emphasizing the quality, cleanliness and purity of their tortillas.

We asked ourselves, 'What do we need to do to start selling tortillas?' The market for tortillas in Mexico is already saturated. We don't need more Tortillerías. But, Tortillerías in Mexico are unhygienic, disorganized, without any standards. We thought about developing a *tortillería* model that addressed these issues. That processed the maize of our associates that used the pre-hispanic process of maize, water and calcium, which did not use glues, additives or preservatives. And it would be something that the regional organizations could administer. So we created the Tortillerías of Nuestro Maíz.

They are also expanding their products and will be opening a plant that produces snacks and maize sweets.

All producers participating in Nuestro Maíz grow maize as well as other crops. In the San Antonio Atotonilco region in Puebla state,⁵⁸ some farmers are also growing squash for the seeds, as they are a popular local snack and a fetch a good price on the market. The 38 producers who are part of this local producer group have anywhere from three to 40 hectares under production. Production methods are conventional. Agricultural inputs such as chemical fertilizers, pesticides and herbicides are used by the farmers. Agricultural extension, fundraising, administrative support and maize improvement initiatives are facilitated by the central Nuestro Maíz organization located in Mexico City. The participating producer groups own the local technology and share the profits and risk of the Nuestro Maíz business amongst themselves.

The industrialization of the Nixtamal process has presented several challenges for Nuestro Maíz. The same maize landraces that the project wants to conserve have proven difficult to work with. Consumers, used to tortillas that are a particular colour (white), and particular texture (that hold together under a moist *guiso* or filling), have complained about the heterogeneous characteristics of the Nuestro Maíz tortillas, as

they reflect the particular batch of local maize. The colourful diversity of the maize landraces grown locally clashes with the homogenizing tendencies of consumer demands and industrialized processes. The associate producers in the project, to address this problem, are planting hybrid varieties of maize with their maize landraces to improve the uniformity of the grain. Nuestro Maíz has instituted a rigorous crop improvement programme, working closely with agronomists and crop improvement specialists to improve the maize landraces used by local producers. Jeffre Proceros, director of the Nuestro Maíz project for ANEC describes this issue.

The Nuestro Maíz model surfaced from the threats to and importance of *criollo*⁵⁹ maize in Mexico. When *criollo* maize is used by *campesino* families to make tortillas – a few each day – it functions very well. But when you take this maize to an industrial process, it doesn't function in the same way. We created the industry, the infrastructure, and then realized that the primary material was not adequate. But we already had the enterprise installed, we already had the Tortillerías, the plant, the vehicles, everything. The *criollo* maize functions very well when a *campesino* woman uses it to make tortillas daily for her family. But when it is processed in large quantities, it doesn't function the same way. So we had to find a way to resolve the issue of the maize quality. We are working with INIFAP (National Institute for Forestry, Agriculture and Fisheries Research) to improve the varieties of maize grown in each region. We are improving the *criollos* so they can be used in the *masa* and tortilla industry. But there are places where we've had to change the *criollos*, and so we what we are doing is producing hybrid maize ourselves, for our Nixtamal plants (Jeffre Proceros, personal communication February 2006).

Nuestro Maíz works with farmers to improve their farming systems, with a focus on maize crop improvement and the introduction of suitable hybrids through work with extension workers and crop improvement specialists.

When we started with the tortilla production we were using every type of maize. There was a tremendous mix, and we couldn't control the process because we didn't have quality grain. Within two years we have been able to produce grain specifically for *masa* tortilla production, and separate it from grain for forage. (Luis, Head of the Atotonilco producer group).

Nuestro Maíz has made advances in three areas related to improving the maize quality for the Nixtamal plants. First, in each area where there is a Nixtamal plant, the *criollo* maize has been evaluated. The best maize

for the *masa*/tortilla process has been identified and improved. Second, hybrid varieties are being tested and evaluated by producers. Third, producers are now growing their own seed, which saves a tremendous amount of money. This is all being done through a participatory crop improvement project in partnership with INIFAP.

We have done a lot of work in the area of crop improvement. This has focused on raising the consciousness of the producers, and changing their ideas based on long traditions of growing *criollo* maize. It has been very difficult. Another challenge that we face is changing the consumers' ideas that the best tortilla isn't a white one. This is a new concept for most. This is key to making the plant profitable for us (Luis, personal communication, March 2006).

The twinning of rural development goals (improving the viability of maize production) and agrodiversity conservation has proven difficult for Nuestro Maíz, and the project reveals the tensions between the two.

The Nuestro Maíz project affiliated with the San Antonio Atotonilco S.P.R. de R.L. producer group in Puebla is successful in comparison with some of the projects in other states. This is a result of the strength of the producer group. The Nuestro Maíz model has been difficult to replicate across the country and the success of each individual project has depended on the participating producer group. Nuestro Maíz, and the parent organization, ANEC, understands the need for producer group capacity building and its challenges in a context where the price of maize is falling and government support for *campesinos* is dwindling. The impending elimination of the remaining barriers to importing maize in 2008 under NAFTA further undermines the potential success of the Nuestro Maíz project. ANEC's associate maize producers expressed concern about their ability to continue growing maize in the future, and even about staying on their land.

The value added market networks constructed by the Nuestro Maíz project are still vulnerable to economic shifts and the global maize and tortilla industry. The project was conceived as a way to promote the sustainable production and use of maize, and to ensure viable livelihoods for participating producers. The challenge of using heterogeneous maize landrace varieties in an industrialized process is but one of many challenges faced by the Nuestro Maíz project. None of the Nixtamal plants have broken even, and the producer organizations are paying off large debts resulting from the investment in the Nixtamal and tortilla infrastructure. In the meantime, the national and international tortilla industry is consolidating and vertically integrating to seize more control

of the market. This has created a highly competitive environment for small, neighbourhood Tortillerías, some of which have resented and protested *Nuestro Maíz's* intrusion into their marketplace. With ongoing and growing subsidies to US maize producers, the viability of maize production in Mexico is further undermined. Nevertheless, seeking alternatives for maize producers, adding value to their grain, and keeping the profits circulating locally represent creative strategies to mitigate the impacts of global trade relations and new biotechnologies.

Itanoní Tortillería

The Itanoní Tortillería is a family business in Oaxaca started by Amado Ramírez Leyva and Lea Gabriela Fernández Orantes (a husband and wife team). They opened a *tortillería* in September of 2001 selling tortillas made from four maize landraces. By January 2002 the demand for tacos made with the tortillas and *guisos* (taco fillings) encouraged Ramírez Leyva and Fernández Orantes to open a restaurant in a middle class neighbourhood with a simple menu and table service. In October of 2005 a second restaurant was opened in the historic centre of Oaxaca.⁶⁰

At the restaurant, the public is welcome to walk through the processing facility and see maize soaked, mixed with lime, ground, and then pressed by hand into tortillas – blue, yellow, white and red. Surrounded by tables, the clay *comal* is a hub of cooking activity and the place where all the dishes available at the *tortillería* are prepared. The numerous *guisos* surrounding the *comal* are secondary to the taste of maize.

