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# Managing the Agricultural Biotechnology Revolution: Responses to Transgenic Seeds in Developing Countries

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# MANAGING THE AGRICULTURAL BIOTECHNOLOGY REVOLUTION: RESPONSES TO TRANSGENIC SEEDS IN DEVELOPING COUNTRIES

A Dissertation Presented

by

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## ABSTRACT

MANAGING THE AGRICULTURAL BIOTECHNOLOGY REVOLUTION: RESPONSES TO TRANSGENIC SEEDS IN DEVELOPING COUNTRIES

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There has been heated debate over transgenic or genetically modified (GM) crops in agriculture. Advocates and critics argue over possible economic, environmental, public health implications of this technology. This study examines varying policy approaches to regulating GM crop cultivation in four developing countries where the technology has large potential application. Why have some countries banned GM crop cultivation in their territory while others encouraged it? In countries where GM crops were allowed, why have varying systems of intellectual property rights (IPR) protection been constructed? To investigate these questions I comparatively examine the policy experience (1995-2015) of Argentina, Brazil, Turkey relying on original fieldwork and India based on secondary literature. The explanation combines structural considerations with a social constructivist understanding of how actors make use of ideas to interpret and articulate their interests in a context defined by novelty and uncertainty.

I find that transnational biotechnology companies lobby developing country governments for permission of GM crop cultivation and strict IPR protection so as to be able to charge the cultivators technology fees. While public opinion tends to be opposed to these crops, associations of big farmers tend to favor their adoption and view the IPR claims by

biotechnology companies as relatively tolerable. Smaller farmers and domestic seed industry, on the other hand, seek guarantees from the state that technology adoption conditions will not be established to their disadvantage. Which agenda is prioritized in policy-making will depend not only on the political weight of each pressure group but also on the statesmen's management of the available knowledge on such questions as how the GM plants work, who they are good for, why they may or may not be needed.

I observe that coalitions of scientists, civil society activists and pro-active bureaucrats are influential in shaping the policy vision by generating policy knowledge and ideas offering answers to such questions. I call them "epistemic coalitions." They strategically mix selective scientific evidence with social and ideological narratives, under conditions of incomplete scientific consensus. I demonstrate that GM-skeptic epistemic coalitions can have a good chance at policy influence where the pro-GM producer sector is highly fragmented, but where the producer sector is strong the same opposition can be functional in obtaining a domestic producer-oriented policy by challenging the legitimacy of extensive IPR claims advanced by transnational biotechnology firms.

The study thus provides an empirical account of the political reactions provoked, and some of the social-economical outcomes generated, by a controversial agricultural technology. On a theoretical level it contributes to debates in political science about the place of ideas, cognitive frames and social learning in public policy; and advances the epistemic communities research program.

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

# CHAPTER I

# INTRODUCTION

## The Question

If hypothetical Martians had been closely observing the living matter on the planet Earth, they would notice something peculiar around the year 1995. Suddenly, DNA molecules of a kind that had not existed before would make an appearance. These DNA would consist of genes from animals, plants and bacteria spliced and recombined together. The aliens observing our planet would further notice that dense colonies of such recombinant DNA would quickly grow and stretch like a huge green carpet over the land, in some parts of the planet. In other parts, though, the new thing would fail to appear even as years pass. In some places, the carpet of new DNA would suddenly end, as if someone drew a line there. Intellectually curious, the alien observer could wonder what determined the origin, the pace, and the obviously non-random extent of the new matter's growth, and what its impact on the environment was.

The alien observer would probably be quick to understand that the human species played a major role. Humans invented the new living matter, devised ways to multiply it fast and far, but ended up introducing it—insofar as they could control the process—in Argentina but not Turkey, embodied in soybeans but not wheat stalks. Seeking a parsimonious explanation, the alien could reason the following. Humans often pursue selfish interests, and many are interested in owning things as property. A small group of people from the northernmost parts of the planet—incorporating themselves under names like Monsanto or Syngenta—who owned the property rights to the new genetically engineered plants, were very enthusiastic about spreading them around; because the further these plants would spread, the greater the rents they hoped they could charge for the use. These were powerful people, and if nothing else intervened, one would expect them to get their way globally. However, in order to facilitate the spread, they had to interact with and recruit as allies the potentially powerful groups within each national jurisdiction they encountered. Sometimes they were successful in doing this. In some settings they were not very successful, and the new plants were blocked at the border. In other settings, the local groups got the new plants, but did not pay the rents due, it seemed. How come? Why did the local groups in different national settings take these divergent decisions? This study tells the story *how*, attempting to explain *why*.

For the life of genetically modified (GM) plants is not only a matter of interstellar academic interest, nor should it be left solely to students of life sciences. Our political responses to this technology will have profound implications on the way agricultural production is organized over the next century. Advocates argue that this technology, by producing crops with greater yield or better resistance to plagues and drought, could serve as a powerful tool in increasing agricultural productivity. It would help meet the needs of a growing world population under conditions of ecological stress; and contribute to development of countries where agriculture is a prominent economic activity. However, skeptics argue that the effects of GM crops on human health and ecosystem integrity are not well understood. Furthermore, they fear that these crops come with too many private intellectual property rights (IPR) claims attached to them, associated with the few US- and Europe-based transnational corporations (TNCs) dominating the biotechnology industry. Against this background, developing countries have received wildly diverging advice from policy advocates, ranging from a total prohibition to a full embrace of this technology with as few biosafety and commercial regulations as possible. The statesmen face the challenge of formulating policies to make the best of the application of this technology and/or preempt its damage, under pressure from local and transnational interest and opinion groups. By now it has become obvious that countries with already large-scale GM crop cultivation should have an interest in defending liberal standards in GMO (genetically modified organisms) regulation (Drezner 2008, Schneider and Urpelainen 2013), but this does not explain how countries initially choose to ban, limit or encourage GM crops. Why did they choose the particular policies they did? This is the subject.

More specifically, I pursue two research questions:

1. *Why have countries adopted more and less permissive policies towards GM crop cultivation?* Certain countries have banned GM cultivation in all or part of their territory, or allowed only for a very limited number of crops and with remarkable time lags; while others have taken a relatively laissez faire attitude.
2. *In countries where GM farming was allowed, why have varying systems of IPR protection been constructed?* In certain countries and for certain crops, the biotech TNCs have been able to assert property rights over the transgenic constructs embodied in the GM seeds and generate billions of dollars in revenue by charging farmers royalty fees. In others, the TNCs have exerted less control over how farmers reproduce the seeds; and domestic research started to compete with them for technology supply to a greater extent.

The two questions are not simply additive but complementary to each other. The potentially greater enforceability of IPR over GM (as opposed to non-GM) crop varieties is a primary reason why these crops have been developed and marketed with great zeal at the first place. A patented transgene is like a company logo stamped into plant germplasm for perpetuity, serving as a non-erasable marker of property claims even if the matter ends up being reproduced by unauthorized parties. Conversely, reasonable—though often exaggerated—concerns over strict IPR enforcement in a context of monopoly have been a major reason for the resistance against GM crops. Lastly, where these crops did find acceptance, the threat of strict IPR enforcement has generated informality in the GM seed market, as the developing world's farmers sought in this way to access the technology in favorable terms otherwise not available. Informal spread of GM seeds raises formidable barriers to effectively implementing official biosafety policies that would aim to minimize environmental and public health risks.

The "international regime complex" (Raustiala and Victor 2004) in this area leaves room for countries to adopt divergent policies. On biosafety, World Trade Organization (WTO) rules preclude regulations that would discriminate against the trade of GMOs without scientific evidence of harm, but the Cartagena Protocol on Biosafety allows for precautionary measures in case of scientific uncertainty, and at the level of regulatory detail scientific evidence is not interpreted by everyone (even all experts) in the same way. On IPR, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) requires countries to extend intellectual property protection to genetic engineering products, but other agreements such as the International Union for the Protection of New Varieties (UPOV) conventions might be interpreted to contradict TRIPS. Thus we get variation in policies, which is consequential.

## Why Pursue This Question

The stakes in this debate are high. Current wisdom on economic history holds that the industrial revolution would not be possible without parallel advances in agricultural productivity; and improved crops constituted an essential ingredient of the latter.[1] On a list of most important

[1] There is a strong case that differences in agricultural labor productivity circa 1800 explains why the industrial revolution started where it did; because higher productivity enabled a shift of population to specialized jobs in the urban sector (Allen 2000, Huang 2002). Higher agricultural productivity continued to mark the advanced economies thereafter, and during the nineteenth century agriculture saw much greater rates of labor productivity change than

innovations in American agriculture to date, a 1940 US Department of Agriculture study placed hybrid corn as second to none, regarding it as important as the tractor.[2] Transgenic seeds carry the promise of another such leap, suggesting possibilities for an "agricultural biotechnology revolution" that could enhance the ability to grow crops on a hotter, dryer planet. Considering potentially far-reaching implications on economic growth, environment and public health, the attention paid by political scientists to the political economy of agriculture is far from matching the subject's importance; the attention paid to technological innovation in this area is basically nil.[3]

The well-known students of GMO politics have been either uninterested in dynamics of agricultural production—focusing on the politics of the GM commodities consumed in wealthy countries—or they have not adequately addressed the place of IPR in it, as we shall examine in greater detail. The dominant approach has been to focus on the divergence of policies between the USA (liberal towards GMOs) and the EU (precautionary towards GMOs), and derive predictions about how the rest of the world would behave based on ties of dependence on these great powers. However, hypotheses that rest on the influence of this divergence to explain policies in developing countries perform disappointingly. Secondly, it is doubtful that the nature of the trans-Atlantic divergence itself has been correctly understood, consequently, it is difficult to apply lessons learned from the literature on the North Atlantic to domestic policy contestation in the developing countries. Third, because IPR issues were relatively insignificant when it

manufacturing or services (Maddison 1991: 150). Successful industrialization of South Korea and Taiwan, and later on of China, were preceded by significant increases in agricultural labor productivity, food production and food security (Wade 1983, 2003, Hayami and Anderson 1986, Storm and Naastepad 2005, Timmer and Akkus 2008), whereas industrialization attempts elsewhere were often stalled by inadequate agricultural growth (Lipton 1977, Bates 1981, Mathur 1990, Saith 1990, Singh and Tabatabai 1994).

[2] Noted by Gardner (2002:12).

[3] By comparison, there are entire research disciplines devoted to studying the economics and sociology of technological innovation—both of which descend from seminal studies of modern seed varieties in the mid-twentieth century (Ryan and Gross 1943 and Grilliches 1957 respectively).

comes to GMO debates in the wealthy countries where this proprietary technology originated from, such derivative explanations omit or play down an important dimension of the policy debate as it actually unfolded in the developing world. As a result, the GMO-skepticism among the developing world's stakeholders and policymakers is explained by a suspiciously high dose of irrationality.

This is an unjustifiable gap in our knowledge. There is evidence that GM seed adoption in developing countries has resulted in significant economic gains.[4] There is also suggestive evidence that farmers have captured a greater share—in static terms, anyways—of these economic gains where biotech TNCs were not allowed to exercise IPR enforcement to their full satisfaction.[5] The findings of this study will shed light on such policy-relevant questions as why some countries have forgone potential economic gains by banning GM seeds, whether GM cultivation elsewhere has produced significant environmental or public health damage, what political dynamics have allowed for various degrees of IPR enforcement. My purpose is less to draw policy lessons than to understand what has happened and under what constraints.

Apart from its substantive importance, this topic serves as an interesting case to study theoretical issues relating to scientific expert input for policy-making, and its relationship to NGO activism and interest group lobbying. By examining this case, the study aims at contributing to debates in political science about the place of ideas, cognitive frames and social learning in comparative national public policy or international cooperation in general (Skocpol and Weir 1985, Hall 1989, March and Olsen 1989, Sikkink 1991, Katzenstein et al 1998, Wendt 1999, Berman 2001, Blyth 2002 and 2003, Parsons 2003, Schmidt 2008, Woll 2008, Abdelal et al 2010, Nelson and Katzenstein 2014), and the epistemic communities research program in

[4] See Smale et al's (2009) review and meta-analyses by Finger et al (2011) and Areal et al (2012).

[5] See Demont et al's (2007) interpretation of their meta-analysis, as well as Raney's (2006) less systematic inquiry.

particular (Ruggie 1975, Adler and Haas 1992, Haas 1992). The epistemic communities research program rests on the premise that in areas such as environmental policy, causal ideas and associated norms propagated by "epistemic communities" of experts may contribute to better policies by changing the way political power holders view an issue, especially if experts are perceived as impartial. However, critiques argue that policy knowledge put forward by experts may simply rationalize already existing preferences, or it may be ignored when faced with powerful material interests (see Cross 2013). Similar criticisms apply to the autonomous causal role of ideas and norms in general. Hard and crucial tests through systematic comparative inquiry would be necessary to reject this materialistic null hypothesis. To this end, I study the competitive interaction of profit- and non-profit oriented civil society actors, scientific experts and the public decision-makers they try to influence, with a debate on agricultural technology; and I do this in comparative fashion in meaningfully differing agricultural contexts, to provide empirical tests. As statesmen faced pressure from international forces and lobbying by interest groups, how, if any, did the input of scientific experts and other idea-propagating and norm-building actors contribute to policy-making? This is the guiding *theoretical* question of interest.

## Research Design and the Argument

The country cases with the most leverage to answer the research questions would be developing countries close to the world's temperate agricultural zones; where either soy, corn or cotton was grown in great quantities at the onset (c. 1995) of the commercial release of GM crops (because these three crops are the ones for which GM seed applications have been available and therefore biotechnology TNCs would be much interested to market GM seeds there). This would be a setting where farmers from the Global South and their political representatives have to negotiate with biotechnology TNCs over terms of access to the technology. It excludes advanced industrial countries where these TNCs are headquartered and pay taxes to, because there IPR conflicts between farmers and the biotech industry do not hinge so much on the international division of labor and cause much political dispute. Also, where the farming population is small and agricultural input markets have long been substantially conquered by capitalist relations with strictly defined property rights, as it is the case in North America, Europe and Japan, the introduction of the GM seeds does not seem like a major turning point for the agricultural sector. The definition also excludes small and/or very poor countries that are either of little commercial interest to TNCs or reliant on foreign aid and whose policies have closely followed international donors' preferences. In short, at focus are sizeable middle-income countries with significant autonomy in writing their own policies, but which happen to be on the receiving end of an asymmetric relationship of technology exchange, having to manage a situation of dependent development.[6] Among those one should be particularly interested in countries with relatively open polities, where some degree of civil society representation and public deliberation exist and can be observed.

For this end I comparatively examine the policy experience (1995-2015) in Argentina, Brazil, Turkey, India. The methods I use are qualitative, although econometric evidence from secondary literature will be taken up whenever relevant. I employ process-tracing techniques to analyze the paths leading to the formation of particular GMO policy regimes in each country. To generate the qualitative data necessary for the analysis I have undertaken fieldwork in Argentina, Brazil and Turkey, conducting elite interviews (in Spanish, Portuguese and Turkish as well as

[6] This economic-geographic focus locates my study within the tradition of Cardoso and Faletto (1979) and Evans (1979, 1995).

English) with actors involved in the policy process and collecting documents. I have relied on online evidence and secondary literature for India, because of time and resource constraints.

These countries have been chosen so as to observe policy reactions to a novel technology in meaningfully varying settings, and to avoid generalizations from what could be exceptional experience. The cases display methodologically useful variation on agrarian structure fundamentals that are relevant to generating explanatory variables (and they happen to allow for variation on the outcome variable).[7] Two of them are land-abundant New World countries with settler colonial heritage, where larger, relatively well-capitalized farms dominate the agrarian landscape; and crop production is heavily oriented towards exports. The other two are societies with ancient agrarian heritage; where, relatively speaking, land scarcity and land fragmentation is the norm, and smallholding farmers characterize an agricultural sector that struggles for self-sufficiency in crop production. The variation in outcomes observed within each pair enables comparisons via what John Stuart Mill called as the "method of difference" (where the researcher isolates chief variables of interest while holding everything else as relatively constant), and the variation between pairs enables "method of agreement" kind of comparisons (where the researcher isolates parameters that remain relatively constant across cases while everything else varies).[8] Process-tracing within each case gives insights otherwise unavailable from cross-country comparisons. Chapter III discusses the methodological issues involved.

The variation on policy reactions to be explained is shown in Table 1. The upper left cell of the table is where the biotech TNCs would like to see the world to converge, and that is where

[7] There is debate in political science methodology over what kind of variation should inform case selection criteria. This issue is discussed in greater detail in Chapter III.

[8] These methods also go by the names "most similar" and "most different" respectively, as called by Przeworski and Teune (1970). See Gerring (2011) for a more recent treatment.

USA and Canada can be found, but actors in developing countries have mostly resisted going there.

Table 1: The two-dimensional policy regime on GM cultivation as the dependent variable

| | | Biosafety policies | | |
|---|---|---|---|---|
| | | Permissive | Restrictive-contested | Prohibitive |
| IPR policies | Strong IPR | (TNC ideal) | Brazil | Turkey |
| | Weak IPR | Argentina | India | |

The next chapter will introduce the reader to the details of policy challenges relevant to regulating GM crop cultivation and will thus make clear what is captured by the dependent variable. It would suffice here to note some striking features. In Turkey, a farmer can be put to jail for up to twelve years for cultivating any GM crops, in India GM seeds are widely used for cotton but not allowed for food crops, in Brazil permission came late after contestation over policy due to a combative opposition, whereas in Argentina GM seeds quickly took over almost the entire production of commercially significant crop production with little friction with public regulation. In terms of IPR; in Argentina once a farmer legally buys a bag of GM seeds, he can reproduce them freely in his farm for self-use, in India official price ceilings for GM seeds accompany a large informal market in “pirate” seed development and reproduction openly tolerated by government authorities, while in Brazil farmers have to pay a tax-like royalty fee to the biotech TNC for each subsequent harvest that springs from the original seed purchase. How to explain this variant public policy reaction across cases?

My explanation, detailed in chapter III, sets out by identifying the relevant policy stakeholders who would have material interests to be enhanced or endangered by policy change in this area. In designing policies, public decision-makers have to respond to lobbying by the multinational biotechnology industry interested in collecting technology rents from the adoption of GM crops, and a general consumer public worried about negative externalities regarding food safety and the environment. In between there are domestic agricultural producers who have a potential interest in accessing new seeds. Among them, while sectorial organizations representing big farming interests are generally supportive of permitting GM seeds and relatively tolerant towards IPR claims attached to them; small and medium farmers' preferences on both counts are less determinate, because they have a lesser chance of taking a share in pioneer rents from new crop adoption and their precarious economic and social position make them more sensitive to IPR encroachment over traditional seed saving practices. This implies that the position of smaller producers should be open to deliberation and persuasion—they would expect guarantees from the state that the terms of access to the technology will not be set to their disadvantage or else they may join the ranks of GMO-skeptics. Therefore, in a setting characterized by smallholding peasantry, GMO-skeptic opposition activism can have a greater chance at policy influence. Conversely, a more consolidated, capitalistic agricultural producer sector is expected to be more strongly in favor of permissive policies. In such a setting, an opposition orientation towards confronting GMOs altogether as an illegitimate, inappropriate technology on biosafety grounds seems doomed to failure. However, an opposition orientation towards minimizing biosafety risks from the adoption of GM crops, while questioning the strict IPR demands associated with them, may enable the GMO-skeptics to form an alliance with the producers.

In other words, economic structure determines the strength of the local producer sector to an important extent, but delimits its interests to a lesser extent. If GMO-skeptic coalitions can attach themselves to producer sector discourse, by framing the GMO threat in terms of property claims that can be handled rather than purely consumer risks that have to be blocked, they may help define those preferences and become influential over policy. If they do not do so, and if the producer sector happens to be strong, the GMO-skeptics become irrelevant, and the TNC gains greater chance of materializing its vision by influencing public policies. Therefore, where TNC lobbying is a constant, public decisions materialize as a resultant of the political strength of the agricultural producers, and the orientation of the influential opposition coalition. The combined effect of these two variables is illustrated visually below as Table 2 describing the policy trajectory in each case, named from the vantage point of how the TNC experiences it.

Table 2: Policy processes faced by the TNC depending on two explanatory variables

| | | Opposition orientation | |
|---|---|---|---|
| | | Challenging IPR restrictions | Challenging the entire technology |
| Producer sector | Stronger | Permission obtained, IPR compromised (Argentina) | Opposition overcome (Brazil) |
| | Fragmented | Limited permission, IPR compromised (India) | Opposition prevails (Turkey) |

The same effect is illustrated below as a decision tree leading to policy choices. In the conclusion chapter I will also discuss the social and economic consequences of these policies.

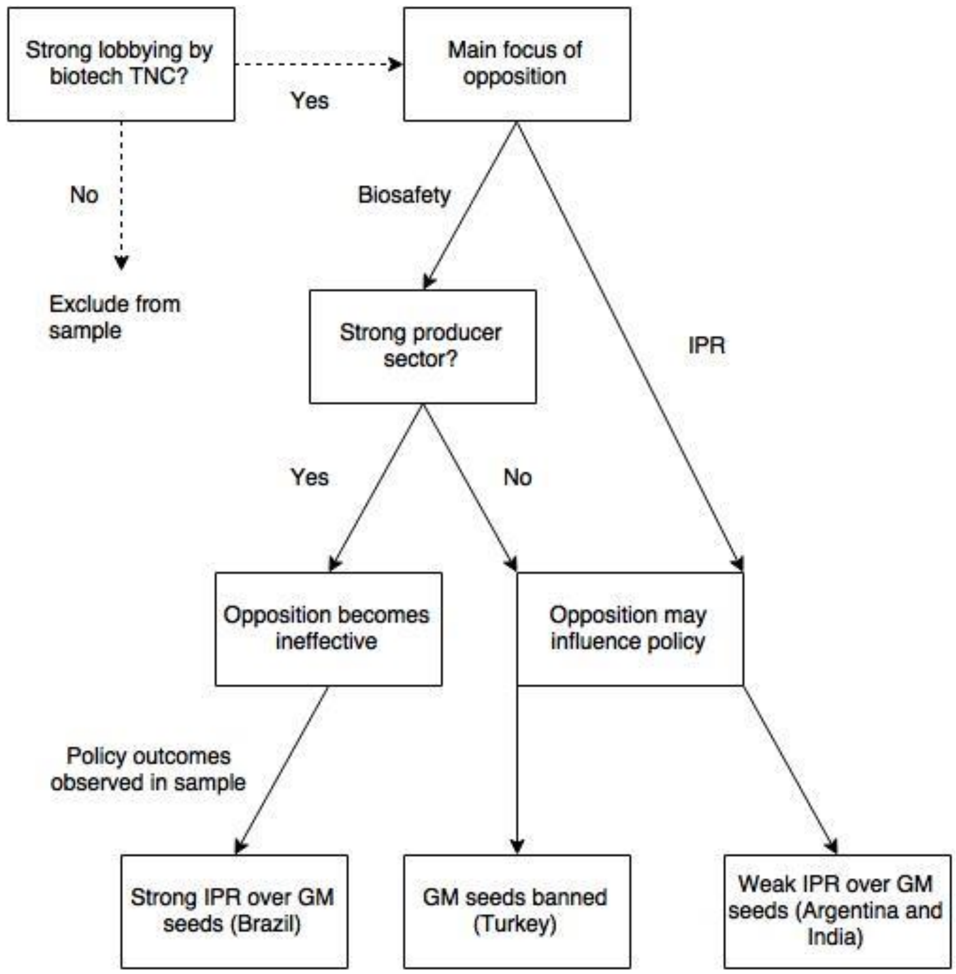


Figure 1: Causal pathways to policy choices

Where we observe that oppositional orientation is making a difference, there is evidence for the influence of ideas. Causal ideas, supported with certain associated norms, make a difference because actors, even if selfishly oriented towards material gains, are bewildered by uncertainty, they do not always know what to expect from new technology, and they need to learn their interests. The crucial finding that emerges from my analysis is that ideas—about how GM seeds work, and why we may or may not need GM seeds—articulated in opposition activists' discursive and campaign orientation do not automatically follow from the material economic setting, and they have an autonomous influence over policy in a manner orthogonal to material variables. Activists exert this ideational influence through the mechanisms of persuasion (because they persuade statesmen) and political pressure (because they persuade the public, to which the statesmen respond).

With case studies I provide evidence that scientific and legal experts take part in the generation of these ideas and the formation of the particular orientation of GMO-skeptic opposition in each country. However, the relationships between scientific experts and the other actors they communicate with are causally complex and multidirectional. Experts contribute to policy knowledge, both directly in communication with public decision-makers and by influencing civil society organizations who then exert pressure on public decisions; but the observed influence of the experts probably rests on some selection bias: to some extent decision-makers and lobbying groups should be selecting which experts to listen to based on prior beliefs that rest on non-expert knowledge.

Therefore, it is difficult to pass a confident judgment in favor of the epistemic community hypothesis; but the influence of ideational engagement on the outcomes, and the heavy presence of scientific knowledge claims in the arguments made by the parties to the debate, cannot be dismissed either. So instead of singling out epistemic *community* influence as a variable by itself I offer the term "epistemic *coalition*" to describe the broader relationship between activists, the scientific knowledge sources they utilize on the one hand, and the public decision-makers they try to influence on the other. The coalition brings together scientists, lawyers, civil society activists, and pro-active bureaucrats. It strategically mixes selective scientific evidence with ideological narratives and social norms to produce truth statements over the nature of the policy challenge in question, under conditions of incomplete scientific consensus. In these terms, this study documents the struggle between competitive epistemic coalitions that put forward rival kinds of policy knowledge towards policy influence. The policy outcomes observed imply that the policy process has been in a wide sense a process of learning and cognitive evolution, but not necessarily towards better outcomes; because in formulating a narrative of policy knowledge, epistemic coalitions mix scientific and non-scientific ideas, good ideas and bad.

To identify the policy stakeholders and their expected positions, and to delimit where the ideational contribution of epistemic coalitions should come into play, my study builds critically on existing studies on the public regulation of GMOs. The analysis in turn provides a more comprehensive picture of the policy challenges in this area—especially as it concerns countries in the global South—than what is found in the existing literature.

## **Political Science and the Regulation of GMOs: The Extant Literature**

Research on GMO politics, even though a substantial corpus by now, has often been conducted without a clear conversation with general theories in the study of international and comparative politics. We can glean the elements of such a conversation from the literature though, and map the relevant arguments in circulation as in the following.

Table 3: Theoretical explanations in the study of policy-making

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">Nature of causal mechanism</td></tr>
<tr><td>Material</td><td>Ideational</td></tr>
<tr><td rowspan="2">Source of primary cause</td><td>External</td><td>1) Coercion and incentives by great powers</td><td>3) Influence of hegemonic ideas</td></tr>
<tr><td>Domestic</td><td>2) Interest groups and polity structure</td><td>4) Role of learning, local NGOs or experts</td></tr>
</table>

Since GMOs gave rise to one of the most important disputes in the history of the GATT/WTO between the USA and the EU, most literature studies these two Northern powers, based on explanations of the type 2 and 4, and with some success in explaining the policies prevailing in these places (though not without inconsistency and ambiguity on important questions about lobbying by the producers). For the rest of the world, the studies have been few, mainly of the type 3 and especially 1, and unsatisfactory. No doubt, a comprehensive empirical account would have to make use of all these approaches eclectically. While in line with that spirit, I will put forward a theoretical framework that emphasizes causation of the type 2 and 4 to explain GMO policies in major developing countries. This is not only in order to counterweigh against the bias for the role of external influences found in the literature and contribute to more complete empirical knowledge accumulation. It also helps with the methodological task of isolating countries as cases. Transnational influences over policy, both formal and through transnational action networks and such (Keck and Sikkink 1998, Risse 2002), are no doubt present. This study is interested in understanding how these external sources of (information, knowledge, and material) influence are received, absorbed and translated to local policy knowledge in each place in specific ways due to the characteristics of local actors.

Let me describe each of the four theoretical approaches and how they are relevant to the issue at hand.

### Type 1 (Material-external) Explanations

Theories focusing on the ability of great powers to affect other countries through coercive and material incentives have a lineage going back to classic theories of imperialism. More recent scholarly formulations are divided in terms of how much they appraise the role of a single hegemon (Kindleberger 1986, Lake 1993, Ikenberry 2000, Kelley 2007) as opposed to post-hegemonic great power rivalry and cooperation (Keohane and Nye 1987, Hafner-Burton 2005, Drezner 2008). Hegemonic stability theory would predict the preferences of the USA to have an overbearing effect where it matters to the USA. However, with the economic power of the USA in relative decline, and the regulation of food and agriculture being an area where the fearsome military capabilities of the hegemon has little fungibility, hegemonic pressure is conspicuous by its limited bite when it comes to this issue. Attesting to this are the precautionary biosafety standards for GMOs prevailing in Europe and elsewhere and the fact that many developing countries challenged the US call for strict IPR protection over biotech industry's (chiefly the US-based Monsanto's) proprietary genes. Indeed, this study will provide evidence, through US embassy cables available via Wikileaks, that the hegemon's pressure for certain kinds of policies was always present but not sufficient by itself to make countries change course.

Post-hegemonic great power rivalry is obviously the more relevant variant of the external-materialist explanations. This in turn may authorize several theoretical expectations: The great economic powers USA and EU may successfully influence third countries through rival sanction threats or trade and aid incentivizes, resulting in competing spheres of influence (Drezner 2008, Paarlberg 2009, Schneider and Urpelainen 2013). Alternatively, the self-contradictory regime complex that emerges as a result of great power divergence, wherein certain international institutions are favorable in procedural structure or policy content to US interests (such as WTO agreements) and others to the EU (such as the Cartagena Protocol), may create forum-shopping opportunities and even give room for maneuver to developing countries in formulating policies not foreseen by any great power (Alter and Meunier 2009, Helfer 2009). Those two are somewhat rival explanations. To the extent that the first one is correct, there would be little interest in studying developing country policies because we already know where they come from, and there is little hope for changing them in desirable ways without first addressing the disagreements between the great powers. If the second one is valid, then the question remains how the preferences of the developing countries (to which end they would use forum-shopping opportunities) are generated.

Schneider and Urpelainen (2014) provide a testable version of the great power influence theory. Taking the ratification of the Cartagena Protocol (which the USA opposed and the EU favored) as their outcome of interest, they hypothesize that ratification will depend negatively on an observed country's dependence (measured by bilateral trade ties and military alliance) on the USA and positively on dependence on the EU. However, out of 39 countries that either were particularly enthusiastic early ratifiers of the treaty or remained non-ratifiers, only 22 cases are predicted correctly by the theory, and the ratio falls to 8 out of 18 for early ratifiers. In this respect the predictive power seems barely distinguishable from that of a random guess. Crucial cases such as Mexico, with a high degree of dependence on the USA and an early ratifier (and which maintains a ban on GM production for corn, her most important crop) are predicted incorrectly. And it is not clear how consequential treaty ratification is for policies actually adopted: Brazil is a ratifier, and is the world's greatest GM crop producer—second only to the USA. Most of the world's GM cotton is produced in India, also a ratifier of the Cartagena Protocol, and so on. Hence, the expectation of a simple alignment of policies with major external partner performs disappointingly.

Mainstream explanations based on Northern leadership are also limited by their short treatment of how IPR and related corporate strategies complicate the acceptance of GM crops in developing countries. Because IPR issues were relatively insignificant in GMO debates in the wealthy countries where this proprietary technology originates from, such derivative explanations omit or play down this important dimension of the policy debate as it actually unfolded in the developing world. Paarlberg (2009) demonstrates that policy-makers in African countries imported the European opposition to GMOs because of ties of dependency such as the role of European donors in African agricultural R&D funding, and from this, he hastily concludes that corporate IPR over seeds has not been and should not be a source of hesitation in the policy debate over GM seed adoption in poorer countries (Paarlberg 2009: 115-116). But there is little evidence in his work that during the period under investigation profit-oriented biotechnology companies considered Africa's tropical crop varieties worth investing in, or that public consortiums made enough progress in their GM crop development projects to face concrete rejections by the policy-makers they would be approaching.[9] And when concrete proposals for local GM crop adaptation for Africa were about to materialize, disagreements over IPR enforcement contributed to their stalling.[10] In any case, the theory of great power influence over GM agriculture in the third world, whatever its merits are for Africa, applies poorly to sizeable "emerging markets" with enough autonomy to write their own policies.

There is another variant of the great power influence approach which does pay attention to IPR issues, favored by those critical scholars who locate the debate within the broader context of the expansion of industrial agriculture in the global South since the Green Revolution. Such works have characterized the codification, commodification, and exclusive ownership of plant germplasm through proprietary technology as an enclosure movement: the enclosure of the global commons in plant genetic resources (Kloppenburg 1988, Brooks 2005, Jasanoff 2006, May and Sell 2006, Otero 2008, Clapp and Fuchs 2009, May 2009). However, this literature, while accurately putting up US and Europe-based proprietary interests for critical analysis, tends

[9] In sub-Saharan Africa, major crops were too different from the temperate-zone varieties for which transgenic transformations were already available, seed markets were too underdeveloped, and individual countries were too small to attract significant investment in technology adaptation in this early period. South Africa, which Paarlberg focuses as an exemplary case, is the exception that proves the rule.

[10] About the slow progress in mobilizing international aid for development of GM crops suitable for Africa, Paarlberg's own account points to cost considerations and disagreement over IPR enforcement among the (especially private) participants of the project as the most visible obstacle (2009: 165-170).

to draw a reified picture of the power of multinational business and their diplomatic supporters (a good recent exception is Filomeno 2014). For a refined view, more attention needs to be paid to the national interface through which such power is negotiated by domestic actors within developing countries, and how the outcomes vary across different settings.

## Type 2 (Material-domestic) Explanations

This is where type 2 explanations, i.e. the study of material constraints within a given national setting, become relevant. For most mainstream literature in international political economy and comparative politics, such explanations arguably represent the modal approach to explaining policy-making. Accordingly, particular country characteristics (defined in terms of factor endowments, sectorial composition, or class structure) affect the power and preferences of domestic interest groups responding to world markets, and policy then results from the politically mediated contestation between these groups. The "open economy politics" research program puts emphasis on deterministic theories whereby group positions and the prevailing policy can be predicted from the national economy profile (Lake 2009). The "varieties of capitalism" school pays more attention to strategic interaction between interest groups and the role of preexisting institutional arrangements in directing interaction towards politically desired coordination foci (Hall and Soskice 2001). Alternatively, scholars may eschew explaining interest group behavior, take alternative policy proposals as an observational given, and limit attention to how the institutions of a polity resolve policy contestation. Most political science writing on GMOs takes policy divergence between the USA and EU as their topic of interest and, eschewing a political economy analysis, employs the last strategy. Consequently, this line of inquiry has successes but also limitations. The most comprehensive explanations find the main cause of divergence in institutional (and cultural) differences built into these polities (Ansell and Vogel 2005, Jasanoff 2006, Pollack and Shaffer 2009). Scholars have been more successful in analyzing how the institutional structure of the European Union empowers the anti-GMO member states (Bernauer 2003, Sheingate 2009) or promotes policy contagion (Tosun 2014) and less so in explaining why anti- or pro-GMO preferences predominate in particular states at the first place. The focus on institutional (and cultural) dimensions of the policy process leaves out how economic interests, if any, weighed themselves on the policy decisions.

This gap is addressed by economists who explore the possibility that the stringent European regulations against GMOs might have an economic function (and, by implication, an economic motive). Their findings are mixed but they are often translated in lay wisdom to the idea that Europe has blocked the GMOs because of lobbying from its farm sector seeking trade protection against more efficient producers across the ocean. However, scholarly evidence does not support this view at a close look. Econometric simulations using global trade models suggest that while aggregate welfare (not counting any externalities) in Europe would be worse-off by banning GM imports, it is not clear that European farmers as an interest group would be better-off from a ban either: existence of net positive gains to farmers depends on delicate assumptions about the completeness of the ban (which, we now know, has remained far from complete), and, importantly, the level of *existing* consumer aversion taken exogenous to farm sector lobbying (see Nielsen and Anderson 2001, Nielsen, Robinson, and Theirfelder 2003, van Meijl and van Tongeren 2004, and most conclusively Jackson and Anderson 2005). Under such uncertainty over marginal gains, it is difficult to believe that European farm sector would actively lobby for an anti-GMO position and forego absolute productivity increase, which was more certain.[11] From

[11] Taking farm size (which is high in Europe in world standards) and farmer education level (likewise high) as the main determinants of productivity enhancement from GM crop adoption, van Meijl and van Tongeren (2004)

this perspective, while it may be reasonable to think that banning GM commodity imports could serve as protectionism *once* Europe eschewed GM crop cultivation itself (Drezner 2008: 155, Graff et al 2015: 677); it remains a mystery why European farm sector would not want GM agriculture if they were given the choice *before* the consumers show their hand. Furthermore, as Cadot et al note, "as European agriculture is already heavily subsidized, the rationale for 'shifting rents' away from US farmers [through protection] is unclear" (2001). "In the case of maize, European producers neither needed nor wanted import protection [in the form of a GMO ban]" (Lynch and Vogel 2001). The Common Agricultural Policy was already providing subsidies for this crop, and no substantial change in production level and farm income would result from a more permissive biosafety regime, van Meijl and van Tongeren (2004) estimate.[12] In the case of soybeans and cotton, European production was small, and it is not clear which economic interest would be enhanced in Europe by substituting imports from USA with imports from other places (Tiberghien 2007).

Empirical studies of European policy-making have not found evidence in support of what we could call the producer-induced-protectionism thesis either. Lynch and Vogel (2001) conclude against the thesis in their review of the EU policy-making process, and Pollack and Schaffer (2009) find the cause of policy in preexisting cultural and institutional features that increased the salience of consumer fears. According to Bernauer and Meins (2003) and Ansell et al (2005) there is little evidence that European GMO protest is a triumph for protectionist producers' groups. Tiberghien (2007) notes that in the case of France, which became an

estimate that Europe's productivity enhancement rate from GM seeds would be as high as that of Argentina's (an early and enthusiastic adopter).

[12] Furthermore, as Drezner (2008: 155) reminds: "A large (albeit decreasing) fraction of CAP subsidies are tied to production: farmers received a larger subsidy with increased crop yields… If GMOs increased European agricultural productivity, the CAP system would mandate an increased outlay of subsidies, posing a considerable strain on the EU budget [while benefitting farmers]."

important country in upholding the EU moratorium on GM crops, the corn growers federation was publicly pro-GMO, “concerned about losing out in a competitive battle over technology;” and the peak agricultural organization took a neutral position, whereas the union of small farmers joined the anti-GMO coalition—hence the much publicized but unrepresentative example of the farmer-politician José Bové. In Switzerland, home to the biotechnology giant Syngenta, farmers were at odds with the anti-GMO coalition that came to dominate the country’s agenda. According to Tiberghien, in nearly all EU countries, farmer involvement in the debate came after the urban-based activist groups already turned the issue into a public debate. As for the next link in the industry chain, the food retailers, Bernauer (2003) concludes that they turned to non-GM supplies only after 1996 when mandatory labeling was in the horizon and it became apparent that the consumers would prefer non-GM products. Contrary to the implicit hypothesis in most writing on the matter, European producer sector organizations seemed welcoming to GM seeds *until* European consumers made it clear that they did not want GM food and European policy-makers chose to adopt precautionary biosafety policies that made farming with GM seeds a less viable option.

Hence, a clear picture of how domestic interest group interaction weighed itself on policy-making cannot be found in the literature on the North Atlantic, where this approach is typically considered to be the most appropriate. When it comes to developing countries, the implications of such an approach have been explored in passim only. One hypothesis would be that developing countries follow the regulatory approach of the countries to which they export most of their agricultural commodities, out of market access concerns. However, this hypothesis cannot predict variation because virtually *all* major agricultural markets, including Europe, Japan, South Korea, and the increasingly important China, are generally biased against the

GMOs. (The major pro-GMO rich countries USA and Canada are not significant markets for field crops, instead they are important exporters themselves). On the basis of this hypothesis, early commentators had suggested that export farmers and countries they dominate, like Argentina and Brazil, would be the first to oppose GM crop cultivation in order not to lose markets (Lapan and Moschini 2002, Graff et al 2009). Pretty much the opposite has come true, because trends in export markets oscillated and, I would argue, productivity and profitability concerns ultimately trumped market access fears where either producers or biotech sector lobbying were politically strong enough. By now it has become obvious that countries with already significant GM crop cultivation should have an interest in defending liberal standards in GMO regulation (Drezner 2008, Schneider and Urpelainen 2013), but this does not explain how countries initially opt to ban, limit or encourage GM crop cultivation.