The dishes served at Itanoní are chosen to highlight the flavour of the different maize varieties used. Regional dishes from around the country are chosen to compliment the Oaxacan maize. These dishes are known as *antojitos*, or snacks, and are usually eaten after breakfast between 9am and 11 am, in the late afternoon between 4pm and 6pm, or in the late evening. It is common to see a *taquería* open at 1:00 am and bustling with business. Itanoní is open from 8am to 4pm catering to the morning crowd and people interested in a quick lunch lighter than the usual *comida*, or mid-day meal. Many people come to the restaurant simply to buy tortillas to take home for their mid-day meal.

Maize for the *tortillería* is grown by four producers in diverse regions of the state of Oaxaca. Oaxaca is famous for its ecological and cultural diversity. Topologically the state spans from the Pacific Ocean to the Sierra Madre mountains that reach more than 2700 meters in some areas. The mountainous characteristics of the state means that the ecol-

ogy varies wildly, from dry savannah to tropical cloud forest to coastal beaches. There are 17 distinct ethnolinguistic indigenous groups that live in the state (Barabas *et al.*, 2003), and several of the small-scale producers that grow maize for Itanoní identify as indigenous.

Oaxaca state is characterized by subsistence agricultural production. Maize is produced as part of a *milpa* agroecological system. If maize is not intercropped with squash and beans, it is grown in rotation with these items. The incredible ethno-cultural and ecological diversity of Oaxaca state has resulted in a corresponding concentration of agricultural diversity. Oaxaca is one of the regional centres of origin of maize, chilli peppers, and squash. Oaxaca City is known as a cultural and culinary centre. Its colonial architecture, vibrant *zócalo*, art galleries, artisanal crafts, café's and restaurants are attractive to tourists. Over the past ten years a number of cooking schools have opened in Oaxaca, making the city a popular place to come and learn to cook Mexican specialties such as *mole*. The food markets in and around the city are world famous for the diversity of products they carry. The availability of visually stunning and diverse market products, tantalizing street food and haute Mexican cuisine offer the international gourmand endless opportunities to explore interesting ingredients, complex flavours and long standing culinary practices.

Both Ramírez Leyva and Fernández Orantes have backgrounds working on rural development projects in Oaxaca and Chiapas. Ramírez Leyva is an agricultural engineer, and has worked on numerous maize agrodiversity initiatives with the International Maize and Wheat Improvement Centre (CIMMYT) and INIFAP. Prior to opening Itanoní, Ramírez Leyva operated a business that improved and sold maize landrace seed to producers in Oaxaca. Ramírez Leyva grew up in Oaxaca, where his grandfather, a maize producer in the Mixtec region of the state instilled an appreciation for maize. By academic training, Fernández Orantes is a chemical engineer with a specialization in aquatic resources. She grew up in Chiapas in a mestizo family. Earlier in her career she worked in Chiapas on a rural credit project supporting fishers as the fishing stocks disappeared. Then she moved to Mexico City where she worked for the National Indigenous Institute. Later, Fernández Orantes worked for eight months with indigenous and *campesino* peoples in rural Chiapas.

Making tortillas by hand is a dying culinary art as people become busier, and processed foods are more available. The culinary history of making tortillas at home and the history of the tortilla industry reflect the story of class and race, and development and modernization. As

is evident at Itanóni, tortilla production is a gendered process. Only women are the *tortilleras* at the restaurant, while the men grind the *masa* and wait on tables. As rural and urban women entered the formal workforce, it was increasingly difficult for them to maintain the domestic practice of making tortillas. New technologies became available to alleviate the hard work of grinding *masa* with a *metate*, an electric grinder that, by grinding soaked maize, revolutionized domestic life in the 1970s. The *masa* grinder is still a commonly used community tool used in villages across the country side. Meanwhile, in the urban centres, women who could afford to pay domestic help to make tortillas by hand clung to the laborious practice of using the *metate*, claiming that the taste was superior (Pilcher 2005). The large tortilla suppliers and most of the small neighbourhood Tortillerías now purchase maize flour with which they make their tortillas and have discarded the use of *masa* altogether (Pilcher, 1998 and 2005; Lind and Barham, 2004).

Itanóni has created a small niche market for maize landraces, geared towards urban consumers. The people who eat at the restaurant are generally urban Oaxacans. Many tourists are beginning to learn about the restaurant, so there is an increasingly international clientele. Most consumers understand that they are eating maize landraces grown by regional producers. They learn this through educational materials that are visible at the restaurant – a banner that hangs at the front of the restaurant, and placemats that tell a story about the cultural importance of maize in Mexico.

The banner at the restaurant's entrance reflects Itanóni's goals to cultivate an appreciation for maize agrobiodiversity and the culinary traditions of the region, as well as support local farmers. It reads:

Itanóni

...maize flower

Gastronomic semantics of maize

Native maize selected from Oaxaca,

By consuming it you will have the opportunity to:

Digest the pure flavours of maize developed in our diverse soils and villages.

Contribute to the preservation and reproduction of diversity: the biological, cultural, and culinary diversity of Oaxacan maize.

Ensure fair prices for the campesinos who cultivate our maize.

Understand and digest maize products made with artisanal methods and processes.

Ramírez Leyva has a network of four farmers growing eight varieties of maize for the restaurant. The relationship with these producers,

located around the state of Oaxaca, was developed through Ramírez Leyva's previous work growing and selling maize seed. The producers were chosen simply because they were growing maize landraces Ramírez Leyva liked – good quality and intensely flavourful. Each owns 3-5 hectares of land. Some land is also rented to produce the maize. One of the farm families has irrigation while the rest depends on the seasonal rains. The farmers are growing several varieties of maize each, for different agricultural or culinary purposes. All are *criollo*, or landrace, varieties and have been passed down over generations.

The network of farmers is a loose affiliation. The producers, although part of an informal cooperative, are regionally isolated. They have individual relationships with Ramírez Leyva. Occasionally, there are opportunities for one of the producers to visit another producer, or meet at a special event. Due to their proximity to Oaxaca City, two of the farmers have more contact with Ramírez Leyva.

Ramírez Leyva describes maize agrodiversity as an infinite flow of diversity that is perpetuated through individual maize plants and their particular associations with farmers and the land. This notion of infinite diversity clashes with the notion that agrodiversity can be preserved *ex situ* – in seed banks. The concepts of flow and infinity challenge ideas of static diversity, of traditional or native landraces, illustrating how the diversity is constantly changing and adapting to the everyday realities of producers, their relationship with their fields and maize, farming practices, agricultural and rural transformation and changing ecologies. The Itanoní Tortillería provides a market for landraces conserved in-situ, or in the farmers' fields.

Ramírez Leyva supports the farmers he works with in a number of ways. He contracts to buy their maize. This represents small quantities of maize not needed for household consumption. Ramírez Leyva assists the farmers with seed selection on a yearly basis. Seed selection is typically done after the harvest, from the husked cob. Ramírez Leyva prefers to select seed on the maize stalk, as this indicates not only the quality of the grain, but also the characteristics of the plant growth. The costs of inputs (such as organic fertilizers) and labour are shared between the producer and Ramírez Leyva. Ramírez Leyva can afford to pay a premium for the maize,⁶¹ due to the direct relationship between himself and the farmer. This also enables Ramírez Leyva to have some control over the quality and varieties of maize available for the restaurant. Farmers are supported through difficult production cycles. For example, in 2005 one of the producer's maize crops was destroyed by a persistent drought. The support of Ramírez Leyva and Itanoní

encouraged him to continue planting his maize, despite the difficult conditions and a job off the farm that ensures a steady income.

The producers sell maize directly to Itanoní. Some producers sell other products to the restaurant as well. All of the farm families have off farm income. Remittances are received by all the farm families from children or close relatives who work in the United States. Other income is generated through selling agricultural crops, or working outside of the farm.

The production methods of the farmers growing for Itanoní are not certified organic, but could be considered ecological. Chemical fertilizers and pesticides are not used, although crops are exposed to pesticides through drift from neighbouring farmer's applications. Ramírez Leyva supplies organic fertilizers to be applied at various points during the production cycle.

The restaurant buys fruit and vegetables from the local markets in Oaxaca, and sources products like eggs, chickens, pork and beef from producers who treat their animals humanely. Fernández Orantes described how she is willing to pay twice as much for chicken from a woman who cares for her chickens, feeds them well and has enough space for them. 'I believe that inputs of good quality give a good quality product.' Fernández Orantes seeks out products that will compliment the maize. For example, she uses *chili de agua*, a chilli pepper that is native to Oaxaca. This pepper is quite delicate, and needs a lot of care to grow. She buys the peppers directly from women who grow it at their houses.

Oaxaca is the centre of struggles for maize agrodiversity conservation, and the *tortillería* is integrated into environmental and indigenous networks working to preserve agrodiversity. The activities of Itanoní synergistically interrelate with other local, national and international initiatives. For example, Ramírez Leyva and Fernández Orantes have participated in the Slow Food movement's Terra Madre conference that brings together artisanal food producers.⁶² There is a growing movement in Mexico to link producers with consumers. Two examples of this are the proliferating organic farmers markets⁶³ and the growth of companies marketing Mexican organic and natural products to the national market. Itanoní's potential lies in its ability to link agrodiversity conservation with the growing urban interest in local food. Galvanizing urban interest in agrodiversity by marketing Mexico's culinary culture and the unique flavours of maize landraces creates an alternative maize economy – one that supports local producers and agrodiversity.

Similarly, the restaurant's newly established sister foundation 'Identity and Diversity' has a mission to promote cultural identity and the agrodiversity preservation of maize and other native crops, recognizing the intimate relationship between natural environments, food crops, kitchens, and the table. This mission will be achieved by a series of educational activities related to maize agrodiversity and Mexican agricultural and culinary traditions. This project is in its infancy, but involves Mexican and international advisors who are guiding the development of an organizational constitution and working to register it as a non-profit organization.

Ramírez Leyva and Fernández Orantes view their work to promote maize agrodiversity as distinct from, but complimentary to, other activities to promote and conserve maize agrodiversity. Fernández Orantes describes the work at Itanoní as parallel to the work of activists who are protesting GM maize. The demands of the Tortillería mean that Ramírez Leyva and Fernández Orantes do not often attend meetings or protests, but recognize this work as important. The network of activists working on issues of genetically modified maize, rural development and indigenous livelihoods support the work of Itanoní in two ways. First, they support Itanoní by frequenting the restaurant and buying tortillas. Second, they spread the word to people by telling others that Itanoní is an alternative to the dominant, corporate tortilla market.

Ramírez Leyva and Fernández Orantes hope to franchise their business in the near future, capitalizing on the restaurant's concept. Ramírez Leyva believes that the idea could be replicated across Mexico and beyond. Plans are underway to open a restaurant in Mexico City. Ramírez Leyva's network of agronomists and maize researchers will enable him to make contacts with farmers in each region that a restaurant is opened, to supply the restaurants with local maize landraces.

Itanoní is reviving and reclaiming Mexican culinary practices through its focus on making tortillas and *antojitos* using a variety of maize landraces, typical Mexican ingredients and traditional cooking processes. The owners of Itanoní articulate the importance of these culinary practices, linking their use and promotion to agrodiversity conservation and food security. Working closely with a network of regional farmers, Itanoní is able to simultaneously address the goals of increasing consumer consciousness about maize agrodiversity and supporting small-scale farmers. Itanoní's focus on the flavour of regional maize and culinary practice represents a creative strategy to mitigate the impacts of global trade relations and new biotechnologies.

Conclusion

The Itanoní Tortillería and Nuestro Maíz link maize producers to consumers in their region through a local food network. An examination of these networks illustrates their complexity and the need to move beyond a commodity chain analysis⁶⁴ to understand the unlikely actors, their potential and their challenges. These initiatives nurture horizontal networks between producers and consumers, as well as vertical networks between the production-consumption network and social movement actors addressing issues of agrodiversity and food security through policy processes and awareness-raising campaigns. The Itanoní Tortillería and Nuestro Maíz, beyond the horizontal and vertical network construction, pay attention to the spaces in-between these linear expressions of connection. Sarah Whatmore pushes this analysis to explore a praxis of ethical relating (Whatmore, 2004, p. 166) that ‘articulates the fluxes of becoming that complicates the spacing-timings of social life, and (that is) expressive of the creative impulse of more than human energies’ (Whatmore, 2004, p. 165). Whatmore’s work pushes us to acknowledge new modes of connectivity that incorporate diverse bodies, policies, and practices.

The strategies used by the Itanoní Tortillería and Nuestro Maíz enhance and renew cultural and biological diversity by creating new practices that work to build food security and conserve maize agrodiversity. Harriet Friedmann describes urban gardens and community kitchens to illustrate how agronomic and culinary knowledge, skills, desires and tastes are continually invented by people, despite the oversimplification of monocultures (Friedmann, 2005, p. 10). Friedmann calls these practices the ‘secret history of colonialism’ (Friedmann, 2005, p. 2). The Itanoní Tortillería is reclaiming and adapting culinary practices that focus on a new understanding of agrodiversity as a living, evolving expression of the relationship between people and plants closely tied to agricultural methods, livelihoods and use. Nuestro Maíz is operating at a different political and industrial scale, illustrating how the agency of plants, technology, crop improvement professionals, politicians and activists continually reinvent agrodiversity conservation and food security practices. These practices challenge the notion of agrodiversity and food security as static and fixed, recognizing that they are continually recreated by multcentred people (Friedmann, 2005). This corresponds to Zimmerer’s critique of static, or fixed, notions of biodiversity as they have been articulated by global policy processes and conservation programmes. He invokes metaphors of flux, flow, and networked environments to describe hybrid-rich landscapes

(Zimmerer, 2000, p. 358). These landscapes are made up not only of the topographical characteristics that are home to particular plant and animal species, but also people, their kitchens, gardens, fields, communities, social relations and activities.

The Itanoní Tortillería and the Nuestro Maíz projects are examples of how commodity markets are not homogeneous, how the commodification of food is contested by everyday practices, and how people are claiming space for alternative economic activity (Leyshon and Lee, 2003) that embodies social and environmental values. This represents a cultural politics of food networks starting with daily practices in the field and at the table, and extending to new spaces where organizing and acting to address agrobiodiversity and food security takes place. At the same time, the activities of the Itanoní Tortillería and the Nuestro Maíz are embedded in global capitalist processes that are shaping the trajectory of these initiatives and resulting in their continual adaptation to shifting social, economic, political and ecological contexts.