Interest group politics, and especially the stances taken by the rural producers have perhaps taken longer shrift in advocacy writing than in the scholarly literature on the matter. Among policy advocates, critical writers claim that rural producers should be and mostly are against GM crops (Shiva 2001), while pro-GMO writers claim the exact opposite (James 2011), without presenting precise reasons. The former ignores many instances where rural producers have taken a strong stance in favor of the legalization of GM seeds (a fact that leads to the question why they have not done so everywhere with equal force). The latter ignores the fact that rural producers everywhere have had at least an uneasy relationship with the IPR claims of biotechnology companies (a fact that leads to the question why they have been more or less successful in “winning” that conflict). It needs to be acknowledged that there may be grounds for differentiation of the interests of different kinds and classes of rural producers, and furthermore, that interests can to a significant extent be uncertain, pushing producers in different settings to develop different ideas about what will best serve them.

## Type 3 and 4 (Idea-based) Explanations

The ongoing failure to draw a clear picture of interest group politics suggests that more than straightforward material factors need to be taken into account. Type 3 and 4 explanations would emphasize that ideas in circulation can make a substantial difference by shaping views on an issue for policy stakeholders and public decision-makers alike.

In a basic sense, ideas are complementary to otherwise materialistic explanations. Mainstream materialistic accounts in political science are founded upon the postulates of the rational choice paradigm. But this paradigm, stripped down to its essentials, is agnostic about where the preferences come from. Whether to prefer higher corn yields over biodiversity and minimized allergenic risk is not a matter of rational choice; it is in the prior realm of values. Actors with different values have different preferences, and they can all be equally rational about them.[13] So, how do actors know what to value most? According to Wendt (1989) ideas in the form of definitions of one's identity guide them towards value preferences. March and Olsen (1989) examine institutionalized identities that endow people with principled beliefs about what is appropriate or normatively desirable for someone in their position.

Furthermore, once actors discover their own social identities; they have to discover the world they are living in—how it works and what populates it. Rational choice scholars study those situations where a well-institutionalized polity renders the structure of the political game

[13] Rational choice modeling is founded upon two minimum rationality assumptions. First, actors can rank-order preferences in a consistent manner. This implies the mathematical principle of transitivity (if $A > B$ and $B > C$ then $A > C$). Secondly, actors make choices aimed at getting the best possible outcome according to those preferences. The content of the preferences, at this level, does not matter.

and the relevant set of rival actors (if not their preferences) common knowledge to everyone. However, political life abounds with other kinds of situations and they may be no less important. Economic crises (Blyth 2002), discovery of hitherto unknown problems (Haas and Haas 1995) and, as examined in this study, ground-breaking technology easily give birth to such situations characterized by exasperating levels of complexity and novelty, putting actors at a loss about how to orient themselves.

In classical rational choice accounts, such situations are viewed through the lenses of information, transaction costs and risk. Rational ignorance may ensue because actors refrain from acquiring information when the cost of educating oneself on an issue exceeds the potential benefit that the information could provide. Still, strategies can be formulated by discounting the probability of benefits by the costs of information multiplied by some risk aversion coefficient. However, scholars of constructivist political economy have generated fruitful discussion by reintroducing the concept of "Knightian" uncertainty as different from any risk (Beckert 1996, Blyth 2006, Woll 2008, Nelson and Katzenstein 2014). Under uncertainty, actors are at a loss about the causal parameters that move the world and they therefore have no basis to know what the objective probability distribution of outcomes may look like.[14] The distinction is a fine one, and some would insist that the concept of risk can accommodate uncertainty, but perhaps the point is that a quantitative increase in information requirements may warrant a qualitative distinction: given the bounded computing capacities of real people and the bewildering variety of information they have to process, in real-world situations risk estimation can easily collapse into muddling through uncertainty.[15] In this more behavioral sense of the term *at least*, the policy-

[14] The concept originates in economist Frank Knight's classic work that declared, contra Pigou, that "uncertainty … [is not] a gamble on a known math chance" (1933: xiv).

[15] Limits to cognitive processing as understood by Herbert Simon (1982) and Douglass North (1990) are arguably along the lines of such behavioral, not truly Knightian, uncertainty. See Woll (2008) for a good discussion.

making effort for GMOs comes with considerable uncertainty. At the onset of technology introduction in c. 1995, policy stakeholders and public decision-makers face no precedents, have limited scientific data, and international law on both biosafety and intellectual property aspects of the technology is still emergent.

Under such uncertainty, ideas in the form of causal beliefs about how the world works become crucial variables. These may be scientific (and social scientific) statements that demonstrate the connections between things (Haas 1992, Ida 1993, Blyth 2002, Woll 2008) or policy models that provide a blueprint for how to pursue particular political objectives (Holzinger and Knill 2005, Marsh and Sharman 2009, Weyland 2005). Actors holding different ideas may pursue very different strategies, indeed opposing strategies, in order to serve the same broadly defined value because they interpret causal relationships differently. As Iida explains, "Disagreement could arise not only from a conflict of interest in underlying preferences but from different predictions concerning the consequences of [actions]" (1993).

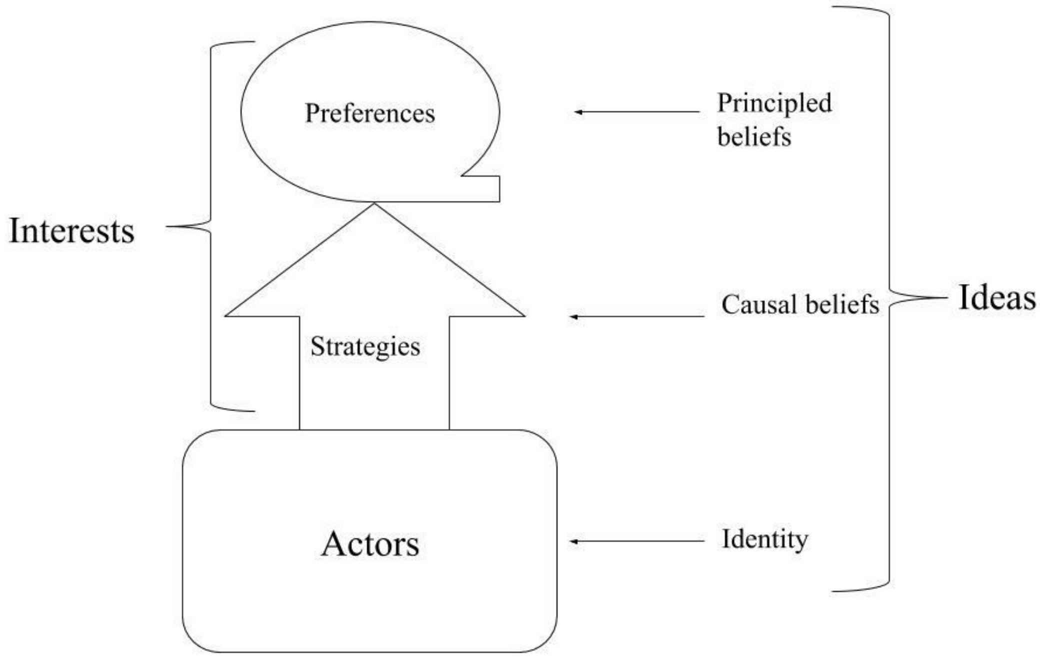


Figure 2: Ideas and Interests

Therefore, changing actors' ideas can lead to a change in their ultimate preferences or the strategies they use to pursue them, or both. This is why not only interest groups in the classical sense, but idea-generating and idea-propagating agents become crucial in analyzing the politics of policy-making. The agents of ideational change include international organizations with a mandate to address a problem (Finnemore 1996), public policy entrepreneurs (Roberts and King 1991, Mintrom 1997), activists organized in NGOs (Keck and Sikkink 1999), or scientists and other experts with epistemic authority over a technical issue, or "epistemic communities" (Haas 1992, Knorr Cetina 1999).

Most scholars would agree that the universe does not give to ideas a blank check for defining people's interests, which are also informed by material conditions in ways that do not *always* require *a lot of* ideational mediation to become intelligible. It is true that "structures do not come with instruction sheets," as Blyth has commented (2004), but structures—the rainfall to your farms, the depth of your ports, the volume of US$ denominated bonds in your treasury or the nuclear weapons in your arsenal—do exist, and ideational instruction can ignore them at the risk of its own irrelevance. Ideas nonetheless make a difference in helping to choose among the structurally relevant options. The average Brazilian farmer would not react to the proposition of permitting GM crop cultivation in the same way that the average Austrian music teacher would, but still, his interests are not completely delimited by the fact of being a farmer in Brazil and he may need to hear ideas on a number of particular policy questions to define and articulate his interest on this matter. The situation would be likewise for the statesmen in these countries who are taking decisions with some input from these civil society actors. As Craig Parsons writes, "ideas, as an autonomous causal factor, thereby select from a range of structural and institutional possibilities" (2002: 48).

When it comes to the study of the regulation of GMOs; various scholars have noticed the crucial role of ideas, discourses, and narratives (Hajer 1995, Scoones 2006 and 2008, Jasanoff 2011, Newell in passim). It is curious, though, that when the more materialistically-oriented scholars discuss the topic, these contributions barely receive notice despite the disappointing record of the proposed materialistic hypotheses. Perhaps this is partly because constructivist scholarship often does not proceed through methodical selection of comparisons and counterfactuals whereby alternative theories can be evaluated. The particular domains where ideas make a difference are not always carefully delineated either, but they should be. For example, where idea transmission channels between actors are coupled with strong material ties it is difficult to distinguish between pretension and true persuasion: Actors may behaviorally follow certain ideas because they feel obliged to do so due to material constraints, or it may be the case that economic and institutional ties expose actors to particular ideas instead of others, which then lead to a genuine change in belief about what is desirable. European influence on GMO policies in Africa (Paarlberg 2009), for example, could be either, or both. As King et al advise, "To show that ideas are causally important, it must be demonstrated that a given set of ideas held by policymakers, or some aspect of them, affect policies pursued and do not simply reflect those policies or their prior material interests" (1994: 191). So long as this task is not attended, one can always suspect that we are not explaining the ideational formation of interests but merely describing how structurally generated interests look like when we ideographically zoom in to their social articulation at a low level of abstraction. To quote Parsons again, one needs to seek "counterfactual leverage": "What was the range of possibilities without these ideas? Cross-case comparisons help in this respect, suggesting alternatives in similar situations" (2002: 50).

This is what I will do in this study. I take countries that form two "most similar" pairs with regards to certain agricultural structure characteristics that inform the needs and the political power of the producer sector. The variation in outcomes *between* these pairs attests to the strength of such structural factors in delimiting political options. The variation *within* each pair attests to the strength of the particular ideas that were engaged with the policy debate.

I will also stress the more local processes of idea generation and circulation, and endogenous learning by developing country policy stakeholders and decision-makers themselves. In a world where both epistemic communities and NGOs are more and more organized transnationally, it is not easy to distinguish between domestic and external sources of ideas, but a distinction is analytically useful. When it comes to developing countries, as with the materialistic theories, idea-based ones too tend to have a bias for the influence of globally influential actors

(Haas 2001, Keck and Sikkink 2014). Type 4 explanations are therefore scarce for our geography of interest and we need more of them.

For the neglect of the processes of adaptation of global lessons to locally specific, policy-relevant knowledge leads to misleading conclusions. Both Drezner (2008) and Paarlberg (2009), for example, dismiss the role of epistemic community influence over GMO policy-making because of the observed variation in regulatory policies despite what they maintain to be a global scientific consensus on the desirability of GMOs. This conclusion is problematic not only because it anachronistically projects the emergent (and still contested) scientific consensus about the safety of GM food back to the mid-1990s when decision-makers had to formulate regulations based on scant scientific data. It also fails to distinguish between purely scientific research and "regulatory science" (Jasanoff 1995, Irwin et al 1997, Bonneuil, and Levidow 2012). The latter is a hybrid practice responsible for producing an actionable, policy-oriented narrative suitable for particular locales and issues, and not all of its proposals can be reduced to imperatives of science proper, which operates at a more abstract level.

Consider the following: Many a GM crop variety contains a "marker" gene (necessary to complete the process of transgenesis but not required for the performance of the end product) that, as a side-effect, confers resistance to a certain class of antibiotic—kanamycin. Kanamycin would be the basis for the next wave of drugs treating tuberculosis; and it is not unreasonable to suspect that those drugs could be ineffective on consumers of GM food. Since tuberculosis is no longer an important problem either for humans or animals in Europe this need not be a concern in EU's GMO approval procedures. However, even when trying to chart a path close to the EU paradigm, Turkish policy-makers would have to form their own judgments because Turkey still fights tuberculosis.[16] In such a context, Turkey-based experts, even if they are otherwise of lesser academic standing, may become particularly important informers for policy stakeholders and decision-makers alike.

The role of ideas in substituting for missing common knowledge explains the surprising efficacy of idea-generating and idea-propagating agents in affecting policy—whom I call as epistemic coalitions. Epistemic coalitions consist of scientists, civil society activists and bureaucrats working across the state-society divide. They strategically mix selective scientific evidence with ideological narratives and social norms to produce convincing truth statements over the nature of the policy challenge in question, under conditions of incomplete scientific consensus. Epistemic coalitions not only help define normatively oriented preferences. They also help actors to adopt causal ideas about what may or may not lead them to those preferences. They answer questions such as whether kanamycin resistance is bad for you. They answer questions like whether the grains GM seeds generate can be replanted as new seeds. (For someone worried about helping farmers to retain control over the seeds they use, the answer to this question is consequential for the choice of strategy. If you are convinced that GM seeds are biologically sterile, for example, you may want to block GM seed cultivation altogether. If not, you may hope to deal with the situation through IPR laws).[17] This is what is "epistemic" about them, or the reason why they are not simply political coalitions. A lot of people involved with

[16] This insight comes from a conversation with Ahmet Atalık from the Turkish Chamber of Agricultural Engineers. Also see Atalık's published note "EFSA Skandalı! GDO'ların Ülkemize Girişi Durdurulmalıdır!", at the Chamber's website, dated 25 February 2011 and last accessed December 2015, http://www.zmo.org.tr/genel/bizden_detay.php?kod=15830&tipi=3&sube=3 . For background, see "Antibiotic Resistance Genes: A Threat?" in *GMO Compass*, http://www.gmo-compass.org/eng/safety/human_health/46.antibiotic_resistance_genes_threat.html, last accessed December 2015.

[17] GM seeds are not necessarily sterile. However, the situation is complicated, because GM seeds of the future may be biologically sterile (through "terminator seed" applications), and that in turn depends on IPR law (i.e. whether the current ban on "terminator seeds" will remain in place). The situation is explained in detail in chapter II.

this debate are confused about such questions, so epistemic coalitions become important. The concept is developed further in Chapter III and reviewed in Chapter XIII.

## **Research Procedures and the Outline of the Dissertation**

Chapter II is intended to serve as a primer on genetic engineering in agriculture, and the extent of the public policy challenges it raises regarding both biosafety and IPR issues. The reader should consult it as a reference for the terms of the debate.

Chapter III lays down the methodology and the analysis, and presents the argument in detail. It sets out from a theoretical framework, informed by agricultural economics, that delimits the relevant actors, lays down certain expectations about their behavior. The chapter concludes by summarizing the observable implications of the theoretical framework, and describing the research procedures in detail.

Starting with Chapter IV, I present individual country cases. For these case studies I conducted elite interviews with politicians, bureaucrats, private sector representatives, scientists, lawyers and NGO activists. Non-random sampling for elite interviews is recommended when the goal is "not … to draw a representative sample in order to use interviews to make generalisations about the … full population of relevant actors, but rather to obtain the testimony of individuals who were most closely involved in the process of interest" (Tansey 2007). This was precisely my goal and I have used a non-random "snowball" (or chain-referral) method wherein each interviewee supplied names of other potential interview subjects. Interviews were conducted by myself in English as well as the native language of each country, Spanish in Argentina, Portuguese in Brazil and Turkish in Turkey. To reconstruct an accurate narrative, interviews were triangulated with data from documentary evidence (official documents like parliamentary minutes, law drafts, embassy cables accessed via Wikileaks; memos and reports issued by for-profit and non-profit civil society organizations), press reports, and secondary literature. Where possible I relied directly on publicly available information, and referred to interviews only in additional support. Among the sources that I consulted, widely available publications are listed as bibliographic entries. Other sources, including press items and Wikileaks cables, are to be found in footnotes. A chapter is devoted to India, where I did not conduct original fieldwork, but which is studied through secondary literature and online evidence. My data collection operations are explained in more detail in Chapter III.

Lastly, in the conclusion chapter I discuss how findings from country case studies challenge and improve the analytical framework laid down in the beginning, comment on theoretical lessons and briefly consider policy implications of this study.

But before going any further the reader may want to know what, of consequence, I have found in a nutshell. I have found three things. First, both simplistic pro- and anti-GMO narratives are wrong in assuming that the technical characteristics of the technology will solely determine its reception and impact. It is the legal-institutional package within which the technology is delivered to the markets that affect not only whether the technology will enjoy acceptance, but also what kind of social outcomes it will generate once it is adopted. While critical scholars may have exaggerated fears concerning corporate ownership of technology, they correctly identify a major fault line. In the four countries examined here the biosafety and IPR aspects of policymaking have been indeed closely linked, concerns over IPR abuse in a context of monopoly have complicated GM crop acceptance, and biosafety concerns in turn have become instrumental in challenging IPR claims. The resulting policies defy, to varying extents, the TNC vision of how the technology should be deployed in the market. Second, this also attests to the fact that in making their policies developing countries have not simply followed Northern examples, or acquiesced to pressure from the same, and instead they have made use of a complex international regime that leaves room for policy discretion, with significant attention to pleasing their own domestic interest and opinion groups. Against theories of political science (mainstream or critical) that accord too much influence to external influences, this calls for an appraisal of domestic politics in at least the bigger, more powerful developing countries, and more attention to connecting the study of international to comparative politics. The third finding concerns the relationship between economic factors and dynamics of civil society activism. Economic structure determines the strength of the agricultural producer sector to an important extent, but it delimits its interests to a lesser extent. If GMO-skeptic epistemic coalitions can attach themselves to producer sector discourse, they may help define those interests. If they do not do so, and if the producer sector happens to be strong, they risk being irrelevant. There is an intellectual implication: While political science shows little sign that agriculture or farmers exist in the world, they actually still mean a lot for especially developing countries' economies, and occasionally they are politically influential. More attention needs to be paid to how agricultural producers formulate their political interests, and act or fail to act upon them.

# CHAPTER II

## GENETIC ENGINEERING IN AGRICULTURE: PROMISES, RISKS AND FEARS

The arguments on the different sides of the debate over the use of genetic engineering in agriculture are summarized in Table 4 below, classified in issue areas. For the sake of consistency and convenience in presentation I subsume these issues under two broad names: biosafety and IPR. Accordingly, food safety and environmental issues are addressed by the "biosafety" policy, and questions of socio-economic organization concerns "IPR" policy. The dissertation explores the sources of variation on biosafety and IPR policies across countries, presuming that these policies are interdependent yet autonomous. I analyze why some countries have more permissive (versus restrictive) biosafety policies towards GM crop cultivation, and why some give biotechnology companies stronger (versus weaker) IPR protection opportunities vis-à-vis farmers.

Table 4: Potential benefits and risks in the GMO debate

| Policy | Issue | Potential benefits | Potential risks |
|---|---|---|---|
| Biosafety | Food safety | Biofortified products with enhanced nutrition value | New allergens or toxins, transfer of antibiotic resistance, digestion difficulties for transgenic DNA and RNA |
| | Environment | Reduction in chemical inputs, soil conservation from low-tilling techniques | Biodiversity loss, ecosystem evolution with gene flow and rival plant replacement |
| IPR | Economic organization | Lower prices for agricultural products and/or higher profitability for agrifood business | Farmer dependency on biotechnology companies, market loss from consumer aversion, difficulties in segregation |

The rest of this chapter introduces the reader to the debate in greater detail, summarizes the state of the scientific knowledge over these issues and the international regime constraints that apply, with the aim of making the stakes over policy clear.

## **The Promise of Technology: Productivity Increase and Resilience**

The recombinant deoxyribonucleic acid (r-DNA) technique for genetically engineering organisms constitutes a modern biotechnology tool for plant-breeding. Plant breeding is the most fundamental agricultural technology. As a result of biological evolution every plant comes in varieties and sub-varieties that have different genetic compositions, which give them different external traits. Effectively, breeding is the selection of genes that are responsible for certain traits from within the gene pool of the plant; however, for most of history this was done without any knowledge of the genetics underlying the varietal differences. Farmers would plant many different seeds (or roots), select the best of the appearing progeny and then replant their seeds (or roots), and so on. Genetic engineering, on the other hand, signifies an ability to do selection on the molecular level, making breeding work more precise and much faster. Its roots go back to the discovery of Mendelian principles of genetic inheritance in 1865, after which specialized breeders were able to purposefully "cross" two different varietal lines, each displaying a desirable trait that the other did not, in order to obtain a progeny that would display both. This could still take a lot of trial-and-error time because the transfer of the desired genetics was an issue of considerable luck.

The invention of r-DNA technique in the 1970s started the age of modern genetic engineering. It is now possible, in a lab, to isolate the fragments of DNA expressing the genes that carry a desired trait in one plant variety, split the DNA molecule of another variety or plant with other desired traits, and then combine the two partial DNA molecules into a single new DNA molecule, which can then be incorporated into desired plant varieties. A complete transformation in this way is called a genetic “event;” and the method used to achieve it is “transgenesis.” The whole process is what we refer to as “genetic engineering” or “genetic modification,” and its product a “GMO.” Food and pharmaceuticals that are derived from GMOs are referred to by the adjectives “GM,” “transgenic,” or “biotech”. Because it is a complicated job to develop a working genetic event, and because they express traits that can be of economic value, developers typically seek IPR protection for genetic events through patents.

When used in containment, as for industrial enzymes and drugs, GMOs have been subject of relatively little dispute. GM agricultural crops to be released to the environment, however, have caused great controversy. While conventional breeding could only cross sexually compatible plants; transgenesis can transfer genes from a broader range of sources, even from outside the plant kingdom—bacteria, for example. For the developers of this technology, this signifies unprecedented capabilities in plant-breeding. An important application would be the development of biofortified food, the most famous example so far being the “golden rice.” Rice is the staple food for poor people in large parts of Asia, and developing rice varieties with improved vitamin A and iron content could be highly desirable since the deficiency in these micronutrients are major causes of illness in that part of the world. As the necessary genes for such an improvement were not available in the rice gene pool, they had to be introduced from elsewhere through genetic engineering.[18] Other improvements are for agronomic purposes. Traits enabling increased yields and better drought, heat, or virus resistance could be crucial in keeping agricultural output robust and consumer prices low as we adapt to climate change and further

[18] Potrykus (2001),

population increase; and genetic engineering increases the range of expected gains on these scores compared to what could be achieved with conventional breeding.[19]

In the two decades following their first release around 1995, the majority of commercial genetic engineering applications have been biased for improvements that are less visible to those outside the sphere of agricultural production: reductions in farm operation costs and management time as well as the use of certain toxic chemicals. Among these improvements, insect resistance trait—called Bt after the bacteria (*Bacillus thuringiensis*) from which the insecticidal proteins are derived—aims to enable pest management with fewer chemical pesticide applications. Herbicide tolerance (HT) trait allows farmers to freely use glyphosate or glufosinate for weed management, which are broad-spectrum herbicides that encourage the adoption of low-tilling techniques with salutary impacts for soil quality.[20] Incorporated into three crops with wide industrial uses—soybeans for protein, corn for energy and cotton for fiber; these two traits have dominated the contribution of genetic engineering to world agriculture so far. In 2012, among all GM crops planted worldwide, 59% were HT, 15% were Bt, and 26% were "stacked," expressing both traits at once due to multiple genetic transformations.[21] Tables 5 and 6 show the distribution in terms of crops.

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[19] Dr. Edmeades, a former leader of the maize drought program at the International Maize and Wheat Improvement Center (CIMMYT) estimates that for commercial maize, conventional breeding can deliver a yield increase from better drought tolerance of around 1.4% yearly over the next two decades. If complemented with marker-assisted selection (a modern biotechnology tool that increases precision in genetic material identification for both transgenic and conventional breeding) this could go up to 2%. Based on private company claims of performance, and assuming one new transgene will be available every eight year, transgenesis would lift this to 2.7%. See Edmeades (2012: 240).

[20] For most crops, some tillage to prepare the soil for planting is necessary. Excessive tillage, however, increases the susceptibility to soil erosion, causing environmental damage that can last for centuries; and reduced tillage is encouraged for soil conservation benefits. Because weed control can be done with HT crops during the post-emergence phase, farmers can use direct-seeding techniques and the need for pre-seeding tillage is much reduced. See Sanvido et al (2007) for details. On the toxicity of glyphosate, see Arancibia (2013) for dissenting views.

[21] James (2012: 216).

Table 5: Common GM Crops in 2012

| Crop | Million hectares | % of total GM crop area |
|---|---|---|
| Soybeans (HT) | 80.7 | 47.4 |
| Corn (stacked) | 39.9 | 23.4 |
| Cotton (Bt) | 18.8 | 11 |
| Canola (HT) | 9.2 | 5.4 |
| Corn (HT) | 7.8 | 4.6 |
| Corn (Bt) | 7.5 | 4.4 |
| Cotton (stacked) | 3.7 | 2.2 |
| Cotton (HT) | 1.8 | 1.1 |
| Others | 0.9 | 0.5 |
| Total | 170.3 | 100 |

Source: James (2012)

Table 6: Share of GM varieties in major crops[22]

| Crop | GM area in 2012 (million hectares) | Global area in 2009 (million hectares) | GM as % of global area |
|---|---|---|---|
| Soybeans | 80.7 | 100 | 81 |
| Corn | 55.1 | 159 | 35 |
| Cotton | 24.3 | 30 | 81 |

Source: James (2012)

In a meta-analysis of 63 studies covering the impacts of the two main GM crop traits and three of the main GM crops produced worldwide Areal et al (2012) conclude that GM crops perform better than their conventional counterparts with respect to absolute differences in yield and input costs, although the average improvement comes with remarkable regional variation, allowing for net losses from GM crops in certain settings. These findings echo the overall favorable evaluation in Smale et al's (2009) review. The agronomic gains (by way of pesticide

[22] Note that the third column should be a slight overestimation, since it relies on data in the first two columns, which come from different years.

reduction and/or yield increase) from the Bt trait for insect resistance are especially well documented, as would be seen in Finger et al's (2011) meta-analysis in this area.[23] While these early applications represent only a part of what this platform technology can deliver, the sustainability of the agronomic advantages documented at the earlier stage of the technology is not to be taken granted at the face of the wider ecological changes they are bringing about, either.[24] Still, for all we know, it is reasonable to define GM seeds as a potentially productivity-enhancing technology. It has been estimated that, although limited in application, GM crops increased crop production value by $20 billions for the year 2011.[25] The would-be adoption of GM rice in China alone could contribute $4 billions annually.[26] The non-agricultural reader should not mistake these values to be small, as they are improvements at the margin only. (By comparison, the world's largest producer and exporter USA has an annual agricultural GDP of around $150 billions). In short, GM crops represent a potentially productivity-enhancing technology.

## Concerns: Food Safety, Biodiversity, and Economic Organization

However, GM crops have also raised skepticism and opposition. Concerns have been expressed in three issue areas: food safety (is eating GMOs safe for humans?), environmental

[23] The rapid spread of HT seeds, on the other hand, is somewhat puzzling. In a study conducted for the Fernandez-Cornejo and McBride (2002) suggest that its main attraction to farmers seem to be reduction in sheer (farm and labor) management time without necessarily decreasing costs. Nevertheless, the cost is a function of the prices for glyphosate and the glyphosate-resistant seed. Fernandez-Cornejo and McBride's (2002) study examines USA at a time where both of these inputs enjoyed IPR protection and high prices. In other places and other times, the price was significantly lower (as documented in the chapter on Argentina below) hence HT seeds probably functioned as a cost-reducing technology for farmers there.

[24] Furthermore, note the reservations about the methodology of impact studies reviewed in these meta-analyses (Stone 2012).

[25] Brookes and Barfoot (2013)

[26] Hareau et al (2005).

impacts (is growing GM crops safe for the environment?), and socioeconomic organization (who will reap the economic benefits from the improvements, and will anybody lose?).

With regards to food safety, it has been feared that new allergens and toxins can be introduced to the food chain by GMOs. Corn incorporating genes from Brazilian nut has been barred from human consumption for this reason, since those with an allergy to the Brazilian nut could then develop allergic reactions to the corn.[27] How demanding the safety tests required to monitor such plausible risks before approving a GMO for human or animal consumption is a source of disagreement since tests consume time and resources. Furthermore, it has been conjectured that the transgressing of previously natural boundaries of gene flow, and with novel instruments, might be changing the organisms in ways that we do not fully understand, exposing consumers to unmonitored risks—or "unknown unknowns," as it has been called. For some on the anti-GMO camp, this amounts to adequate reason to ban the GMOs altogether. Many others would like the freedom to choose if they want to consume GM food or not; however, facilitating this freedom can take huge market coordination and regulation efforts, since it requires identity preservation systems in agrifood production to make sure that GM and non-GM materials are not mixing. Even where in place, such systems do not guarantee complete identity preservation—"adventitious presence" is almost always a reality. Many national jurisdictions require distinctive labels to identify food items that may include in their ingredients more than a certain fraction (such as 0.9%) of GM material (of the varieties approved in that jurisdiction). Those advocating for greater acceptance of GMOs argue that once a product has been approved by regulatory authorities as safe for consumption, labeling serves nothing more than an unnecessary growth in logistical difficulties and costs; and that it attaches a sense of inferiority for GM products where

[27] See Streit et al (2001).

no such thing has been documented. In many food retail markets there is indeed a premium price for non-GM items and farmers supplying them have to be careful in keeping their production GM-free.[28] This is not very easy, nonetheless: the seeds of GM crops can travel with the wind as any seed does and "contaminate" fields dedicated to the production of non-GM varieties of the same crop; which brings us to the question of ecosystem behavior.

In this area, the principal concern is the impact of GM crops on biodiversity. Biodiversity is essential for the resilience of any ecosystem. The decline in biodiversity especially in areas that constitute a given crop's historic center of origin may mean the loss of valuable genetic material that could have supported future improvements for that crop (and possibly in pharmaceuticals). GM crops, apart from contaminating non-targeted commercial fields, may also cross with wild crop relatives, leading either to the demise of certain plants or the alteration of wild plant ecology. For example, a herbicide-tolerant GM crop could confer this property to an otherwise undesirable weed, producing a "superweed" that drives out competing plants. Together with such unintended colonization of the gene pool; the commercial spread of GM varieties may lead to a reduction in the diversity of crop varieties grown, resulting in a decline in biodiversity.

It should be noted that the relationship of GM crops to biodiversity is essentially reflective of the modus operandi of industrial monoculture at large. Where modern commercial breeding and capitalist farming are practiced, traditional varieties and "landraces" found in dispersed localities are often replaced with a single commercially popular variety, and this should be of concern whether it be GM or not.[29] Debates in this area center on the question just how different the challenge should be in protecting wild plants from non-GM modern varieties as opposed to protecting them from GM crops that may or may not display particular survival

[28] Jayson et al (2005).

[29] Tripp (2009b: 11-12).

advantages due to their genetically engineered traits.[30] Before approving a GM crop for cultivation in their territory, national jurisdictions require field trials to see how it would behave in the local ecosystems of interest. The scale and length of these trials, again, are a point of dispute since they are a costly regulatory hurdle on the way to commercialization. Another point of dispute is the segregation distance between fields planted with GM crops and surrounding fields—required to limit the interaction of GM crops with their environment and thus slowdown the emergence of new generations of insects that are immune to the insecticidal trait expressed by a widely used GM crop. In approving the cultivation of GM crops, regulatory authorities would typically specify such distances, but enforcement is incompletely done in many jurisdictions.

What do the scientists *now* know about the biosafety risks noted so far? On food safety Nicolia et al (2013) note that "[t]he EU funded more than 50 research programs in 2001– 2010, for a total budget of 200 million euros, with the intent to gain new scientific evidence addressing the public concern on the safety of GE [genetically engineered] crops. A summary report of these programs highlighted that the use of biotechnology and of GE plants per se does *not* imply higher risks than classical breeding methods or production technologies (European Commission, 2010)".[31] When it comes to environmental impacts, the picture seems more mixed. In a review of 847 scientific papers published during 2002-12 examining the interaction of GM crops with the

[30] Engels et al (2006).

[31] Emphasis mine. Nicolia et al (2013) conclude the following about particular risks. About the safety of the transgenic DNA inserted into food: The ingestion of transgenic DNA does not imply higher risks than ingestion of any other type of DNA because transgenic DNA is digested like any other DNA and horizontal gene transfer of transgenic DNA into gastrointestinal bacteria (which could transfer antibiotic resistance) is an extremely rare event. About the digestion of transgenic RNA, however, resistance to digestion has been found, and this may be a cause of concern, even if, again, statistically rare. About the safety of the proteins encoded by the transgenes: Only two cases are known about the potential allergenicity of transgenic proteins, the verified case of the brazil-nut storage protein in soybean, which has not been marketed; and the not (positively or negatively) verified case of maize Starlink. The authors also note that nutritional equivalence between non-GM and biofortified GM food cannot be assumed from substantial equivalence, that 90 day rodent tests are required to establish this, and such studies have been few in number.

environment; and from which they derive conclusions that are largely supportive of GM technology, Nicolia et al (2013) summarize the following impacts: Little or no evidence of negative effects of GM crops on non-target species like birds or snakes are reported. Undesirable resistance buildup to the transgenic trait among the targeted population has been reported in several settings, resulting in glyphosate-resistant weeds and Bt-resistant insects. Gene flow from GM crops to both other crops and wild plant relatives has been documented. Hybrid fitness, determining the ability of the emerging plants to survive in the wild, varies on a case-by-case basis. The resulting pest-resistant wild plant populations are a cause for concern.

For our purposes it is crucial to note that these scientific data, which have accumulated over the course of the last two decades, were largely unavailable in c. 1995, when the need to formulate public policies appeared with the commercial release of GM seeds. Stakeholders and public decision-makers could reasonably expect both agronomic productivity enhancement from the adoption of GM seeds, and associated biosafety safety risks, whose magnitude and exact nature were difficult to predict.

Uncertainty over potential gains and risks was further increased by concerns over a third issue area: the potential impacts of growing GM crops on the organization of the agricultural economy. Complications in this area mostly stem from the fact that skills for genetic engineering are quite scarce and the majority of the commercially available plant genetic transformation events have been developed by a few transnational corporations (TNCs) headquartered in the Global North. Data shown in Table 7 by the UN Conference on Trade and Development is illustrative. Of all transgenic events approved worldwide by national biosafety institutions for commercial release by 2005, 85 percent belonged to four firms. The US-based Monsanto alone owned more than half.[32] Also noticeable is the importance of company takeovers. In fact, King and Schimmelfennig (2005) calculated that 70 per cent of the agricultural biotechnology patents held by the top six firms in the USA were obtained through mergers and acquisitions, rather than developed by in-house research.

Table 7: Plant genetic transformation events approved for release, 1992-2005, by subsidiary and parent company

| Corporation | Number of approvals | | Share in total approvals |
|---|---|---|---|
| Monsanto | | 35 | 52% |
| Monsanto | 22 | | |
| Calgene | 9 | | |
| Asgrow | 1 | | |
| DeKalb | 2 | | |
| Upjohn | 1 | | |
| Bayer Crop Sciences | | 15 | 22% |
| Aventis | 3 | | |
| AgrEvo | 10 | | |
| Agritope | 1 | | |
| Plant Genetic Systems | 1 | | |
| Syngenta | | 3 | 4% |
| Syngenta | 1 | | |
| Novartis Seeds | 1 | | |
| Northrup King | 1 | | |
| Dow | | 4 | 6% |
| Other | | 10 | 15% |
| Total | | 67 | 100% |

Source: UNCTAD (2006)

Such is the degree of horizontal consolidation. Vertical integration, in which biotechnology firms acquire firms developing and marketing particular seed varieties, is also relevant. A transgenic event is worthless if not incorporated into seed varieties that are prized by farmers in a given ecosystem. (You do not want any insect-resistant cotton; you want your best

[32] These data on approved events, while already striking, underestimate the monopoly position enjoyed by Monsanto. In some individual countries and for individual crops Monsanto has been the only source, for a long time, of the commercially available transgenic events.

cotton to be also insect-resistant, among its other qualities). Biotech and seed companies can cooperate through license agreements or form joint ventures to put the transgenes into the seeds. But with full integration, the biotech industry can hope to better integrate research priorities up- and down-stream, better command the value chain by internalizing principal-agent interactions and prevent leakages in IPR enforcement, and link biotech products to a package of other agricultural inputs in order to maximize profits at the product distribution phase.[33] In the case of Brazil, for example, most private domestic seed industry was taken over by the biotech TNCs in a few years when this country emerged as an important potential user of GM seeds. The major deals leading to this outcome are seen in Table 8 below.

Table 8: Seed company acquisitions in Brazil, 1998-2000

| Buyer (parent) | Deal description |
|---|---|
| Monsanto | On 24 November 1997 (closing date of the transaction) Monsanto acquired *Sementes Agroceres* (Brazil) for an undisclosed amount. The acquisition brought a company with 30 per cent of the corn seed market in Brazil, one of the top corn seed markets in the world. |
| | On 29 June 1998 (date of announcement) Monsanto declared its intention to buy *Cargill's International Seed Operations* in Central and Latin America (Brazil). |
| Dow | On 7 August 2000 (closing date) Dow Chemical, through its subsidiary Dow AgroSciences, acquired *Empresa Brasileira de Sementes* from AstraZeneca and Advanta to strengthen its efforts to build a global network market and commercialize seed and biotechnology traits in Brazil. |
| | On 20 April 1998 (date of announcement) Mycogen (controlled by Dow Chemicals Dow AgroSciences) agreed to acquire *Dinamilho Carol Productos Agricolas Ltda* (Brazil) to establish global corn and oil-seed business through which to commercialize crop enhancement products. |
| | On 14 September 1998 (date of announcement), Dow Chemical, through Mycogen, agreed to buy *Hibridos Colorado and FT Bio-genetica* (Brazil). The deal, combined with the previous acquisition of Dinamilho Carol Productos, allowed Mycogen to become a significant player in the rapidly growing Brazilian seed market. |

[33] Goldsmith (2001).

| | |
|---|---|
| Bayer/ Aventis | 19 November 1998 (closing date), Hoechst Schering AgrEvo GmbH, a unit of Hoechst AG (then incorporated into Bayer AG/Aventis Cropscience), acquired *Granja 4 Irmaos SA*, the largest producer in Brazil of rice seeds. |
| | On 1 May 1999, Hoechst Schering Agrevo GmbH acquired the Brazilian seed companies *Sementes Ribeiral Ltda* and *Sementes Fartura Ltda*, as well as the corn research company *Mitla Pesquisa Agricola Ltda*, Brazil. |
| DuPont/ Pioneer | On 22 March 1999 (closing date), DuPont, through its subsidiary Pioneer Hi-Bred International, acquired *Dois Macros* in Brazil to enhance its soybean lines worldwide. |

Source: UNCTAD (2006)

Brazil is not an exceptional case in this regard. Through similar acquisitions in major agricultural producer countries, biotech companies have established themselves as the new masters of the seed market. By 2006, Monsanto, Dupont and Syngenta were estimated to control 44 percent of the global commercial seed market (worth $8.5 billions annually)—see table 9 below. Ten years earlier none of them would appear in a list of top ten seed companies; they were simply not part of the business then.[34]

Table 9: World's top 10 seed companies, 2006

| Company | 2006 seed revenues (US$ millions) |
|---|---|
| 1) Monsanto (US) | $4,028 |
| 2) Dupont (US) | $2,781 |
| 3) Syngenta (Switzerland) | $1,743 |
| 4) Groupe Limagrain (France) | $1,035 |
| 5) Land O'Lakes (US) | $756 |
| 6) KWS AG (Germany) | $615 |
| 7) Bayer Crop Science (Germany) | $430 |
| 8) Delta & Pine Land (US) | $418 |
| 9) Sakata (Japan) | $401 |
| 10) DLF-Trifolium (Denmark) | $352 |

Source: ETC Group[35]

[34] Compare with the 1996 list at http://www.etcgroup.org/content/worlds-top-10-seed-corporations.