To conclude, I offer a brief story as told by Silvia Ribeiro, from the ETC Group in Mexico City in a report from the Forum in Defence of Maize (personal communication, January 2005, and in an article published in *Seedling* magazine in 2004). At the meeting, a coalition of indigenous and civil society organizations working to prevent the contamination of maize landraces by GM maize initially demanded more and ongoing testing for contaminated maize in their fields. After realizing the futility of this, Ribeiro describes a shift in their demands. 'The communities recognized that what made them vulnerable to contamination were a series of national and international economic and political factors (free-trade agreements, massive migration, cultural and food erosion, urban and rural poverty, etc.). They came to the conclusion that they could only defend maize by defending the wholeness of peasant and indigenous life along with their rights and resources' (Ribeiro, 2004, p. 9). At the end of the meeting the participating groups declared a moratorium on transgenic plants and stated that they will not plant unknown seeds, nor cook with unknown maize. The participating groups stated that they would promote local, native seed; strengthen local and community seed exchange systems; and promote and reaffirm local cooking habits, traditions, myths and ceremonies. The groups stated that they would continue with their anti-GM lobbying activities. Finally, the groups proposed to strengthen and expand links with both urban and rural groups working to promote the consumption of native maize from local markets. The everyday politics and practice of growing and eating cannot be separated from global politics and policies related to new biotechnologies and trade relations.

CONCLUSIONS

The regulation of biosecurity, more specifically the adopting of GMOs is a controversial matter, since it stems from various sources: economic and trade-related, environmental and geopolitical. Consequently, the debate has been complex and not been limited to the scientific sphere and the effects of biotechnology on health. Rather, it centres upon the choices and perceptions of consumers, as has been the case in other countries.

In the final analysis, regulation of biosecurity is nothing else than the balance of costs and benefits from biotechnology agreed on by each society. In this sense, it can be stated that Mexico, for better or worse, at least managed to bring the issue of GMOs to the legislative level, to formulate a law, whereas its NAFTA partners have applied existing regulations, maintaining that GMOs are essentially not a new product. Thus, the Mexican Law on Biosecurity is an important achievement. However, there is still much to be defined. On the one hand, since the key aspects of this legislation, of which the most important is the special regime for maize, are not yet definitive, the controversy is indeed not over. It is rather a question of postponing important decisions. On the other hand, since there is in Mexico a historical and systemic problem about the application of laws in general, and the regulatory organs do not have full independence nor enjoy public trust, it is to be feared that in this case a law that is ambiguous in a number of aspects might be interpreted in different ways, thus leading to its idleness.

The regulation of GMOs took place in conditions of adversity characterized by the type of agonistic governance and very contrary positions not apt to change or adjust their stance. In these conditions the margin for negotiation and deliberation was extremely narrow. In

fact it was restricted to one unique fact of recognizing that there should be a stricter environmental evaluation than in other countries that are not as mega-divers and do not function as centres of origin for a series of plants. This was due mainly to international requirements on the part of the Convention on Biological Diversity (CBD).

In the absence of an open discussion, it would appear that from the outset the opponents could only make use of the debate on GMOs as an opportunity to disseminate their ideas and make the public aware of the potential negative effects of GMOs. In any case, the framework set up by the regulatory agencies for posing and channelling the problem of biosecurity has widened, for example, with the proposal for special regimes. In the future, if the opposition is well organized, it may be able to take advantage of its antihegemonic position in order to demand greater accountability in governmental decisions regarding risk assessment and to encourage the participation of consumers in the process.

It was argued that, according to the analysis from the point of view of regimes of justification, the Mexican social anti-GM movement has been able up to now, to deploy the uncertainties involved in the GM issue in its favour. In its practice, it exploited a series of uncertainties inherent in the controversy about the consequences of GM technology, such as those deployed in the controversy of trade liberalization versus agriculture and scientific fact versus biological and cultural diversity. However, if this movement in the future wants to channel the conflict more effectively and to avoid that its uncertainties might be easily absorbed by the proponent of GM technology, its members would not only need to act but also grasp the meaning of its practices and consciously incorporate them in its discourse. By doing so they would obtain more political space and new attentions, and they would eventually construct a new collective identity.

Since the basic question is the duality of the situation, with industrial and high technological interests on one side and agriculture and poor *campesinos* on the other, one may only wonder if these different interest groups can be catered for by the same policy and regulatory standards. The Mexican biosecurity law assumes it can, since it supposes the coexistence of GM foodstuffs and traditional ones. This is only possible if the resolution of controversies is limited to a technical question, such as the physical distance between a GM plant and a *criollo* one, and the complicated set of physical standards.

The question of adopting GM maize has undoubtedly an economic aspect. However, other in relation to values, such as taste and tradi-

tion, and to a way of life, make all the more complicated to measure costs and benefits of technological and traditional knowledge by the same standard. It is likely that the polarization seen in the production scheme and in the perceptions about GMOs will demand policies that cater for the two sectors separately.

The antihegemonic, alternative proposal to technology is the local food networks linked to a broader agro-food movement that struggle for community food security and food sovereignty, building local markets, and conserving maize agrodiversity. The cases presented in this study demonstrate the complexity from the global-local dimension of these networks among the social and civil movements, researchers, agronomists and bioconservers. These examples explain in detail, how people have built up and continue to build an intimate relationship between biological and cultural diversity, and the incredible richness of knowledge that has grown up around maize. According to *campesinos* and native Mexicans, what GM seeds jeopardize is precisely all that security, identity and richness.

The two examples, the network of producers and the *tortillería* restaurant in Oaxaca presented here, also illustrate the enormous sociocultural and agroecological importance of maize and the relevant role played by small-scale farmers in the conservation process. They explain the meaningfulness of concepts as abstract as risk and security for the *campesino* and the native Mexican. *Campesinos* feel that with GM maize – that is to say contaminated maize – it is their own identity that is at risk, since they can no longer identify something that they do not know in depth. They also fear that if the maize is contaminated and later patented by a corporation, they lose their patrimony forever.

Beyond doubt one of the most important results of the anti-GM movement has been the link established between rural producers and urban consumers through the many campaigns in defence of maize. There have been some examples of consciousness rising about the importance of maize in Mexican society: a request is in process before UNESCO to recognize and certify maize as an intangible patrimony of humanity.

NOTES

¹ Maize is an open-pollinating plant. Genetic flux is thus easy to take place between different varieties grown in each other's proximity.

² Basically, two types of first-generation genetically modified maize are put on the market by Monsanto and other companies. The first is Bt maize which carries a gene from the bacteria *Bacillus thuringiensis* and creates its own insecticide. The second is a glyphosate-tolerant variety ('Roundup-ReadyTM') that is not affected by herbicide application.'

³ The article by Quist and Chapela was first criticized by a Berkeley group of scientists opposing the findings. The main accusation was that Chapela – who backed the anti-GM campaign in Mexico – was a clear exponent of an activist-turned-scientist who had found what he desperately wanted to find. In an unprecedented move Nature - after listening to the arguments of this group – retracted the article. What followed was a heated exchange over conflict of interest and scientific discourse as the group critical of Quist and Chapela's study was found to have had its research funded by biotech giants such as Monsanto. See Scott (2003) for an account of this controversy, and of the breakdown of scientific discourse following this episode.