[35] The list is available online at http://www.etcgroup.org/content/top-ten-seed-companies-2007 (last accessed September 2014).

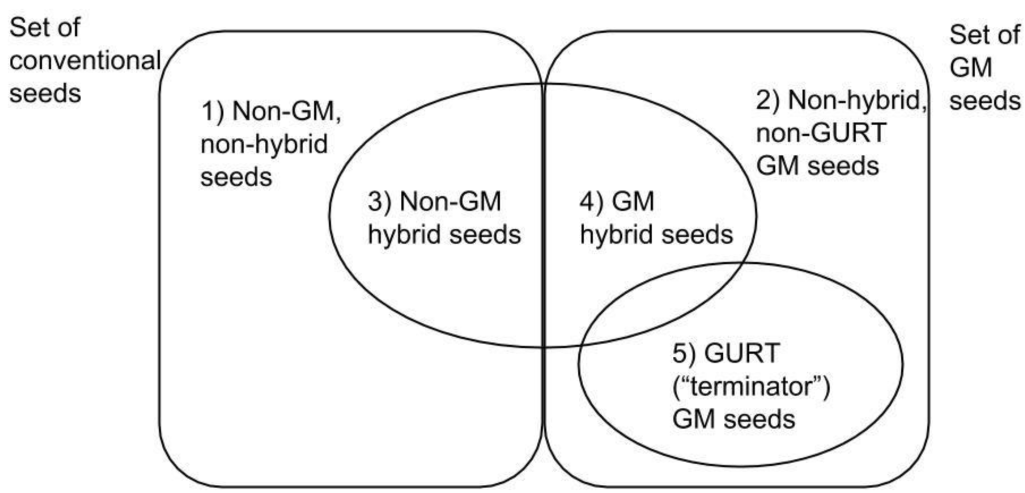
Horizontal and vertical consolidation in the upstream of agricultural biotechnology supply has raised among skeptics the concern that the qualities and the pricing of the available GM crop technology might serve (as monopoly theory would predict) rent-maximization motives on the part of the technology supplier more than the welfare of the farmers or the consumers, and that even if resulting in net total welfare gains, this pro-industry development may not be worth taking the GMO-related risks noted above. Facing limited competition, biotechnology pioneers chose to focus first on developing GM traits suited to their specific commercial interests; like Monsanto's Roundup Ready trait that makes a crop resistant to Roundup, a glyphosate-based herbicide sold by the firm, thus encouraging the greater application of this particular herbicide as opposed to others. As a result, genetic traits of direct interest to consumers, like biofortification, have been neglected; and as for the fall in consumer prices expected from other traits, it cannot be taken for granted as it would be a function of the profits retained in the biotechnology and farming sectors. Nelson et al. (1999), for example, calculated that full adoption of GM corn and GM soy around the world would result in no more than a 4.9 percent price reduction for corn and a 1.7 percent price reduction for soybeans. For the farmers, the concern is over the possibility of getting squeezed between high prices for GM seeds whose superior agronomic performance in particular ecosystems cannot be guaranteed, and a consumer market with considerable aversion to GM products. The impact assessments that document higher (in average) yields from GM seeds also note that "[f]indings clearly point to the hypothesis that arrangements for supplying seed and purchasing the product … affect … farm [profitability] impacts" (Smale et al 2009).[36]

In other words, while farmers can reasonably expect to obtain superior agronomic performance from GM seeds, they cannot be confident that this will make their business more

[36] Also see Demont et al (2007) and Raney (2006) for supportive assessments.

profitable (even in static terms) unless they can access the seeds in favorable terms. With regards to access, many farmers dislike the encroachment on their seed reproduction practices by IPR (and possibly, biological) restrictions brought by GM seeds. It has been feared that with the introduction of GM seeds farmers will not be able to replant harvested seed, and will be dependent on the biotech TNCs for continuous seed supply. For these reasons, some national jurisdictions require an evaluation of farmer vulnerability in their approval regulations for GM crop cultivation. The rationality of this requirement is disputed by those who insist that farmers would not adopt seeds that would harm them economically.

Legal and biological barriers to farmers' unauthorized reproduction of seeds are illustrated in the figure 3 below, and it will be seen that GM seeds do bring new restrictions in this area, although there are restrictions that apply regardless of whether the seeds are GM or not.




Can replant harvested seed?
1, 2: Yes
3, 4: Typically not (loses vigor)
5: Absolutely not (biologically sterile) (currently prohibited worldwide)

Which intellectual property rights may apply?
1, 3: Plant variety protection
2, 4, 5: Plant variety protection and patents

Figure 3: Legal and biological barriers to the reproduction of seeds

The figure visualizes the following facts: It is possible for farmers to reproduce seeds from the product of their harvest, unless the original seeds were of the "hybrid" kind, which give greater yield but no replantable offspring—and which may be genetically engineered or not. Regardless, commercial seeds are protected by legal instruments of intellectual property protection such as plant variety protection (PVP) acts, which may prevent farmers from reproducing seeds without remunerating the original seed supplier for each subsequent harvest. All of this already applied to seed markets prior to the advent of genetic engineering. What the latter introduces as novelty in this area is of two kinds. One is biological: "Terminator seeds," properly called as GURT, are seeds that are genetically engineered so as to make their harvest biologically sterile and prevent unauthorized reproduction by farmers, and GURT-ification can extend to crop varieties for which conventional hybridization was not practically possible (such as soy or wheat). Contrary to the beliefs of many anti-GMO activists, GURT is not legal anywhere for the time being; and GM seeds can thus be successfully replanted (to repeat, unless they are hybrids). Contrary to what has been implied in some pro-GMO writing, though, terminator seeds is not a myth or "hoax" either—both the US Department of Agriculture and the private companies it cooperated with to develop GURT technology explicitly want it to be liberated, and they have already co-written law drafts to make this possible. The second novelty genetic engineering introduces is legal, as it opens the way for patent protection. As per the 1995 TRIPS agreement, WTO member countries have to grant patents for genetic transformation events, and this provides the legal basis for the biotechnology companies' royalty claims on GM seeds (which embody patented genetic transformation in their DNA) sold in those countries. An industrial patent is a stronger instrument of intellectual property protection than PVP, so patent protection helps in ratcheting up IPR standards in this area. Among all these restrictions on farmer's freedom to reproduce seeds, biological restrictions apply similarly everywhere on our planet, whereas legal instruments may come in variations, depending on how countries choose to translate the requirements of TRIPS and other agreements into domestic law. In other words, what kind of restrictions GM seeds imply for farming practices, while partly determined by technical characteristics, is in good part endogenous to policy.

To fully understand the nature of these restrictions I will present below a somewhat technical discussion of how seed provision and use works, since there is much confusion over these questions even within the agricultural policy circles. Readers interested in a lesser level of detail can have one more glance at the figure above and jump to the next section of this chapter for a summary of the policy challenges of interest to this research.

## A Closer View of IPR Issues Relating to GM Seeds

### Biological and Institutional Foundations of Seed Markets

The property claims on GM seeds are part of a relatively recent history of progressive commodification of agricultural inputs. Well into the twentieth century, seed was not alienated from its user. Farmers would save, exchange, and replant seeds themselves—using "bin-run seed" as it is called among American farmers. The difficulties associated with effective seed saving meant that particularly skilled farmers would find themselves specializing to some extent in multiplying and providing seeds to their neighbors, but there was no market robust enough for the establishment of non-farm seed industry.

A major change came when technological advancement (hybridization) helped the corporate sector overcome biological barriers to market development in an important staple crop (corn). Corn, just like rye and millet, is a cross-pollinated (*allogamous*) plant that can "outbreed": each kernel on an ear of corn may be fertilized with a pollen from a different plant; as opposed to self-pollinated (*autogamous*) crops like wheat or soy that predominantly "inbreed".[37] The sexual promiscuity of corn frustrated breeders' efforts, because it meant that any varietal improvement would be permanently lost in a plant generation since each plant was a new genetic mix. In the early twentieth century American breeders discovered that by isolating inbred corn plants, pure genetic lines could be obtained and certain combinations of these could create hybrids that dramatically outyield the source population, a quality called as "hybrid vigor" (*heterosis*). The problem with hybrid vigor was that although the first hybrid cross ($F_1$) was a great improvement, the subsequent generations ($F_2$, $F_3$, …) would be increasingly uneven in yield, making it necessary to go back to the original combination of the inbred parental lines each year. Hence, the farmer could not simply reproduce seeds with hybrid vigor in the field as part of the crop growing process. Seed production had to be specialized at the hands of agents who kept the inbred parental lines intact (which were therefore maintained as industrial secrets) and crossed them anew to produce $F_1$ hybrids for each growing season.[38] By creating a permanent market for seed, hybrid vigor thus opened way to the dominance of corporate enterprise in crop breeding and seed provision. Because hybrid corn outperformed (in yield) available open-pollinated corn varieties, it spread rapidly among farmers after its commercialization in 1930s despite the much higher price for the seed and in a couple of decades all corn grown in the USA was hybrid. The spread of hybrid corn, incidentally, was also a

[37] There is no universal agreement on this terminology. See Tripp (2001: 27-28) and Simmons (1979) for details. Also note that after the hybrid revolution, calling any non-hybrid plant variety that breeds true to type as an "open-pollinated variety" (OPV, as in a wheat OPV) became common parlance within the agricultural community, although this seems somewhat misleading as far as the biological basis of plant sexuality is concerned.

[38] On the details of heterosis, see Kloppenburg (1988: 91-129) and Lipton and Longhurst (1989: 39-42).

landmark for social sciences, since the attention given to it marked the birth of the sociology[39] and the economics[40] of technology diffusion.

However, the commodification of corn seed, while repeated for sugar beats and sorghum, cannot be applied in the same manner to all crops, because *heterosis* is difficult to achieve with naturally inbreeding plants like wheat, rice, soybeans, cotton, barley, or oats.[41] For these crops, instead of hybrids, farmers continue to save and use seeds that “breed true” (maintain the desired traits) when replanted for many generations; keeping the biological barrier to market formation intact. To abolish this barrier, private industry has recourse to legal instruments of intellectual property rights (IPR) protection. If particular seed varieties are recognized as intellectual property, then market institutions can be constructed to either prevent the farmers from saving seeds or to remunerate the developers of the property for the seeds saved. This would ensure a steady financial return to seed development, and establish a pecuniary incentive for continued private investment in this area.

### Instruments of Intellectual Property Protection

Until the genetic engineering revolution, *plant variety protection* (PVP) remained as the legal instrument most relevant to property relations over the seed, since industrial *patents* were typically not applicable to plants and other living organisms. An international convention, called UPOV, supports the national PVP acts. The first UPOV was adopted in 1961 and it has since been updated several times, becoming progressively stricter in the protection granted to the

[39] Ryan and Gross (1943).

[40] Grilliches (1957).

[41] The distinction is not ironclad. Although the production of hybrid cotton is an extremely labor-intensive job that is generally deemed uneconomical; hybrid cotton is widely used in India because the seed industry there finds the costs manageable.

upstream players. Currently, member states can opt either for the 1978 or the 1991 version. In the former, "farmer's privilege" (to save protected seeds for self-use purposes) is recognized, in the latter it is left to the discretion of national law. In the former, "researcher's exemption" (to use protected material for research purposes) is recognized, the latter specifies limits to the exploitation of "essentially derived varieties" (varieties derived from other protected varieties). The former prohibits "double protection" of plants in national law, meaning that any species eligible for PVP protection cannot be patented. The latter, formulated in the context of the incipient GM revolution, permits such protection; and extends the minimum protection term from 15 to 20 years. Progressively stricter protection has been the norm in most national legislation too, reflecting the growing power of the plant breeding and seed industry. In the USA, the farmer's privilege was practically eliminated with an amendment to the PVP Act in 1994.[42] Of course, the effective enforcement of IPR requires public and private policing (in the USA, for example, Pinkerton detectives have been employed to monitor farmers) as well as civil association for market coordination; and practical results may diverge from the legal fiction significantly in some settings.

For late developing countries, coordinated international efforts at improving crop quality in sub-tropical and tropical climes, amounting to what has been called a Green Revolution, have complemented domestic activities. The efforts started in the 1950s with the introduction of US corn hybrids to Central America and East Africa. A more publicized wave came in 1960s with the development of highly fertilizer-responsive "dwarf" varieties of wheat primarily in Mexico, India, and Pakistan and of rice in East Asia. The work was done at International Agricultural Research Centers (IARCs), which were later brought together under the Consultative Group on

[42] See Dutfield (2003: 187-191) on plant variety protection.

International Agricultural Research (CGIAR)—an organization comprising private organizations like the Ford Foundation together with international agencies the UNDP and the FAO as well as nation-state governments. The Green Revolution did come to serve market formation on the part of Northern industrial interests by increasing the demand for chemical fertilizers and so on, but in a context of widespread revolutionary insurgency in the third world, the immediate concerns centered around development, not profits. The new varieties were shared nonexclusively with national research institutions, which then typically distributed them to farmers through public seed provision networks. Research had a certain bias for non-hybrid varieties so that farmers could replant the seeds, although many hybrids were also developed.[43]

The predominance of public investment and support from non-profit international organizations would not last forever. In many developing countries private firms have been encouraged by the state to substitute public involvement in first seed distribution and marketing, then in seed production, and then breeding work; first with a bias for domestic industry and then with a more liberal approach. Turkey eliminated seed import restrictions in 1984.[44] India did so in 1988, provided that this would finally lead to technology transfer in the form of breeder seed/parental lines but eliminated that proviso too in 2002.[45] China still maintains significant trade restrictions and requires that foreign investment in the development and production of seed varieties must be limited to minority shareholder status in joint ventures with Chinese partners.[46]

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[43] The Green Revolution aimed at and succeeded in increasing grain yields and preventing the neo-Malthussian "population bomb" scenarios in circulation at the time from becoming a reality. More vaguely defined goals towards poverty- and inequality-reduction have also been associated with this enterprise, yet such goals remained elusive. See Conway and Barbie (1988) and Lipton and Longhurst (1989).

[44] Kizilaslan and Onurlubas (2010).

[45] Murugkar et al (2006).

[46] Linton and Torsekar (2011).

In these settings, as (national or transnational) private industry gained the upper hand in seed development and provision, the resort to IPR has become increasingly important.

### The Novelty of GM Seeds: "Terminator Seeds," Patents and Higher IPR Standards

In short, the global history of seed markets has been one in which the means of production has been subjected to the industrial capital accumulation cycle through purposeful technological and institutional change.[47] Genetic engineering pushes the frontier for private property relations over the seed in several ways. Because GM varieties are more likely to be accepted as human inventions, stronger levels of IPR protection like patents can be relied on against unauthorized reproduction. Also, r-DNA methods allow engineering any plant to make its offspring unable to germinate, completely abolishing the biological barriers previously left ajar by heterosis. Dubbed as "terminator seeds" by opponents, Genetic Use Restriction Technology (GURT) is the neutral adjective for such varieties. Various types of GURT have been developed so far, including one in which the reproductive faculties of the second generation seed can be switched on by the farmer by applying a particular chemical that would be purchased as part of the seed package. The rationale of GURT is preventing the unauthorized reproduction of proprietary seeds by pirating seed firms or seed-saving farmers, given the unreliability of legal and administrative IPR measures in doing so. The biotechnology industry also highlights the notion that this technology can diminish undesirable gene flow from GM to non-GM plant varieties.[48]

A patent on GURT was obtained in the USA in 1998 jointly by the US Department of Agriculture (USDA) and Delta & Pine Land, then the world's biggest cotton seeds company

[47] Kloppenburg (1988) is the seminal treatment of this subject.

[48] Kesan (2007).

(now owned by Monsanto), yet no GURT seeds have made their way into the market anywhere in the world even as of this writing. This has been because of the uproar generated by the GMO-skeptic activists who find GURT unacceptable, leading to a recommendation by the FAO for a moratorium on GURT, which was adopted in the Convention on Biological Diversity (CBD) in 2000.[49]

From the industry's viewpoint, though, the desired endpoint of technology development is no doubt commercialization, and the first move to secure a beachhead has already been made in Brazil through the introduction of a legislative bill—first proposed in 2009 and recirculated in 2013—to overturn the country's ban on GURT. A spokesperson from AgroBio, the association for promoting GMOs in Brazil, comments that the ban on the GURTs was a concession the industry had to make to push for the legalization of the GMOs in the country, but the time to move forward has now come, at least for non-food crops like eucalyptus trees.[50] Skeptics fear that this could be the first step on a slippery slope towards eliminating the ban altogether in Brazil, and undermining the international moratorium in the future meetings of the CBD. According to a representative from the USDA, the public involvement in the development of the GURT was from the beginning aimed at making the technology "widely licensed and made expeditiously available to many seed companies," in order "to increase the value of proprietary seed owned by US seed companies and to open up markets in Second and Third World countries".[51] While industry competition dynamics would imply that it is not the only plausible scenario; as IPR expert Dutfield reminds, "the market for crop seeds to be dominated by a small

[49] "Introduction to Terminator Technology," http://www.banterminator.org/The-Issues/Introduction, last accessed April 2014.

[50] Author's interviews, Sao Paulo, March 2013. Also see Filomeno (2014: 89).

[51] USDA spokesman Willard Phelps quoted in http://www.etcgroup.org/content/us-patent-new-genetic-technology-will-prevent-farmers-saving-seed, posted 30 March 1998, last accessed April 2014.

number of large firms producing only GURT seeds" (2007: 301) in the future is a scenario that has to be evaluated seriously. GURT, contrary to what has been claimed, is not a "hoax".[52]

For the time being, though, GURT is not on the market; and technically GM seeds can be replanted. (To be exact, this may apply even to some hybrid varieties: the underperforming second generations of hybrid GM seeds are saved and replanted by small farmers who may find it more profitable than purchasing them anew on the legal market for exorbitant prices).[53] Hence, the legal and administrative realm of IPR continues to be crucial to the struggle over the appropriation of seed. Redesigning the legal realm is not being done in isolated domestic settings. Agricultural biotechnology firms have enjoyed diplomatic support as well as cross-sectoral business solidarity among TNCs in their advocacy for patent rights over plant genetics. The culmination of these efforts has been the conclusion of the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) in 1995, as part of the establishment of the World Trade Organization (WTO). TRIPS establishes higher global standards for the recognition of patent rights and their enforcement without discrimination against foreign patent owners. In relation to biotechnology, it requires the WTO member states to recognize gene constructs, genetic events and the microorganisms that are the product of genetic engineering as patentable. The same is not required for plant varieties per se, but the member states are required to at least adopt the UPOV convention described earlier to enforce PVP rights in that area if they have not done so already.[54]

[52] Herring (2006) made much out of the fact that "terminator seeds" (GURT) were not owned by Monsanto contrary to critiques' claims at the time, which he called a "hoax." In some advocacy writing it is also claimed that GURT does not exist. In fact, it exists and Monsanto has already acquired acquired patent rights to it.

[53] This is the case with GM hybrid cotton in India. See Lalitha et al (2008).

[54] See Dutfield (2003) for details.

In other words, outside a few countries like the USA whose national laws go beyond the TRIPS, plants are not being patented yet. But WTO member countries have to grant patents for genetic events incorporated with plants, and this provides the legal basis for the biotechnology companies' royalty claims on GM seeds sold in those countries. Upstream players, like biotech companies, claim protection over what they share with downstream players like plant breeders and seed distributors (unless they already acquired them through vertical integration) and ultimately farmers, and they stand to collect royalties per bag of seed sold. The exchange is illustrated in the figure below.