⁴ Bt stands for the gene that codes for the *Bacillus Thuringiensis* (Bt) toxin.

⁵ For an excellent overview of the wider issues involved in biopolitics see the volume edited by Schurman and Takahashi Kelso (2003).

⁶ CIMMYT is one of the 17 institutes associated under the umbrella of the CGIAR.

⁷ *Criollo* is the Spanish common word for a landrace or native variety.

⁸ Luis Tellez then Subsecretary for Agriculture, quoted in Luis Hernández Navarro 'Tortilla: la quiebra de un modelo' in *La Jornada*, 17 January, 2007.

⁹ *El ingreso rural y la producción agropecuaria en México* (1989-2002) based on data from INEGI, and comments by Victor M. Quintana, in 'La insostenible falta de equidad en la agricultura' in *La Jornada*, May 14, 2005.

¹⁰ GM soybeans have been planted since 1996, the same year as in the United States. A third of cotton planted is GM cotton.

¹¹ Represented by groups such as Greenpeace, ETC, GRAIN, Vía Campesina.

¹² The public position taken by this entity was very important, since it has the world's largest public bank of corn genes.

¹³ Ley sobre Bioseguridad de Organismos Genéticamente Modificados, for the complete text of the law passed, see: <http://www.senado.gob.mx/sgsp/gaceta?sesion=2005/02/15/1> and documento=25

¹⁴ Article 27 of the Constitution stipulates that all the land in Mexico belongs to the nation, which can cede its control to citizens, with some restrictions.

¹⁵ 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.

¹⁶ Noteworthy is the coverage provided by the left-leaning *La Jornada* newspaper as well as Radio Educación programmes and the CD produced by the Environmental

Studies Group (GEA) entitled *Los transgénicos ¡hoy, hoy, hoy!*

¹⁷ This quote is from the protest letter published with signatures from 300 organizations after the agreement was reached on corn exported from the United States to Mexico, in which a ceiling of 5 per cent of transgenic seeds was accepted.

¹⁸ Agrobio's website is to be found in : <http://www.agrobiomexico.org.mx/agrobio.htm>

¹⁹ The article by Quist and Chapela was first criticized by a Berkeley group of scientists opposing the findings. The main accusation was that Chapela – who backed the anti-GM campaign in Mexico – was a clear exponent of an activist-turned scientist who had found what he desperately wanted to find. In an unprecedented move Nature, after listening to the arguments of this group, retracted the article. What followed was a heated exchange over conflict of interest and scientific discourse as the group critical of the Quist and Chapela's study was found to have had its research funded by biotech giants such as Monsanto. See Scott (2003) for an account of this controversy, and of the breakdown of scientific discourse following this episode.

²⁰ 'The countryside can endure no more'. See Bartra (2004) and the volume edited by Schwentesius et al (2003) for an in-depth analysis of the this movement.

²¹ 'in defense of maize' .

²² Peasant Forum for Seed and Life.

²³ This is the result of a long history of political philosophy; see Boltanski and Thévenot (2005).

²⁴ In this sense, then, justifications can be seen as strategic because they entail the intentional construction or mobilization of arguments to be presented to the right audience in the right situation.

²⁵ A word of caution though is in place here. The orders of justification presented below might give the impression that actors entailed in passive argumentation put on their blinkers and limit their justification to a specific order of worth only. This is not at all true, and evidence shows that actors are quite ready to mix several arguments, switch between them, reach compromises, or strategically focus on one type of justification to attract a specific audience. Versatility is thus a key in strategic argumentation.

²⁶ Justifications in this domain are almost exclusively made by defenders of GM maize.

²⁷ Javier Usabiaga (Minister of Agriculture from July 2000 to September 2005) took this stance. His adversaries often criticized him for this, because it showed his lack of responsibility and deficient social sensibility towards farmers in danger of being squeezed out of the market altogether by cheap, subsidized agricultural imports from the USA.

²⁸ At the time, Horsch was Monsanto's vice-president for international development partnerships. In November 2006 he joined the Bill and Melinda Gates Foundation as senior program officer, focusing on improving crop yields in sub-Saharan Africa.

²⁹ Crop Science Department at the North Carolina State University.

³⁰ For example, since the Bayh-Doyle Act of 1980, patents in the US were broadened to include living organisms such as plants and animals and their constituent parts such

as seeds, proteins and, importantly, genes and specific DNA sequences. In the 1990s, and under great pressure by the life-science industry and US government encouragement, the WTO initiated the Trade-Related Aspects of Intellectual Property Rights (TRIPS) – an avenue to introduce US patent law on a global scale.

³¹ See McAfee (2003) for additional justifications often aired by spokespersons from state and line ministries. See Fitting (2006) for an exhaustive overview (and denunciation) of neoliberal, market-based arguments that support genetic modification of maize.

³² *Movimiento Sim Terra* or the ‘movement of the landless’.

³³ ‘Bioprospecting’ – a more euphemistic term for the same mechanism – in the south of Mexico has indeed raised questions of legal and legitimate forms of access. See Brand and Görg (2003) for an overview and interpretation of some of these projects.

³⁴ The FAO (1989) defined farmers’ rights as ‘rights arising from the past, present, and future contributions of farmers in conserving, improving, and making available plant genetic resources, particularly those in the centers of origin/diversity’. Unfortunately, these rights are not protected under TRIPS or UPOV models (see Wiber 2006 for wider implications) and neither are they under Mexican Law.

³⁵ The Mexico-based Centro Internacional de Mejoramiento del Maíz y el Trigo is one of the 17 institutes associated under the umbrella of the CGIAR (Consultative Group of International Agricultural Research). It is home to the world’s largest maize germplasm collection and delegated by the FAO to conserve this patrimony of humankind.

³⁶ CIMMYT systematically collects new maize varieties evolving under field circumstances, and the possibility that genetically contaminated seed from farmers’ fields enters the collection is seen as a real threat. So when CIMMYT adopted a wait-and-see position after the discovery of genetic pollution of maize landraces in Oaxaca and Puebla, the institution was openly attacked by those concerned with agroecological diversity and the danger associated with uncontrolled gene flow. Of late, this initial wait-and-see position has been changed in favour of one in which CIMMYT publicly supports and carries out research on genetic engineering of maize and wheat. This latter move is congruent with recent shifts in international institutions (from FAO to CGIAR) to complement private sector research in genetic modification, and has further fuelled accusations that these public sector institutes are not serving the general, collective interest.

³⁷ www.ecoportal.net/layout/set/print/content/view/full/63042

³⁸ *ibid.*

³⁹ *Criollo* is the Spanish common word for a landrace or native variety.

⁴⁰ An example of a farmer or an NGO activist travelling from situation to situation and in need to apply different orders of worth according to circumstances can equally well be thought of.

⁴¹ The most widely known of these technologies is the one commonly referred to as Terminator Technology, a method to restrict the use of genetically modified plants by causing seed to be sterile. Using this technology, or so proponents argue, prevents possible escape of transgenes from the source material, thus averting any impact upon biodiversity.

⁴² PCRs are used as a technique that allows the detection of transgenic DNA. As is an in vitro technique, it can be performed without restrictions on the form of DNA, and it can be extensively modified to perform a wide array of genetic manipulations.

⁴³ See Levidow and Carr (2007) for a fascinating account of the way in which changing definitions of 'substantial equivalence' are used to govern social conflict around GMOs, as well as legitimacy problems of regulatory procedures.

⁴⁴ Mexico's Biosafety Law.

⁴⁵ This has, in true industrial fashion, led to a science-based debate about where exactly these areas of origin are located. Some NGO's opposing GM maize are legally implicated in this debate without actually seeing the risk involved: a future, complex mosaic of landscapes where areas set aside for transgenic cultivars, or cultivated selections that can be propagated reliably in a prescribed manner, will be interspersed with a handful of sanctuaries where 'pure' maize landraces and *teocintles* can be found – a pyrrhic victory indeed.

⁴⁶ A forerunner to this possibility is already a reality in the EU where a coexistence regime between GM and non-GM products has been put in place. Ironically, the burden of the proof is on GM-free products.

⁴⁷ The International Labour Organisation's Convention Concerning Indigenous Peoples in Independent Countries.

⁴⁸ See Posey and Dutfield (1996) however, for a fascinating and encouraging account of instances in which traditional resource rights have been successfully defended.

⁴⁹ See e.g. Bellon and Berthaud (2006).

⁵⁰ Cf. Soleri and Cleveland (2006).

⁵¹ Ignorance in the sense of situations of radical uncertainty, where nothing is known.

⁵² Traditional varieties, highly adapted to specific locales or groups. The term is usually applied to varieties of corn, squash, and beans that were domesticated by native farmers, and further modified by native and also immigrant farmers.

⁵³ The translation of *oja de santa* is sacred herb. It has a deep aroma similar to anise. The Latin name is *Piper auritum* (Mexican Pepperleaf)

⁵⁴ A great deal of information is available on ANEC through their website: www.laneta.apc.org/anec.

⁵⁵ This chapter draws on my doctorate research and fieldwork. From January to March 2006 I worked as a waiter at the Itanoní Tortillería to learn about their activities, and interviewed numerous people involved in ANEC's Nuestro Maíz project.

⁵⁶ See the Community Food Security Coalition (www.foodsecurity.org) and La Via Campesina (www.viacampesina.org) for more information on community food security and food sovereignty.

⁵⁷ Calcium carbonate, made from limestone

⁵⁸ This is the Nuestro Maíz project that I visited during my fieldwork.

⁵⁹ *Criollo* is the Spanish common word for a landrace or native variety.

⁶⁰ At the time of writing this chapter, the Tortillería in the historical centre of Oaxaca was closed due to a violent conflict between social movement groups and the provincial

and state governments.

⁶¹ At the time of this research (January – March, 2006), local maize was sold on the market for 4 pesos a kilo. Imported maize from the United States was available for 2.5 pesos a kilo. Farmers growing for Itanoni received 6 pesos a kilo.

⁶² See www.slowfood.com.

⁶³ These farmers' markets are distinct from the produce and food markets that have existed in Mexico for centuries. The new farmers markets provide niche markets for local, primarily organic, farmers, linking producers with consumers, and are networked together through the Mexican Network of Tianguis and Organic Markets, see <http://www.chapingo.mx/ciestaam/to/>.

⁶⁴ Many scholars and activists have used commodity chain analysis to trace a product. See, for example, Gereffi and Korzeniewicz (eds.), 1994, who pioneered this work. Barndt (2002) extends commodity chain analysis in her research on the tomato's path from field to table.

BIBLIOGRAPHY

- Agrobio, <http://www.agrobiomexico.org.mx/agrobio.htm>
- Altieri, M. (2005), 'The Myth of Coexistence, Why Transgenic Crops Are Not Compatible with Agroecologically Based Systems of Production' *Bulletin of Science, Technology & Society*, No. 4, Vol. 25, pp. 361-371.
- Appendini, K. (2001), *De la Milpa a los Tortibonos, La Restructuración de la Política Alimentaria en México*, Mexico City, El Colegio de México, Instituto de Investigaciones de las Naciones Unidas para el Desarrollo Social.
- Barabas, A.M. et al. (2003), *Los Pueblos Indígenas de Oaxaca, Atlas Etnográfico*, Mexico City, Instituto Nacional de Antropología e Historia.
- Barndt, D. (2002), *Tangled Routes, Women, Work and Globalization on the Tomato Trail*, Aurora, Ontario, Garamond Press.
- Bartra, A. (2004), 'Rebellious Cornfields, towards Foods and Labour Self-sufficiency', in G. Otero (ed.), *Mexico in Transition, Neoliberal Globalism, The State and Civil society*, London and New York, Zed Books.
- Bellon, M. and J. Berthaud (2003), 'In Situ Conservation of Maize Diversity, Gene Flow, and Transgenes in Mexico', in *LMOs and the Environment, Proceedings of an International Conference*, OECD, Environment Directorate.
- Bellon, M. and J. Berthaud (2006), 'Traditional Mexican Agricultural Systems and the Potential Impacts of Transgenic Varieties on Maize Diversity', *Agriculture and Human Values*, Vol. 23, pp. 3-14.
- Bellon, M. et al., (2003), 'Participatory Landrace Selection for On-Farm Conservation, an Example from the Central Valleys of Oaxaca, Mexico', *Genetic Resources and Crop Evolution*, Vol. 50, pp. 401-416.
- Benz, B. et al., (2000), 'Losing Knowledge about Plant use in the Sierra de Manatlan Biosphere Reserve, Mexico', *Economic Botany*, 54(2), pp. 183-191.
- Boltanski, L. and L. Thévenot (1991), *De la Justification, Les Économies de la grandeur*, Paris, Gallimard.
- Boltanski, L. and L. Thévenot (1999), 'The Sociology of Critical Capacity', *European Journal of Social Theory* 2(3), 359-377.
- Bourdieu, P. (1984), *Distinction, A Social Critique of the Judgment of Taste*, Cambridge, MA, Harvard University Press.
- Boyce, J.K. (1996), 'Ecological Distribution, Agricultural Trade Liberalization, and In Situ Genetic Diversity', *Journal of Income Distribution*, 6(2), pp. 265-86.
- Boyd, W. (2003), 'Wonderful Potencies? Deep Structure and the Problem of Monopoly in Agricultural Biotechnology', in R. Schurman and D. Takahashi Kelso (eds), *Engineering Trouble, Biotechnology and Its Discontent*, Berkeley, Los Angeles and London, University of California Press.
- Brand, U. and C. Görg (2003), 'The State and the Regulation of Biodiversity, International Biopolitics and the Case of Mexico', *Geoforum*, 34, pp. 221-33.