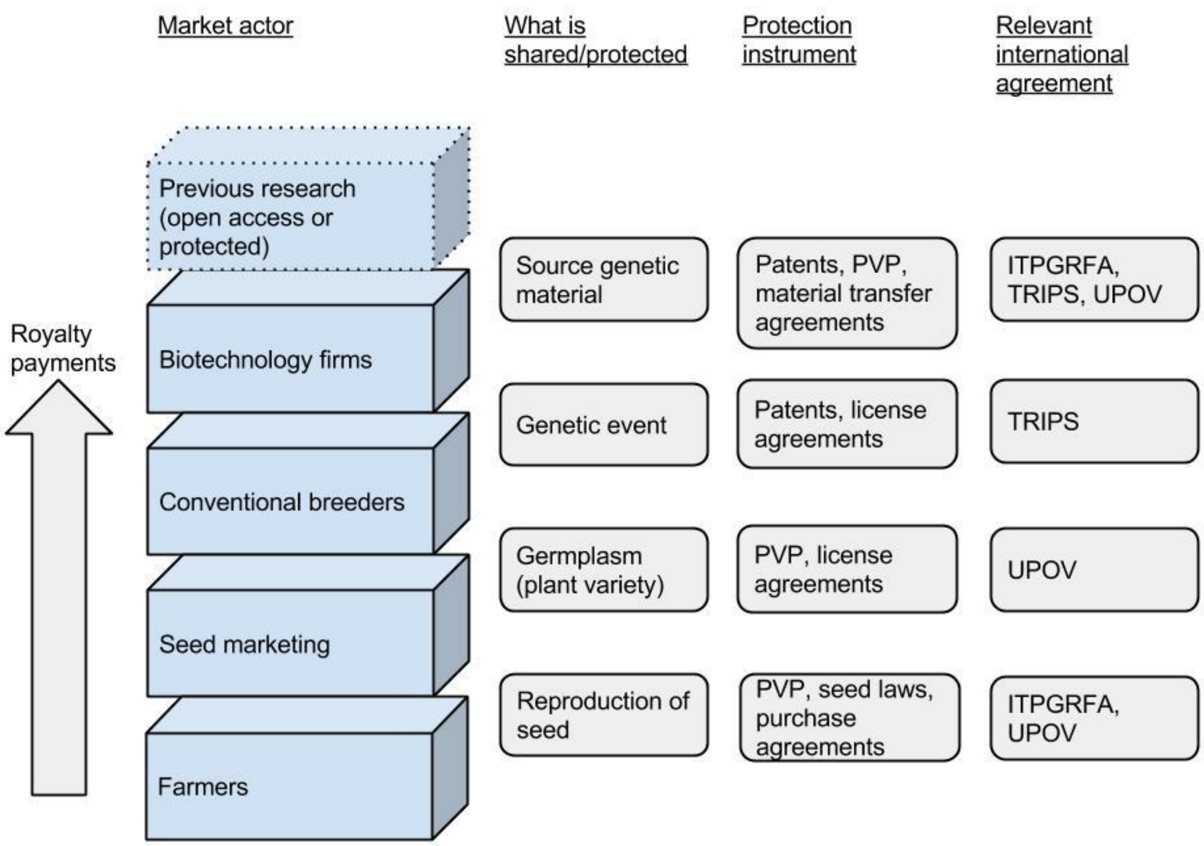


Figure 4: GM crops, IPR and value exchange

What is the commercial volume of this exchange? It is a significant sum. In 2012, when Monsanto and Brazilian farmer associations found themselves in court for disagreements over the appropriate level and form of charging for GM soybean seeds, it was demanded that Monsanto pay back to farmers royalties collected over the past few years amounting to 14 billion Brazilian reais, which would make almost 7 billion US dollars at that time. (By comparison, when the USA's biggest privately owned company Cargill—which also happens to be in agrifood business but which has sold its seed interests to Monsanto—had its most profitable year to date in 2008, its annual profit stood at $4 billions).[55] In other words, the contestation over IPR in seeds raises passionate debates not only because it challenges existing principles and practices regarding farmers' control over their means of production but also because it concerns the appropriation of a significant economic surplus.

## Policy Challenge and the Relevant International Regime

### What the International Law Says

Faced with divergent views, policy-makers have to legislate and execute, at the very least, a system for biosafety regulation for approving particular GM crop varieties for 1) consumption as food, 2) animal feed, and 3) cultivation in the country's territory. Approval is typically granted more easily for animal feed than for food. Certain countries bar GM crop cultivation in their own territory while being open to approving GMOs for consumption if they are to be imported. If cultivation approvals are granted, then appropriate systems (statutory and otherwise) for IPR protection will be demanded by the biotechnology industry; since GM seeds are products of expensive research endeavors, and conventional institutions for seed provision and remuneration found in developing countries are deemed inadequate for ensuring a satisfying

[55] Murphy et al (2012: 25). Cargill, Inc., is a private, i.e. "unlisted" company held by a small number of shareholders and does not offer its company shares to the general public on the stock market. If it were a public company it would rank at number 12 in the USA in gross revenues. "Cargill," Wikipedia, https://en.wikipedia.org/wiki/Cargill, last accessed December 2015.

rate of financial return. The question of regulation may first enter the public agenda upon a company's application to register a seed variety that it reports as GM (public seed registries for quality control and other purposes have been universal regulatory practice for many decades) or launch research towards that goal in the country. The US biosafety regulation for the GMOs, established in 1986, is an early example that has changed little since then. Many other countries started to work on their regulations in the 1990s upon first being contacted by companies, typically Monsanto's local subsidiaries or partnerships. The introduction of regulation may, alternatively, predate any such application as policy-makers decide to follow earlier country examples; or it may lag behind adoption on the ground as policy-makers may be unable to decide on a framework until they discover that certain GM crops have already spread among their country's farmers without official approval. The conclusion of the Cartagena Protocol on Biosafety in 2000, and the capacitation programs sponsored by the UNEP-GEF (United Nations Environment Programme – Global Environment Facility) thereafter gave most developing countries the impetus and the legal resources to start building a biosafety framework.

The international regime that guides this effort remains highly contested. The Cartagena Protocol is the major agreement in the area; however, it has not been ratified by the USA—the world hegemon and the top producer of GM and other crops. This is because the Protocol (article 11.8) states that "[l]ack of scientific certainty due to insufficient relevant scientific information and knowledge regarding the extent of the potential adverse effects of an LMO [living modified organism, i.e. GMO] on biodiversity, taking into account risks to human health," may authorize states to take "appropriate decisions" to regulate (commodity or seed) imports in order to minimize potential adverse effects. Potential contradictions of such a "precautionary principle" with WTO's trade agreements were recognized at the time of the making of the Protocol, but were not satisfactorily resolved. An international dispute arose when, relying on the precautionary principle, the EU practically stopped considering new approvals of GM crops either for cultivation or consumption in June 1999. In May 2003 the US-led party of three countries (with Canada and Argentina) filed complaints with the WTO that the EU's de facto moratorium on new approvals, as well as the national bans on all GMOs in some EU member states, had no scientific basis and amounted to an unjustified non-tariff barrier against their GM agricultural exports. In September 2006, having produced the longest panel report in WTO's history with over a thousand pages, the WTO Dispute Settlement Panel solved the legal question before it by deciding that "unnecessary delays" occurring in EU approvals were indeed in violation of WTO law but it did not pass a judgment on the legality of the approval procedures themselves or the appropriateness of the precautionary principle. The result was that the EU did end its de facto moratorium but did not change course from a relatively stringent regulatory regime.[56] The disagreements between the USA and the EU gives rise to an international regime complex where international institutions functioning in different areas of relevance to GMO regulation may generate overlapping sources of authority and contradictory imperatives. The complex is tabulated below.

[56] For details of contestation at the WTO level see Young and Holmes (2005), Peterson (2010), Bonneuil and Levidow (2012).

Table 10: The international regime complex for the regulation of GM crop cultivation

| | | Field: Biosafety | Field: IPR |
|---|---|---|---|
| Regime | World Trade Organization (WTO) | Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) | Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) |
| | Convention on Biological Diversity (CBD) | The Cartagena Protocol on Biosafety | The Nagoya Protocol on Access to Genetic Resources |
| | Food and Agriculture Organization (FAO) | Codex Alimentarius | International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) |
| | World Intellectual Property Organization (WIPO) | | International Union for the Protection of New Varieties of Plants (UPOV) 1978 and 1991 Conventions |

Source: Author's elaboration, also see Dutfield (2003), Raustiala and Victor (2004), Helfer (2009), Peterson (2010)

Scholars disagree over whether a fragmented international regime complex furthers or hampers global governance (Drezner 2008 and 2011, Gehring and Faude 2014); however it is obvious that such a state of affairs militates against the upholding of one global standard for all countries. In short, the international regime for GMO regulation, even decades after the commercial release of the technology, leaves much to the discretion of national-policy makers; and this allows for the variation in developing country policies under analysis here.

## The Range of Policies Observed

Due to the high trade value and public scrutiny surrounding the GMO debate, there are a number of sources through which policies in this area can be observed and compared. In few countries such as Ecuador, Turkey and Venezuela the *cultivation* of GM plants is completely banned by law. Given WTO rules, it seems more difficult to categorically ban the *consumption* of GMOs (for food or feed), but stringent regulations are typically found. (Contrary to widespread impression, EU law does not ban GMOs either for consumption or cultivation, but subjects them to a special case-by-case approval procedure). A limited list with some exemplary countries is below.

Table 11: Biosafety policies for GMOs around the world, c. 2014

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| **Argentina** is the third largest grower of biotech crops in the world, after the United States and Brazil. GMOs are regulated in Argentina under the Law on Seeds and Phytogenetic Creations and the Law on the Promotion of the Development and Production of Modern Biotechnology, and under administrative regulations issued by the Secretary of Agriculture, Livestock, Fisheries and Food. Argentina has not ratified the Cartagena Protocol on Biosafety. |
| **Belgium** is considered to have an intermediate level of restrictions on GMOs, although public opinion tends to generally be hostile to GMOs. Most of Belgium's regulation of GMOs is directly or indirectly derived from European regulations. Overall, regulation of GMOs in Belgium is mostly focused on authorization requirements prior to their production, use, or distribution; on mandatory technical requirements to limit the potential release of GMOs into non-GMO fields; and on information and transparency measures. |
| In **Brazil**, GMOs are governed by a law that defines the concept of a GMO and sets rules for the laboratories that work with them. Additionally, it establishes authorization procedures for GMO research, and establishes rules for the production and marketing of GMOs, restrictions on their release into the environment, regimes for their cultivation, requirements for reporting their release, inspections and monitoring of GMO research activities and their commercial release, implementing authorities and authorizing procedures for their release, and restrictions on GMOs in foodstuffs. Finally, it provides for the punishment of administrative violations and criminal offenses. |
| **Canada** regulates products derived from biotechnology processes as part of its existing regulatory framework for "novel products." The focus is on the traits expressed in the products and not on the method used to introduce those traits. The Canadian Food Inspection Agency is responsible for regulating GM plants and approving GM feed for animals. Health Canada is mandated to assess the safety of foods for human consumption, including GMOs in foodstuff, and for authorizing them to be sold in Canada. Advertising or labeling the presence of GMOs in particular food is voluntary unless there is a health or safety concern. |
| In **China**, restrictions on GMOs are primarily provided by the agricultural GMO regulations enacted by the State Council in 2001 and relevant administrative rules. The agricultural GMO regulations regulate not only crops, but also animals, microorganisms, and products derived from these sources. The testing, production, and marketing of GMOs in China are subject to government approval. Foreign companies that export GMOs to the PRC, including GMOs as raw materials, must apply to the Ministry of Agriculture and obtain GMO Safety Certificates. |
| **Egypt** takes a permissive approach to GMOs, and its public policy does not oppose growing, importing, and exporting genetically modified crops. Egyptian activists have voiced their rejection of this policy. Egyptian laws do not contain restrictions on researching, producing, or marketing genetically modified crops and food products. The country also has no restrictions on releasing genetically modified organisms into the environment. A draft law on biosafety was not approved by the Egyptian Parliament. |

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| The growth and sale of GMOs are permitted in **England and Wales**, subject to an intensive authorization process that occurs primarily at the European Union level. Most legislation in England and Wales that applies to GMOs is implementing legislation for EU law. The general attitude in England is averse to GM products; however, a slight shift in attitude towards GM products has recently been reported, and the UK government's policy indicates a more receptive attitude towards these products. |
| The production and sale of certain GMOs are legal in **France**, but are subject to very restrictive rules. French legislation supplements the broader framework of European regulation with national rules that provide additional restrictions, particularly focused on the potential release of GMOs in the environment, and on labeling requirements for GM products. As a result of both public hostility to GMOs and these legal restrictions, there are currently no GM crops grown in France, even though France imports substantial amounts of GMOs from abroad. |
| **Germany** discourages the cultivation of GM crops to the extent possible within the already stringent European Union legislation on GMOs. Germany imposes strict liability for accidental contamination with GMOs, and has tough and methodically enforced controls over the release of GMOs. |
| **Israeli** law permits the development and growth of GMOs for research purposes in accordance with requirements established by subsidiary legislation. Although GMO growth is not permitted for commercial purposes, GMO products may be imported, sold, and used in the production of food and pharmaceuticals in Israel. Israel's religious *kashrut* authority has determined that the use of GMO ingredients in food does not affect its kosher status because GMOs are only used in "microscopic" proportions. To date, legislation specifically regulating the labeling of GMO components in food does not appear to have been passed. |
| As a member of the European Union, **Italy** has been implementing European directives concerning GMOs over the last two decades, but at a rather reluctant pace. In fact, as reflected by GMO legislation in Italy, Italian public opinion has shifted from a decidedly general opposition to the introduction of GMOs into a more recent open acceptance of them. The Italian Constitutional Court has ruled that the national government is constrained from encroaching on the power of regional governments to establish their own regimes on GMOs. As a consequence, some regions have enacted slightly more permissive regimes than others. |
| **Japan** enacted the Cartagena Act in 2003 to implement the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. Although it is legal to plant GM crops in Japan if certain procedures are followed, no commercial planting of GM crops (aside from ornamental flowers) is occurring in Japan at this time, mainly because the general public is skeptical about the safety of GM crops. Nevertheless, Japan is one of largest importers of GMO foods, though labeling is required if GM crops are used in food in certain cases. |
| Although **Lebanon** ratified the Convention on Biological Diversity in 1994 and the Cartagena Protocol in 2008, it has not yet adopted policies dealing with GMOs. While there are some existing laws that are indirectly relevant to this subject matter it is fair to say that no comprehensive legal regime on this issue exists at this time. |
| **Mexico**'s Law on Biosecurity of Genetically Modified Organisms is a federal law that provides rules concerning GMOs, and is aimed at preventing, avoiding, or reducing the risks that these activities may cause. The GMO Law provides that violations of its provisions or its regulations are punishable with civil penalties. Mexico's Federal Criminal Code provides that an individual who, in contravention of applicable law, commercializes, transports, stores, or releases into the environment a GMO that negatively alters or may alter the components, structure, or functioning of natural ecosystems is punishable with imprisonment of one to nine years and a fine. |

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| Although the **Netherlands** was the first European Union Member State to have legal coexistence guidelines on genetically engineered (GE) crops, commercial production of GM crops has not yet taken place. While the government and the agriculture sector take a pragmatic approach toward the import and use of GM products, public opinion is divided as to whether GM foods pose health risks. Activities involving GMOs are for research purposes in laboratories or field trials, and are tightly regulated, in particular through EU Directives made applicable in the Netherlands. Prior risk assessment and subsequent monitoring and reporting are necessary for all GMO-related activities. Criminal penalties and administrative sanctions may be applied to violations of licensing requirements. |
| The importation, development, testing, and release of GMOs are strictly regulated in **New Zealand**. Such activities must be approved by the Environmental Protection Authority, which is required to take into account environmental, economic, social, cultural, and public health considerations. GM techniques have been approved for use in research involving both plants and animals, subject to various controls. There are currently no GM commercial crops, though imported food and ingredients derived from GMOs must be approved by a food safety authority and clearly labeled on packaging before sale. Criminal and civil penalties may be applied in relation to breaches of the legislation, and offenders may be ordered to mitigate or remedy any adverse effect on people or the environment. |
| **Norway** is one of the most restrictive importers of GM products and does not produce GMOs. As Norway is only part of the European Economic Area and not a full European Union Member it is not bound by EU Directives but generally implements EU Directives nonetheless. There are several EU-approved GMOs that are specifically illegal in Norway. Following a recent regime shift in Norway it is yet unclear whether Norway's position on GMOs might change. |
| Cultivation of transgenic plants for commercial use is not allowed in the **Russian Federation**. However, several types of GM food and feed lines that have passed the procedure of state registration and control are allowed to be imported, processed, and used for food or feed production. Research on genetically engineered animals is not supported by the government. Russia recently adopted an approval procedure for release of GMOs into the environment, which brings the country closer to possible cultivation of GM plants. Currently, eighteen GM food lines and fourteen GM feed lines are approved and registered in Russia. |
| The primary legislation in **South Africa** dealing with GMOs, including their contained use, trial release, commercial release, and import and export is the Genetically Modified Organisms Act of 1997 (GMO Act) and its subsidiary legislation. The GMO Act places various restrictions on the research, production, and marketing of GMOs, including requiring permits, risk assessments, notification to the public, registration, and demonstrated safety to the environment. The GMO Act imposes civil liability on people who conduct GMO-related activities for damage they cause and criminalizes various acts, including violations of its provisions or refusing to cooperate with the regulatory bodies. |
| **Korea** signed the Cartagena Protocol on Biosafety in 2000 and enacted implementing legislation the following year. Importing, cultivating, researching, and developing GMOs are permitted, as long as applicable procedures are observed. Even though more and more research on GMOs is being performed, people are still concerned. As yet, there has been no authorized GMO cultivation within Korea. Restrictions on GMO food include a safety assessment in addition to a risk assessment and approval procedure. Sellers of GM food must follow labeling requirements. |
| **Swedes**, both consumers and producers, are very conscious of GMOs. GMO use is limited and almost exclusively used in animal fodder products. The use of GMOs in food is a sensitive topic that generates strong public opinion. A majority of Swedes consider it important that their milk is GMO free, and dairy farmers therefore avoid GMOs in their fodder. Sweden, as a European Union Member, has adopted a case-by-case analysis for each GMO. One GM potato for industrial use has been approved for cultivation in Sweden, but currently no GMOs are being produced. |

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| GMOs are regulated in the **United States** under the Coordinated Framework for Regulation of Biotechnology, published in 1986, pursuant to previously existing statutory authority regulating conventional products, with a focus on the nature of the products rather than the process in which they are produced. The form of regulation varies depending on the type of GMO involved. Plant GMOs are regulated by the US Department of Agriculture's Animal and Plant Health Inspection Service under the Plant Protection Act. GMOs in food, drugs, and biological products are regulated by the Food and Drug Administration under the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act. GMO pesticides and microorganisms are regulated by the Environmental Protection Agency pursuant to the Federal Insecticide, Fungicide and Rodenticide Act and the Toxic Substances Control Act. |
| The **European Union** (EU) has in place a comprehensive and strict legal regime for GMOs, food and feed made from GMOs, and food/feed consisting or containing GMOs. The EU's legislation and policy on GMOs is designed to prevent any adverse effects on the environment and the health and safety of humans and animals, and it reflects concerns expressed by skeptical consumers, farmers, and environmentalists. GMOs and food or feed made from GMOs can be marketed in or imported into the EU, provided that they are authorized after passing strict evaluation and safety assessment requirements that are imposed on a case-by-case basis. Since 2001 the EU has had a de facto moratorium on GMO approvals, but a September 2013 decision of the General Court of the EU may put an end to the moratorium. While marketing and importing GMOs and food and feed produced with GMOs are regulated at the EU level, the cultivation of GMOs is an area left to the EU Members. Liability issues and compensation schemes for individuals fall primarily within the domain of the EU Member States. In general, the EU espouses the principle that the polluter pays. |

Source: US Library of Congress[57]

My case studies are selected on the basis of agrarian structure characteristics that may serve as explanatory variables (discussed in detail in the following chapter) for the choice of the regulatory regime, which is the outcome that I aim to explain. The sample produces interesting variation on this outcome. In Turkey, a farmer can be put to jail for up to twelve years for cultivating any GM crops, in India GM seeds are widely used for cotton but not allowed for food crops, in Brazil permission came late, whereas in Argentina GM seeds quickly took over almost the entire production of commercially significant crop production with little friction caused by public regulation. In terms of IPR; in Argentina once a farmer legally buys a bag of GM seeds, he can reproduce them freely in his farm for self-use, in India official price ceilings for GM seeds accompany a large informal market in "pirate" GM seed development and reproduction

[57] "Restrictions on Genetically Modified Organisms," The Law Library of Congress, Global Legal Research Center, March 2014, http://www.loc.gov/law/help/restrictions-on-gmos/restrictions-on-gmos.pdf. This list has been reproduced from the summary version of the report available at http://www.loc.gov/law/help/restrictions-on-gmos/.

openly tolerated by government authorities, while in Brazil farmers have to pay a tax-like royalty fee to the biotech TNC for each subsequent harvest that springs from the original seed purchase. These differences were tabulated in summary form in the Table 1 above. Below they are seen in greater detail.