- Callon, M. (1998), *The Laws of the Markets*, Blackwells Publishers, London.
- CEC (2004), Report on *Maíz y biodiversidad, los efectos del maíz transgénico en México, conclusiones y recomendaciones*, http://www.cec.org/pubs_docs/documents/index.cfm?varlan=espanol&ID=1647.
- Cevallos, Diego (2006), 'Mexico Shuts the Door on GM Maize', *Inter Press Service*, 28 October, <http://www.ipsnews.net/news.asp?idnews=35280>
- Commission for Environmental Cooperation (2004), 'Maize and Biodiversity, The Effects of Transgenic Maize in Mexico', Montreal, Secretariat Report, Communications Department of the CEC Secretariat.
- Cummings, C.H., (2002), 'Risking Corn, Risking Culture', *World Watch* 15(6), pp. 8-19.
- De Ita, A. and P. López Sierra (2004), 'La cultura maicera mexicana frente al libre comercio', in *Maíz, sustento y culturas en América Latina, Los impactos destructivos de la globalización*, Montevideo, Redes, Amigos de la Tierra-Uruguay, Biodiversidad-sustento y culturas, cited in V. Herrera Ramón, *En defensa del maíz (y el futuro), Una autogestión invisible*, Interhemispheric Resource Center, www.americaspolicy.org
- Dyer, G. and A. Yúnez (2003), NAFTA and Conservation of Maize Diversity in Mexico, paper by working group for the programme of the Commission for Environmental Cooperation, February 14.
- Ellstrand, N.C. (2003), *Dangerous Liaisons? When Cultivated Plants Mate with their Wild Relatives*, Baltimore, Johns Hopkins University Press.
- Escobar Moreno, D.A. (2005), 'Valoración de la Agrobiodiversidad, Una Aproximación desde la Economía Ecológica', *Geografía Agrícola*, 35, pp. 7-22.
- Escobar, A. (1992), 'Culture, Economics and Politics in Latin American Social Movements Theory and Research', in A. Escobar and S. Alvarez (eds) *The Making of Social Movements in Latin America, Identity, Strategy and Democracy*, Boulder, CO, Westview Press.
- Escobar, A. (2004), Beyond the Third World, Imperial Globality, Global Coloniality and Anti-Globalization Social Movements, *Third World Quarterly*, 25(1), pp. 207-30.
- Fitting, E. (2006), 'Importing Corn, Exporting Labour, The Neoliberal Corn regime, GMOs, and the Erosion of Mexican Biodiversity', *Agriculture and Human Values*, 23, pp. 15-26.
- Ford Runge, C. and R. Barry (2005), *The Global Diffusion of Plant Biotechnology, International Adoption and Research in 2004*, Twin Cities MN, University of Minnesota.
- Fowler, C. and P. Mooney (1996), *Shattering, Food, Politics, and the Loss of Genetic Diversity*, Tucson, University of Arizona Press.
- Friedmann, H. (2005), *Modernity and the Hamburger, Cattle and Wheat in Ecological and Culinary Change*, unpublished paper.
- Garfinkel, H. (1967), *Studies in Ethnomethodology*, Englewood Cliffs, NJ, Prentice-Hall.

- Gereffi, G. and M. Korzeniewicz (eds), (1994), *Commodity Chains and Global Capitalism*, Westport, CT, Praeger.
- Gibbs, W. (2003a), 'The Unseen Genome, Gems among the Junk', *Scientific American*, November, pp. 47-53.
- Gibbs, W. (2003b), 'The Unseen Genome, Beyond DNA', *American Scientific*, December, pp. 78-85.
- Government of Mexico, *Law of Biosecurity on GMO*, see for complete text <http://www.senado.gob.mx/sgsp/gaceta?sesion=2005/02/15/1&documento=25>
- Greenpeace México, http://www.greenpeace.org./mexico_es/
- Hagendijk, R. and E. Kallerud (2003), *Changing Conceptions and Practices of Governance in Science and Technology in Europe, A Framework for Analysis*, Science, Technology and Governance in Europe (STAGE), Discussion Paper 2.
- Halfman, W. and R. Hoppe (2004), 'Science /policy Boundaries. A Changing Division of Labour in Dutch Expert Policy Advice' in S. Maasse and P. Weingart (eds), *Scientific Expertise and Political decision Making*, Dordrecht, Kluwer.
- Henriques, G. and R. Patel, (2004), *NAFTA, Corn, and Mexico's Agricultural Trade Liberalization*, Americas Program Special Report, www.americaspolicy.org.
- Hernández Navarro L. (2007), 'Tortilla, la quiebra de un modelo' *La Jornada*, 17 January.
- Hernández Navarro, L. (2007) 'La nueva guerra de la tortilla' *La Jornada*, 12 January.
- Hernández, L. (2003), 'Campo, elecciones y movimiento', in R. Schwentesius *et al.* (eds), *El campo aguanta más?*, Mexico, Universidad Autónoma de Chapingo, pp. 229-40.
- Herrera, V. Ramón (2004), *En defensa del maíz (y el futuro). Una autogestión invisible*, Interhemispheric Resource Center, www.americaspolicy.org
- Hirschman, A. (1970), *Exit, Voice, and Loyalty, Responses to Decline in Firms, Organizations, and States*, Cambridge MA, Harvard University Press.
- INEGI, *El ingreso rural y la producción agropecuaria en México (1989-2002)*, Mexico.
- Jansen, C. *et al* (2004), 'Unpacking and Re-packing Knowledge in Development', in D. Kalb *et al.* (eds), *Globalization and Development, Themes and Concepts in Current Research*, Dordrecht, Boston and London, Kluwer Academic Publishers, pp. 163-190.
- La Jornada (2005), 'Buscará UNORCA pactos con frentes sociales y sindicales en apoyo al campo', 11 June.
- La Jornada (2007), 'Erróneas medidas para frenar el desabasto del maíz', 13 January.
- La Jornada (2007), 'La demanda del maíz podría elevar su costo a partir de julio' 14 January.

- Latour, B. (1998), 'To Modernise or to Ecologise? That is the Question', in B. Braun and N. Castree (eds), *Remaking Reality, Nature at the Millenium*, London and New York, Routledge, pp. 221-42.
- Latour, B. (1999), *Pandora's Hope, Essays in the Reality of Science Studies*, Cambridge MA, Harvard University Press.
- Levidow, L. and S. Carr (2007), 'Recasting Substantial Equivalence, Transatlantic Governance of GM Food', *Science, Technology and Human Values*, Vol. 32, No. 1, pp. 26-64.
- Leyshon, A. and R. Lee (2003), 'Introduction, Alternative Economic Geographies', in A. Leyshon *et al.* (eds), *Alternative Economic Spaces*, London, Sage Publications.
- Lind, D. and E. Barham (2004), 'The Social Life of a Tortilla – Food, Cultural Politics, and Contested Commodification', *Agriculture and Human Values*, vol. 21, pp. 47-60.
- Louette, D. and M. Smale (1996), Genetic Diversity and Maize Seed Management in a Traditional Mexican Community, Implications for *in situ* Conservation of Maize, *Natural Resources Working Group Paper 1996-2003*, Mexico, CIMMYT.
- MacMillan, T. (2003), 'Tales of Power in Biotechnology Regulation – The EU ban on BST', *Geoforum*, 34, pp. 187-201.
- Mann, C. (2004), *Diversity on the Farm*, Massachusetts, Ford Foundation.
- Masieu Trigo, Y. and A. San Vicente Tello, 'El proceso de aprobación de la ley de bioseguridad – política a la mexicana e interés nacional' *El Cotidiano*, No. 136, 2006.
- McAfee, K. (2003), 'Corn Culture and Dangerous DNA – Real and Imagined Consequences of Maize Transgene Flow in Oaxaca', *Journal of Latin American Geography*, Vol. 2, No. 1, pp. 18-42.
- Moody, M. and L. Thévenot (2000), 'Comparing Models of Strategy – Interests and the public good in French and American environmental disputes', in M. Lamont and L. Thévenot (eds), *Rethinking Comparative Sociology, Repertoires of Evaluation in France and the United States*, Cambridge, UK, Cambridge University Press, 273-306.
- Nadal, A. (2006), 'Mexico's Corn-Producing Sector – A Commentary', *Agriculture and Human Values*, Vol. 23, pp. 33-36.
- Nadal, A. and T.A. Wise (2004), *The Environmental Costs of Agricultural Trade Liberalization: Mexico-U.S. Maize Trade under NAFTA*, Working Group on Development and Environment in the Americas, downloaded on 22-09-2005 at <http://ase.tufts.edu/gdae/Pubs/rp/DP04NadalWiseJuly04.pdf>
- Nadal, A. (2005) 'El senado de los pollos,' *La Jornada*, 16 February.
- Nadal, A. (2000), *The Environmental and Social Impacts of Economic Liberalization on Corn Production in Mexico*, Oxford, UK, World Wildlife Fund and Oxfam.