Table 12: Regulation of GM crop cultivation across cases

| | First approval of GM crop cultivation | GM crops approved for cultivation | Economic risk an official approval criterion | Labeling of GM food products | Share of GM in total cultivation, c.2010 | Author's classification |
|---|---|---|---|---|---|---|
| Argentina | 1996 | Soy, corn, cotton | No | No | >90% of soy, corn, cotton | Permissive |
| Brazil | 2003 | Soy, corn, cotton | Yes | Yes | Soy: 75%, corn: 56%, cotton 25% | Contested |
| India | 2002 | Cotton | Yes | No | Cotton: 93% | Contested |
| Turkey | None | None | N/A | Yes | Officially none | Prohibitive |

Source: Author’s elaboration, see case studies for details and James (2011) for GM cultivation ratios

Table 13: Management of IPR applying to GM seeds across cases

| | Price ceilings for GM seeds | Gov't tolerance for illegal seed use | Point of delivery royalty collection | Gov't legal conflict with TNC over IPR | Author's classification |
|---|---|---|---|---|---|
| Argentina | No | Yes | No | Federal government | Weak IPR |
| Brazil | No | Yes | Yes | No | Strong IPR |
| India | Yes | Yes | No | Local governments | Weak IPR |
| Turkey | GM seeds banned | N/A | N/A | N/A | N/A |

Source: Author's elaboration, see case studies for details

In the following chapters I describe in greater detail these policy regime elements and analyze their causes by tracing the policy-making process. Certain common dynamics underpin the policy experience in all cases. All of the countries were approached with offers of local GM crop adaptation by biotech TNCs anxious to gain entry to these large agricultural production markets. In all, the salience of GMOs as a debate topic was generated first by urban-based NGOs and their official interlocutors at the health and environment bureaucracy worried over food safety and biodiversity risks. Contrary to the picture that emerges from much writing on Europe so far, broad-brush cultural differences seem to explain little: Public opinion surveys suggest that consumers everywhere have been suspicious of GM food, and if given clear choices they would not prefer it. The key to understanding the acceptance of GM agriculture is not the absence of opposition but the existence of well-organized producer groups in favor of it.

The political efficacy of the producer sector, in turn, was complicated everywhere by the medium and smaller farmers' (and, to some extent, the domestic seed industry's) concerns over the terms of access to technology. Those who raised the strongest objections to the IPR restrictions attached to GM seed use and reproduction were the middle-farmers organizations FAA and CONINAGRO in Argentina (and not the SRA of the big landed oligarchy), the family farm syndicates of Rio Grande do Sul in Brazil (and not APROSOJA or FAMATO of Mato Grosso state where bigger farmers prevail), the middle peasants' chamber ZOB in Turkey (and not the ABÇ of the capitalist farming region Çukurova). When adequately persuaded by epistemic coalitions, some of these organizations turned against the technology altogether and, joined by organizations representing rural workers, denounced GM seeds as instruments of foreign exploitation.

Possible monopoly abuse in respect to the control and pricing of the technology was among the top considerations of policymakers everywhere as they tried to design regulatory systems. Argentinian and Indian cases provide striking examples of government agencies publicizing concerns over the biosafety of GM crops immediately before important negotiation rounds between the farmer organizations and the biotech TNCs, implying the threat of restrictive biosafety policies to preempt commercially disadvantageous agreements. Wikileaks cables reveal that the TNCs enjoyed diplomatic support from US politicians and Foreign Service in their attempts at influencing policy towards the direction of permissive biosafety and strong IPR. Contrary to both the anti- and pro-GMO accounts that exaggerate Northern influence on policy-making in the Global South, these sizeable "middlebrow" countries have not simply acquiesced to these demands and instead generated policies that defied, to varying extents, the corporate vision of how the technology should be deployed in the market. Both direct confrontation (as in the trials between the Government of Argentina[58] and Monsanto over who owns the transgenes embodied in Argentina's agricultural exports) and selective omission (inadequate state capacity

[58] The government got involved as *amicus curiae* in support of firms sued by Monsanto in Europe for importing from Argentina soybeans with Monsanto's allegedly unremunerated intellectual property.

as an excuse for non-policing the “pirate” seed sector in India) have been used to this end by governments, animated by ideas of national development and anxious to court politically influential domestic groups. While critical scholarship reifies transnational corporate control over GM crops as a non-negotiable constant, and leading pro-GMO writers hastily dismiss it as a chimera, the issue has been in fact a field of real contestation with variable policy choices.

Within the discussion of each country case, and briefly in the conclusion chapter, the regulatory policy choices will also become explanatory variables in a parallel analysis, as I will examine suggestive evidence about the socioeconomic consequences of the introduction (or prohibition) of GM agriculture in each place, but this will remain as an “editorial” task. The main aim of this study is to describe and explain the choice of the regulatory regime itself.

# CHAPTER III

# ANALYZING CONTESTATION OVER POLICY

## The Argument and The Research Design: A summary

Why have countries adopted more and less permissive policies towards farming with GM seeds? In countries where GM farming was allowed, why have varying systems of IPR protection been constructed?

My theoretical framework amounts to a simple argument. Because there is high economic value at stake with this policy question, the economic structure of each setting makes a difference by giving actors, especially agricultural sector organizations, different degrees of political power. But because there is a lot of scientific and legal uncertainty surrounding the impact of technology, economic structure requires interpretation, and ideas too make an important difference, through the agency of epistemic coalitions, by helping partially autonomous state managers to select from structurally relevant political options. With such a framework we learn about both what constrained policy-makers' options, and how they have made use of their options. Let me summarize the analysis, and the rest of this chapter will explain it in detail.

I set out to explain regulatory policy behavior following the worldwide introduction of the GM seeds in c. 1995. For this task, first, out of the population of all countries in the world (with the scope condition that my research questions are more relevant, and my answers are more applicable, to developing countries), I differentiate country cases (in the table below) in terms of the most obvious, though surprisingly overlooked, variable: In those countries where soy, corn, or cotton—these are the most important crops for which GM varieties came to be developed—

were not grown in large quantities prior to the introduction of the GM technology, consumer sector opposition to GM seeds will have an easier time in determining policy because the constituency for permissive policies is small. Neither the biotech companies will invest much in lobbying for policy change there, nor the rural producers will find the issue much relevant. It would not be surprising to find that the resulting policies have been responsive to Great Power pressure or otherwise varying strongly with randomly distributed ideas, because in the absence of clear economic interests these settings are "most likely" cases for such ideational takeover.

Table 14: The variation guiding research design

<table>
<tr><th>Population</th><th colspan="2">Samples divided by explanatory variables</th><th>Outcome</th></tr>
<tr><td rowspan="3">All countries</td><td colspan="2">Non-grower countries</td><td>Of little interest</td></tr>
<tr><td rowspan="2">Growers of soy, corn, or cotton</td><td>Stronger agricultural sector</td><td>Varies</td></tr>
<tr><td>Fragmented agricultural sector</td><td>Varies</td></tr>
</table>

I focus on the more interesting puzzle of varying policy regimes in important grower countries.[59] In such a setting, the new technology will be likely to find more advocates because there is, if nothing else, a strong incentive for the biotech TNCs to enter the market as a seed

[59] This is a method of case selection that works through identification of most and least likely cases as deduced by a theory that connects the independent variables (IV) and the dependent variable (DV) (in this case agricultural production characteristics and GMO regulation respectively). There is debate in political science methodology over whether case selection should be informed by the variation on the DV at all. The highly influential King et al (1994) advise avoiding case selection on the DV if possible and otherwise correcting it with within-case observations through process tracing. However, whenever they discuss real examples of social science work, their criticism appears to be against the more specific practice of selecting a sample with *no DV variation.* They also praise (King et al 1995: 477, 479) as examples that confirm their rules of scientific inference those works that either explicitly (Bates 1981) or implicitly (Lijphart 1975) choose their case(s) both on the DV and the explanatory IV based on prior expectations derived either from theory or previous literature—suggesting that their purist advice is impractical for qualitative research. Other methodologists have criticized their quasi-experimental research design logic as being problematic when applied to observational data, whether large- or small-N (Brady 2010). Furthermore, methodological advice developed specifically for small-N research argues for other case selection methods. In this line of thinking, scholars set out from the distribution of cases in a (at least) 2-dimensional plane defined by the DV and (at least) one IV, either actually known from prior large-N analysis (Lieberman 2005, Seawright and Gerring 2008), or deductively derived from theory (Rogowski 1995, 2010, McKeown 2010), in order to choose those cases that would maximize inferential leverage—such as anomalies, outliers, or influential cases. Most actual qualitative research seem to informally follow one of these kinds of non-random selection with a "folk Bayesian" approach.

supplier, and any success of the opposition to the TNCs (either in biosafety policies and IPR) is in itself surprising. Certain variables that may seem like good candidates to explain the variation of policies across this setting, such as factor endowments or export market imperatives actually should not have a systematic effect one way or another. Instead, I propose that the structure of the agricultural producer sector helps explain the puzzle. Where small farmers numerically dominate the agrarian landscape (as in Turkey and India), we get a producer sector facing greater uncertainty about what to expect from the new technology's socioeconomic impact (because smaller farmers have a lesser chance of taking a share in pioneer rents and their precarious economic and social position make them more sensitive to IPR encroachment over traditional seed saving practices), and greater problems of collective action in articulating its interests and getting favorable public policies. In such a setting, the opposition to GM crops has a higher chance at policy influence. However, I observe that there is still interesting variation across such cases: some countries find it necessary to ban GM crops in order to protect their consumers and small farmers from perceived risks of this technology, others do not. Likewise, in countries where a greater portion of agricultural production is dominated by big farmers (as in Argentina and Brazil), we get varying approaches especially in IPR enforcement: some countries allow farmers saving and replanting patented GM seeds, others require them to pay royalty fees to biotech companies for doing so. Thus material structural factors help me splitting the universe into smaller samples of roughly "most similar" cases, comprising two pairs.[60] Those factors should explain most of the variation of outcome *between* pairs, and variation of outcome *within*

[60] Of course, these countries are all very different from each other. The differences between India and Turkey are greater than their commonalities in every conceivable way. What this particular methodological term implies is that the cases have similar values on certain explanatory variables designated as important by theory. Differences on other values, unless they are associated meaningfully with both the relevant explanatory variables and the outcome variable, are not necessarily consequential in our estimation of causal relationships. I am following the terminology in Gerring (2011).

each pair (which is a "least likely" observation) attests to strength of the particular ideas that were engaged with the policy debate. These ideas help determine the way in which the government will exercise state autonomy and formulate particular policies.

Table 15: Country experience based on two variables

| | | Opposition orientation | |
|---|---|---|---|
| | | Challenging IPR restrictions | Challenging the entire technology |
| Producer sector | Stronger | Permissive biosafety, weak IPR: Argentina | Intermediate biosafety, strong IPR: Brazil |
| | Fragmented | Intermediate biosafety, weak IPR: India | Prohibitive biosafety: Turkey |

Two implications immediately relevant to policy advocacy arise from this analysis. As a descriptive inference, I argue that opposition to GMOs originates from and spearheaded by the consumer sector mostly, and rural producers are coopted (if at all) as an ally thanks to IPR concerns. As a causal inference, I suggest that opposition to GMOs is likely to be doomed to irrelevance if it does not take into account the extent and the nature of the demands of the producer sector. Nonetheless, GMO-skeptic opposition can help obtaining a producer-oriented solution by challenging the legitimacy of strong IPR claims over GM crops by transnational biotechnology firms. The empirical chapters of this dissertation provide evidence on which I build up these inferences. In the conclusion chapter I will discuss their wider theoretical implications.

The rest of this chapter is a detailed exposition of the summary above. It justifies the propositions that lead to this sample splitting, and discusses why and how ideas make a difference. The presentation of the theoretical framework starts by identifying three stakeholders (consumer NGOs, domestic producer sector, and the biotech TNC) relevant to the policy and what kind of policy stance is to be expected from each. It continues by discussing various ways in which governments can respond to stakeholder pressure, and where agents of ideational change (which I call “epistemic coalitions”) come into play. It then undertakes a detailed discussion of the economic conditions that shape stakeholder position and efficacy, thus constraining the domain of ideas in particular ways in different settings. The chapter then ends with a methodology section detailing the empirical research procedures.

## Theoretical Framework: Interest, Ideas, and Interaction

### Identifying the Policy Stakeholders

I take public regulation mainly as a society-centered process driven by organized interest groups (Stigler 1971), and recognize partial autonomy for the state (Evans et al 1985). The working assumption is that policy-making state managers are primarily responding to the interests of the powerful stakeholders, and trying to reconcile them towards the achievement of personal, institutional, and national goals.

To understand the potential fault lines within the civil society I set out by recognizing that GM crops is a technology that promises significant productivity increase in agricultural production.[61] These benefits are to be received disproportionately by the biotech TNC and the domestic “producer sector”—including the whole of the production chain from agroindustry to farmers and retailers and represented at the policy circles through sectorial associations. Equally important is the fact that GM crops have raised fears of environmental and public health damage (as well as philosophical or religious offence) that may not be captured in short-term welfare accounting. We can think of the risk of such damage as a negative externality that would be

[61] For an overview, and available evidence about this promise, see Chapter II.

borne by a “consumer sector” in a wide sense—including everyone outside the producer sector and represented chiefly through NGOs advocating for consumer rights and environmental preservation. Of course, productivity increases could imply consumer benefits from increased product quality and lower prices but early in the technology’s lifetime these benefits were highly uncertain or not there yet, because priority was given to genetic engineering traits that allowed producers to save input costs or labor time.[62] Therefore producers will be more interested in permissive policies towards GM crops, while skepticism will be greater among the consumers. For this proposition to make sense, neither it is necessary for all producers to expect to be winners from GM crop adoption nor the consumer sector needs to see them as overall undesirable; what matters is the existence of some perceived negative externality that is not reflected in the producer sectors’ production costs.

However, whether to permit GM crops or not is not the only policy decision to make. Appropriate systems for IPR protection will be demanded by the biotechnology TNCs to supply the technology so that they can get a desirable return to their R&D investments. This question drives a wedge between the domestic producers and the biotech TNC. We know that the latter—through press releases and the activities of the representative associations they form—have been quite clear in revealing their preferred scenario: one in which public regulation towards GM crop cultivation is rather permissive, and strict IPRs are enforced over the seeds used by farmers, together allowing the collection of a large sum in technology rents. However, if the TNCs push too hard for a strong IPR regime, a backlash can occur in the form of restrictive adoption policies favored by domestic actors worried over the abuse of IPRs. The TNCs face a strategic dilemma with regards to how to best enforce IPRs while not endangering technology acceptance.

[62] See chapter II.

For the producers I expect two parameters to be relevant in structuring relevant options: Regardless of particular preferences about the matter, they would like to be the ones to decide whether they will incorporate GM seeds into their production chain, and they should not pay too much for this foreign technology. Consequently, a dilemma arises. If producer associations, fearful of strong IPR, join hands with the GMO-skeptic consumer sector NGOs, they may lose access to the technology because of restrictive and prohibitive policies. If producers support the TNC advocacy for greater toleration of GMOs, this time they may witness the formation of a regime with strong IPR enforcement to the liking of the TNCs.

Hence, the biotech TNC, domestic producers, and consumers find themselves in rivalry over the ideal policy. For clearer, more precise presentation of this three-stakeholder configuration, below I use spatial theoretic form, where the policy question is illustrated as a set of points in 2-dimensional Euclidian space: the horizontal axis represents IPR policy and the vertical axis represents biosafety restrictions.[63] The point Q denotes the status quo in c. 1995, when GM seeds become globally available but have not been domestically approved or regulated yet. Allowing the status quo to drift without policy intervention is far from ideal for all stakeholders because it could result in informal (unremunerated) dissemination of GM seeds and thus foregone rents for the biotech TNC; biosafety risks for the consumers; and risk of market loss due to consumer aversion for the producers as well as unexpected ecosystem interactions. Any policy move from the status quo towards one of the intersection sets ("winsets") would enjoy the support of two stakeholders, as it would bring policy closer to both their ideal points.

[63] For an introduction to spatial theory, which provides the tools for this visual exercise, see de Vries (1999).

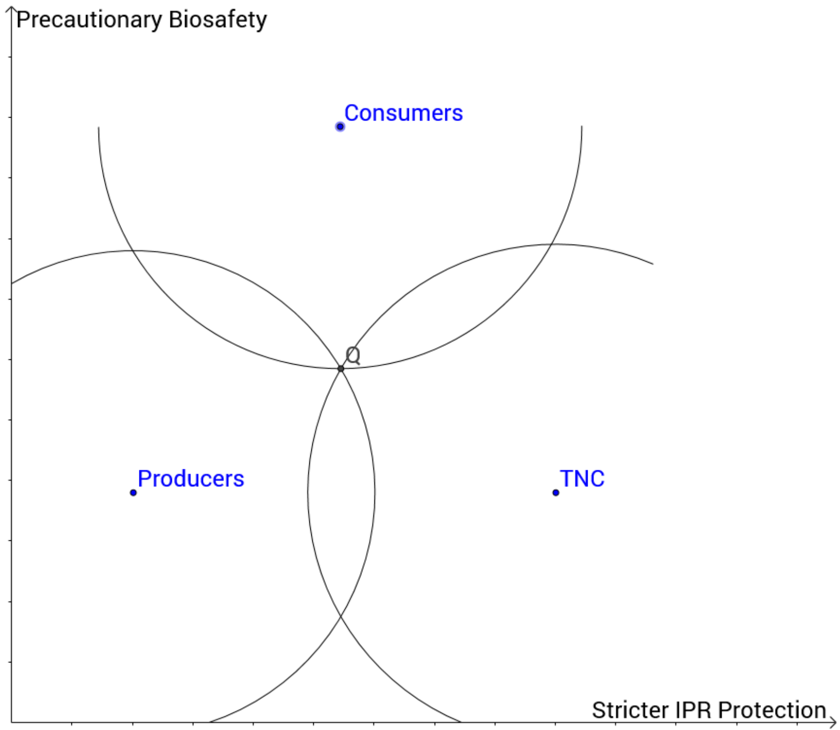


Figure 5: Policy dimensions and stakeholders

In the figure 5 above, each stakeholder has a most preferred position in the policy space, and they are indifferent to policies that are equidistant to that "bliss point". However, the claim in this exercise is not that, empirically, any of the points are likely to have the exact coordinates and any of the circles are likely to have the exact shapes as illustrated, but rather to show how the relative positions of the stakeholders with respect to each other in a two-dimensional policy space make certain policy coalitions plausible in the search for a winset that could defeat the status quo. Actually, the indifference curves will be drawn elliptically if a stakeholder gives more importance to either of the two dimensions of the policy. This is done in figure 6 below for the producer sector in dashed lines. The two resulting ellipses denote different producer sector profiles, one particularly biosafety-intolerant and less sensitive to any change in IPR policy (i.e. a move towards stricter biosafety is more undesirable than an equal-distance move towards stricter IPR policies) and a particularly IPR-intolerant one (vice versa). Being biosafety-intolerant enlarges the winset producers can share with the biotech companies, in other words, gives them greater common ground. Being IPR-intolerant gives the producers greater common ground with the consumer sector. It is not unreasonable to think that in most settings capitalist farmers and agribusiness will be closer to the former type, whereas smaller, more precarious rural producers will be closer to the latter type. I will substantiate this thought further below, and bracket it as an assumption for the moment.