- Ocampo, S. (2007), 'El alza al precio de la tortilla podría detonar estallidos sociales – UNORCA', *La Jornada*, January 30, <http://www.jornada.unam.mx/2007/01/27/index.php?section=politica&article=014n1pol>.
- Paczka, R. Ortega (2003), 'La Diversidad del Maíz en México', in G. Esteva and C. Marielle (eds), *Sin Maíz no Hay País*, Mexico City, Museo Nacional de Culturas Populares.
- Perez, D.T. (2006), 'Cuestión de color, cambiar de blanco a Amarillo podría salvar el libre comercio de maíz', *Expansion*, 22 de febrero.
- Pilcher, J. M. (2001) *¡Vivan los tamales! La comida y la construcción de la identidad mexicana*, Ediciones de la Reina Roja, CIESAS and CONACULTA.
- Pilcher, J., (1998), *Que Viven los Tamales – Food and the Making of Mexican Identity*, Albuquerque, University of New Mexico Press.
- Pilcher, J., (2005), 'Industrial Tortillas and Folkloric Pepsi, The Nutritional Consequences of Hybrid Cuisines in Mexico', in J. Watson *et al.* (eds), *The Cultural Politics of Food and Eating, A Reader*, Oxford, Blackwell Publishing.
- Pollan, M. (2005), *The Omnivore's Dilemma – A Natural History of Four Meals*, New York, Penguin Press.
- Posey, D.A. and G. Dutfield (1996), *Beyond Intellectual Property – Towards Traditional Resource Rights for Indigenous Peoples and Local Communities*, Ottawa, IDRC.
- Pretty, J. (2002), *Agri-Culture, Reconnecting People, Land and Nature*, London, Earthscan Publishers Ltd.
- Quintana, M. Victor (2005), 'La insoportable falta de equidad en la agricultura' *La Jornada*, 14 May.
- Quist, D. and I. Chapela (2001), 'Transgenic DNA Introgressed into Traditional Maize Landraces in Oaxaca', Mexico, *Nature*, Vol. 414, pp. 541-43.
- Report 2003 of Carnegie Endowment, cited in M. Pollan, 'A Flood of U.S. Corn Rips at Mexico', *Los Angeles Times*, 23 April 2004.
- Ribeiro, S. (2004), 'The Day the Sun Dies – Contamination and Resistance in Mexico', *Seedling*, July.
- Rivera, J.G. *et al.* (2004), *Proceedings from 1er Congreso Nacional de Nixtamalización, del Maíz a la Tortilla*, Queretaro, Qro, Mexico, October 17-21.
- Rodarte, A. O. (2003) 'Toward an Equitable inclusive and Sustainable Agriculture – Mexico's Basic Grains Producers Unite', in T. Wise, *et al.* (eds). *Confronting Globalization, Economic Integration and Popular Resistance in Mexico*, Bloomfield, CT, Kumarian Press.
- Schurman, R. and D. Takahashi Kelso (2003), *Engineering Trouble – Biotechnology and its Discontents*, Berkeley, Los Angeles and London, University of California Press.
- Schwentesius, R. *et al.* (2003), *¿El campo aguanta más?*, Mexico, Universidad Autónoma de Chapingo.

- Scott, D. (2003), 'Science and the Consequences of Mistrust – Lessons from Recent GM Controversies', *Journal of Agricultural and Environmental Ethics*, 16, pp. 569-582.
- Scott, J.C. (1998), *Seeing Like a State*, New Haven and London, Yale University Press.
- Skorburg, J. (2002b), 'NAFTA 2003, What's on the Horizon?' American Farm Bureau Federation, http://www.fb.com/issues/analysis/NAFTA_2003.html, accessed February 1, 2003.
- Soleri, D. and D.A. Cleveland (2006), 'Transgenic Maize and Mexican Maize – Diversity, Risky Synergy?' *Agriculture and Human Values*, Vol. 23, pp. 27-31.
- Thévenot, L. *et al.* (2000), 'Forms of Valuing Nature – Arguments and Modes of Justification in French and American Environmental Disputes', in M. Lamont and L. Thévenot (eds), *Rethinking Comparative Sociology, Repertoires of evaluation in France and the United States*. Cambridge University Press, Cambridge (UK).
- Toledo, V. M. (2005), 'Los biotecnólogos y el mito del científico objetivo' *La Jornada*, April 6 and 7.
- Transgénicos, ¿Quién los necesita?, *Grupo Parlamentario del PRD*. Cámara de Diputados, LIX Legislatura, 2004.
- Verschoor, GM. (2004), *Food Security, Food Sovereignty, Genetic Engineering and the Revalorization of Maize and the Public Good in Mexico*, unpublished paper presented at ENSAR, Rennes, on October 7.
- Villa, V. (2006), *Frente de la sociedad civil da Grito de Independencia Genética de México, ¡No a la siembra de maíz transgénico!*, downloaded on 22-09-2006 at www.ecoport.net/layout/set/print/content/view/full/63042.
- Warman, A. (2003), *Corn and Capitalism – How a Botanical Bastard Grew to Global Dominance*, North Carolina, University of North Carolina Press.
- Weiner, T. (2002) 'In Corn's Cradle, U.S. Imports Bury Family Farms', *New York Times*. February 26.
- Whatmore, S. (2002), *Hybrid Geographies, Natures, Cultures, Spaces*, London, Sage Publications.
- Wiber, M. (2006), *Intellectual Property Rights and Food Security – The International Legal Battle over Patenting Staple Crops*, paper prepared for the 25th Anniversary Celebrations of the Law and Governance Group, Wageningen, December 14.
- Zimmerer, K. (2000), 'The Reworking of Conservation Geographies – Non-equilibrium Landscapes and Nature-Society Hybrids', *Annals of the Association of America Geographers* 190(2), pp. 356-70.

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