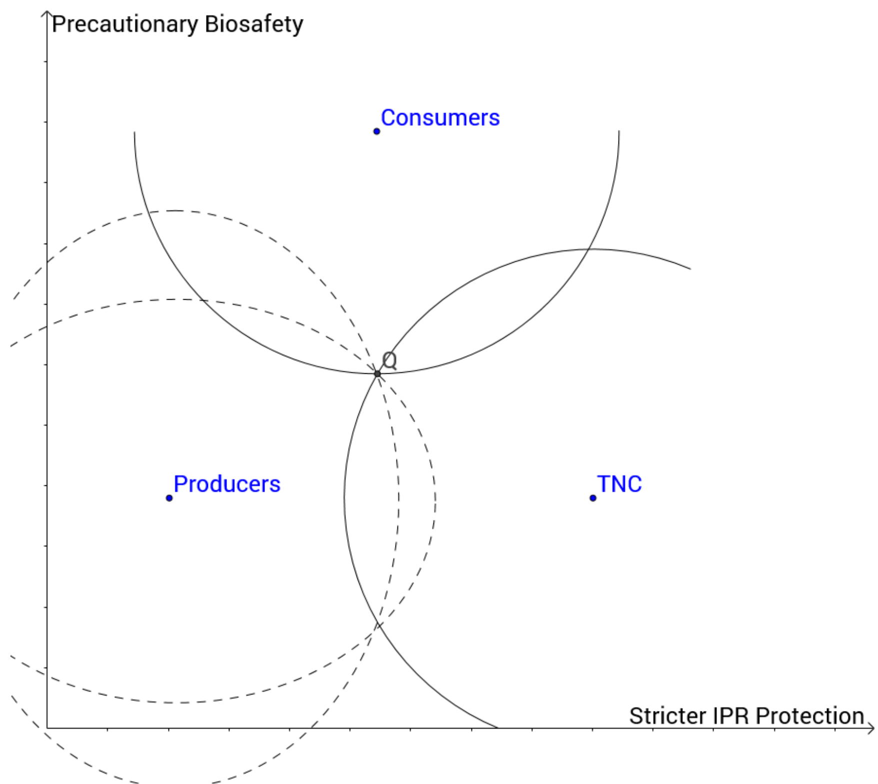


Figure 6: Different kinds of producers

The possibility of such redrawn circles would be in line with the notion that producers of different classes, or in different settings, may have different interpretations of their interests. However, such interpretations will vary within certain bounds: regardless of their support for particular policy forms, the majority of the domestic producers will want to be given a relatively free hand in their choice of production technology without being restricted by government bureaucrats or corporate lawyers. They will never be as enthusiastic about strict IPR laws as biotech TNCs are or as enthusiastic about strict biosafety laws as the consumer sector NGOs are. In other words, the producer bliss point, however defined, will remain to the south of the consumers, and to the west of the biotech TNC, while the biotech bliss point remains to the southeast of the unregulated status quo. The same kind of "bounded room for interpretation" can be assumed for all stakeholders. To reflect this notion, in the figure below the first figure is redrawn, but this time all circles are dashed, and bliss points are left undrawn, to denote the partial indeterminacy in stakeholders' positions.

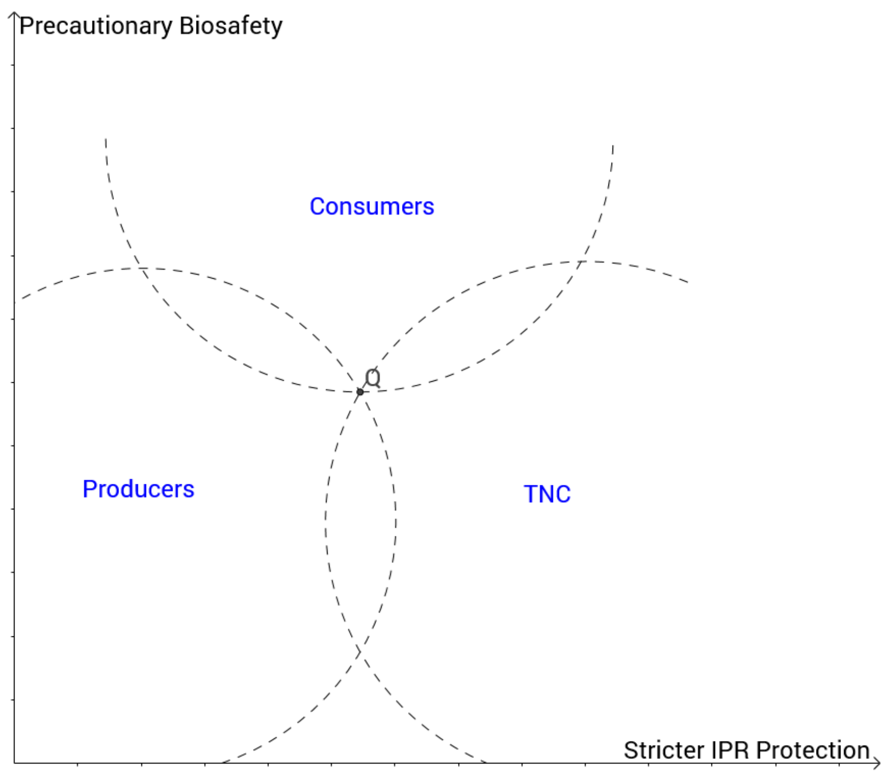


Figure 7: Partial indeterminacy in stakeholder positions

So long as these *relative* positions are taken, three arguments follow:

1) There is a range of policies that could be desirable to consumers and domestic producers yet for the biotech firm are too lacking in IPR protection or too precautionary.

2) There is a range of policies that could be desirable to domestic producers and the biotech firm yet for the consumers are not precautionary enough at any IPR protection rate.

3) There is a range of policies that could be desirable to consumers and the biotech firm yet for the producers are too precautionary or too stringent in IPR protection.[64]

These are descriptive propositions, but they are not trivial. By identifying the policy question and the relevant stakeholders in this way, I am already departing from previous literature on GMO regulation. In mainstream political science writing on the matter, what appears here as a 2-dimensional plane is reduced to a single-dimension line extending from more to less precaution towards the new technology, IPR being omitted as an issue. In most critical writing there is again only a line, wherein the two policy questions are assumed to be one and the same—saying yes to the new technology invariably brings about undesirable forms of IPR. In the former line of thinking there is often effectively two stakeholders—post-materialist consumers on the one side, and on the other side a productive sector undifferentiated between

[64] While the first two arguments may appear less problematic, the last one requires some explanation. These are points where a level of IPR protection satisficing for the biotech industry combine with demanding—though not prohibitive—biosafety standards acceptable to the consumers. Such standards, by requiring lengthy, resource-consuming tests, bar the entry of smaller biotech firms into the market for GM seed technology and help protect the rents of the few TNCs which are able to staff huge labs, field lawyers in several markets and enjoy economies of scale. From the vantage point of the domestic producers the same translates to a limited offer of GM seed technology—all herbicide-tolerance and no drought-resistance, for example—and monopoly/oligopoly prices for it. The idea that demanding biosafety standards may serve as an entry barrier in the biotech market is widely shared within the industry, as revealed in interviews conducted by the author, and is supported by available market research. According to McDougal's (2011) survey the overall cost of producing a new transgenic plant is US$136 million, of which regulatory issues is the longest single phase in product development and is estimated to account for 25.8% and 36.7% of total cost and time involved respectively. Also see Pray et al (2005).

domestic actors (let alone different kinds of them) and the monopolistic TNC. In the latter, again there are two stakeholders, this time differentiated between the TNC as an exploitative foreign actor and everybody else. These identifications are misleadingly simplistic, and the one I present above, I argue, makes better sense of the historical experience so far. It also generates policy implications that run counter to the ones found in these studies. It suggests, for example, there is some contradiction in simultaneously arguing for “strong biosafety regulation” and for a vision where “farmer seed supply should function free of state interference with strong community control” (Shiva et al 1999).

### The Relationship of Stakeholders to the Public Decision-maker

So far this has been a descriptive identification exercise regarding what kind of policy stance can be expected from each policy stakeholder, without a predictive component in respect to which policy will prevail. Rival predictive theories of government could be compatible with the propositions above. To consider the range of such theories, think of the above map as a dartboard, the government a dart player, and the prevailing policy as the point where the dart strikes the board. Now, the government can throw the dart in different ways.

1) Random history: The dart is thrown completely randomly, as if by a monkey who does not know how dart is played. A pure version of a “garbage can model” of policy could come close to this unrealistic scenario.

2) Bureaucratic autonomy: The government has a target point fixated in his mind, chosen purposefully but in complete autonomy from any stakeholders, as a “developmental state” ideal type would have it. Insofar as the targeted point is closer to some stakeholder’s position, this is not a result of compelling political pressure from the latter.

3) Government capture: The government targets to satisfy one stakeholder only. This can be understood broadly as even including electoral populism: if the government believes that serving the consumer sector will return the greatest political benefit, it will become a perfect agent of the consumers.

4) Pluralist interest group politics: The government aims to satisfy two of the stakeholder groups by targeting a winset.

Any of these theories can be infused with uncertainty about the government's capabilities in delivering policies. Consider the following possibility: the government is, and knows himself to be, a highly imperfect player in the sense that he can only roughly approximate his targets in any dart-throwing attempt. In other words, between the point purposefully chosen by the government as the target and the point where the dart actually lands, there is room for random variation. Anticipating this, a pluralist government, for example, would throw the dart towards *the biggest* winset (if there is one), hoping that it will land somewhere in it.

Furthermore, uncertainty can be extended to the government's capabilities in getting intelligence about the stakeholders' positions—like a drunk player whose sight is blurred. In real life, this can easily result from transaction costs of government-stakeholder communication, or even from the fact that the stakeholders themselves may be imprecise and confused about their own position (only to realize ex post facto with greater certainty if the prevailing policy has been serving their interests). This would add a status quo bias in government targeting: alienating stakeholders (any more than they were already alienated) with policies formulated on the basis of imperfect intelligence is less likely if such policies depart little from the status quo.

Path dependence can be infused to any of these theories too. Consider the following dynamic model: The government is given two dart-throwing attempts. The positions of the stakeholders are fully revealed only after the first dart is thrown, through their reactions. The second dart then has to be thrown with the condition that it cannot land closer to the status quo ante than to the first dart landing point, because the government has committed itself to a certain course of action with words and deeds until then. (This may be the case even if the ruling party changes because laws, once enacted, tend to be sticky). An initial choice constraints the domain of later choice(s).

Again, different models of government behavior are implicit in existing literature on the matter. Initially, GMO regulation looked like an area in which the governments could form science-based autonomous decisions, but because various events have turned the issue to a high-profile debate, policies turned out to be more responsive to politicized pressure. Political economists hypothesize that European policy was captured by farmers (and largely find that it was not). Political scientists imagine developing country decision-makers as being captured by a single agenda—satisfying the closest Great Power (but fail to present compelling evidence for it). Critical writers fear that governments will be captured by the biotech TNCs (without allowing for the possibility of variation). Having reduced the policy space to a line, and omitted important stakeholders, existing literature expects a rather simple government capture scenario in one way or another. I argue that except in closed authoritarian regimes and very small economies a form of pluralist politics is a more realistic way to understand governmental decision-making. The government is a drunk dart player whose hands are trembling and whose sight is slighted. But he does not lack purpose. He cares about pleasing the maximum number of stakeholders, allowing for some limited degree of autonomy. Even if one stakeholder looms largest in the government's political calculations, the decision will seek to find a winset in which that stakeholder reaches a common ground with another.

The argument that follows is that a government, if animated by a desire to please the maximum number of relevant stakeholders, could have several (here three) directions to go, and with that condition he could please each stakeholder (but not all of them simultaneously) in one of several (here two) plausible ways. The choice of which direction, and which way, remains open. In a certain technical sense, the policy choice becomes a problem of coordination. Given several zones where the government and a majority of the stakeholders could converge on a policy, i.e. there is no unique equilibrium solution imposed by some set of material conditions, how to define a common goal and orient strategies? This is where ideas in circulation make a difference by providing a roadmap.

### Deciding Under Uncertainty: Ideational Contribution of Epistemic Coalitions

Ideas become influential for actor orientation by filling in for what cannot be surely known. Let us say that that the government wants to seek a solution that would please the domestic producers in some way. But where are they exactly? At which point in the broadly identifiable southwest region of the stakeholder map would the majority of the producers be found, and do the preferences across this stakeholder category really have a consistency to imagine a single indifference curve (however approximate) for the entire sector? It is true that many countries have peak associations representing the agricultural producer sector, and they take part in policy-making to articulate the demands of the sector. However, such associations are always contested both internally and by rival organizations. For example, peak associations are often criticized as being at the service of an unholy alliance of big landowners and agribusiness interests, while family agriculture and marginalized rural communities are left to tend for themselves politically. Identifying where the majority of the rural producers stand, and with which other stakeholder they share a larger winset, is a challenge. Governments often lack good information about this kind of questions. Under conditions of uncertainty induced by technological innovation, they also lack the knowledge to confidently impose their own view of what is best for the sector. Furthermore, many producers themselves may be unsure about how to position themselves. The science, the technology and the law of GMOs confuse a lot of people. Anthropologists report that farmers are often unable to identify different kinds of seed varieties they use.[65] Fieldwork reveals that people are often confused about the technical question of whether GM seeds are biologically capable of reproduction after one generation, which is consequential for IPR enforcement.[66] The legal tools available for IPR enforcement have also not been transparent, because the release of GM crops coincided with the launch of a new global IPR regime embodied in the 1995 TRIPS agreement and it has taken a long time of gestation until many implications become clear. Because both the economic gains from GM seeds and their negative externalities were far from clearly understood in the early phase of the technology, deliberation and persuasion played an essential role in guiding all stakeholders as well as the policymaking statesmen insofar as the latter could act on their autonomous preferences.

In short, to understand the game they are playing, and identify their preferred scenarios and the strategic path that leads to it, the actors have to make up for missing knowledge. Social narratives that embody ideas approximating true knowledge serve the purpose by filling in for what cannot be surely known. Such ideational social narratives provide scripts that are claimed to describe the true identity of the other actors and the nature of their relationships. The scripts evoke abstract leitmotifs like “science,” “life,” “progress” or “imperialism” to endow legitimacy on their descriptions about “what the poor farmers *really* want,” “the truth about the GMOs,”

[65] Tripp (2001), Stone (2007)

[66] Author’s interviews. See chapters below for details.

“Monsanto’s hidden agenda” or “the rich world conspiracy behind Greenpeace,” and the like. When actors adopt ideas, they engage in learning—an update in beliefs about how the world works, and consequently, in a change of conduct.

The role of ideas in substituting for missing knowledge explains the surprising efficacy of idea-generating agents in affecting policy. The picture about policy-making in developing countries that we are more accustomed to see is one in which concerns over things like biodiversity preservation, food safety, or local community practices are easily discarded under the damning weight of the economic development imperative.[67] The policy debate over the GMOs, however, provoked in many developing countries consequential civil society activism preoccupied with what could be seen as “first world problems.”

I call the collectivity of these surprisingly efficacious idea-generating agents as *epistemic coalitions*. Episteme is “a dominant way of looking at social reality, a set of shared symbols and references, mutual expectations and a mutual predictability of intention” (Ruggie 1975: 569-70). An epistemic coalition consist of *epistemic brokers*: scientists, civil society activists and bureaucrats; working across the state-society divide. They strategically mix selective scientific evidence with ideological narratives and social norms to produce convincing truth statements over the nature of the policy challenge in question, under conditions of incomplete scientific consensus.

The concept of epistemic coalition has to be differentiated from a number of neighboring terms that are used to describe agents responsible for driving change in policy processes. One is the “advocacy coalition,” consisting of “actors at various levels of government active in policy formulation and implementation, as well as journalists, researchers, and policy analysts who play

[67] Drezner (2008: 40) stylizes this observation as regulation being a “luxury good” (with high income-elasticity of demand).

important roles in the generation, dissemination, and evaluation of policy ideas" (Sabatier 1988: 131). Hajer's (1995) "discourse coalitions" consist of actors linked loosely through storylines that are seen as the vehicles for change, placing emphasis on the importance of connotations generated by language. Keck and Sikkink's (1998) "transnational advocacy networks" turn the attention to civil society activists and their trans-border interaction in constructing advocacy coalitions of global reach and salience.

Epistemic coalitions builds on the central insights contained in each of these concepts, namely, the centrality of coalition structure, the need to utilize appropriate discursive frames to enlist support for the coalition, and participation of agents across the state-society and interstate boundaries. However in none of these concepts expert knowledge is demarcated as an important constituent of the mechanism inducing cognitive and policy change. For that we have to engage with the concept of epistemic community (Haas 1992, 2001, 2015). Epistemic communities research program investigates the relationship between scientific knowledge and political power, setting out from the premise that in areas such as environmental policy-making and coordination, ideas propagated by epistemic communities may contribute to better policy outcomes by changing the way political power holders view an issue. Epistemic communities consist of experts "responsible for developing and circulating causal ideas and some associated normative beliefs, and thus helping to create … interests and preferences, as well as helping to identify legitimate participants in the policy process and influencing the form of negotiated outcomes by shaping how conflicts of interest will be resolved" (Haas 2001: 11579). With the epistemic coalition concept I build on the epistemic community by focusing on agents utilizing expert knowledge to change causal beliefs in order to influence policy, but relax some of the assumptions about what defines such agents and include a broader set of participants. The coalition is wider than the community.

First, I relax the clear demarcation of the experts (representing “knowledge”) from politicians and interest groups (representing “power”). Expert knowledge is not only found in academic institutions, it is distributed to some extent in political institutions and the wider civil society too. For example, many bureaucrats and even the elected politicians paying attention to the GMO regulation have advanced degrees in agricultural, biological or medical sciences. The same often applies to the secretariat of private sector associations, and sometimes to the very businessmen that lead the association. Likewise, professional scientists working on agricultural genetic engineering applications are often not only that, and instead they move through the evolving doors between research institutes, for-profit industry, and regulatory agencies to assume different roles, sometimes simultaneously.

Secondly, the epistemic community research has paid much attention to how expert consensus translates to policy knowledge and policy change, and relatively little to the interaction between rival expert groups vying to become the authority in their area (Haas 1999 and Bernstein 2002 are exceptions). However, representatives of expert knowledge often clash not only with power but also with each other. The picture of a unified consensual science speaking truth to power can be improved by recognizing the plural and contested set of appropriate technologies that scientific truth warrants. I emphasize that epistemic coalitions are almost always found in disagreement with rival epistemic coalitions, and such disagreement is how they define their boundaries at the first place.

Therefore, the concept of epistemic coalition invites attention to the strategic interaction of competitive coalitions, each with their own attempt at recruiting some expert knowledge in support of their policy agenda. Such coalitions will consist of scientists, civil society activists and pro-active bureaucrats; working across the state-society divide and generating ideas and narratives that both help define the stakeholders' interests and influence the institutional aggregation of interests into public decisions. The differences of epistemic coalition from neighboring concepts, and what this may imply for the literature, are discussed further in the conclusion chapter.

I have argued earlier that the universe does not give to ideas a blank check for defining people's interests, which are also informed by material conditions in ways that do not always require a lot of ideational mediation to become intelligible. Epistemic coalitions can be highly resourceful and inventive, but they will have a harder time affecting stakeholders and policymakers if their arguments do not have a good match with the economic setting—either the arguments will not be found persuasive, or the public salience of the argument will not rise to a level that can fuel action-oriented mobilization. Economic structure helps select the set of ideas that have a higher chance of appealing to the actors. The logic is illustrated simply below.

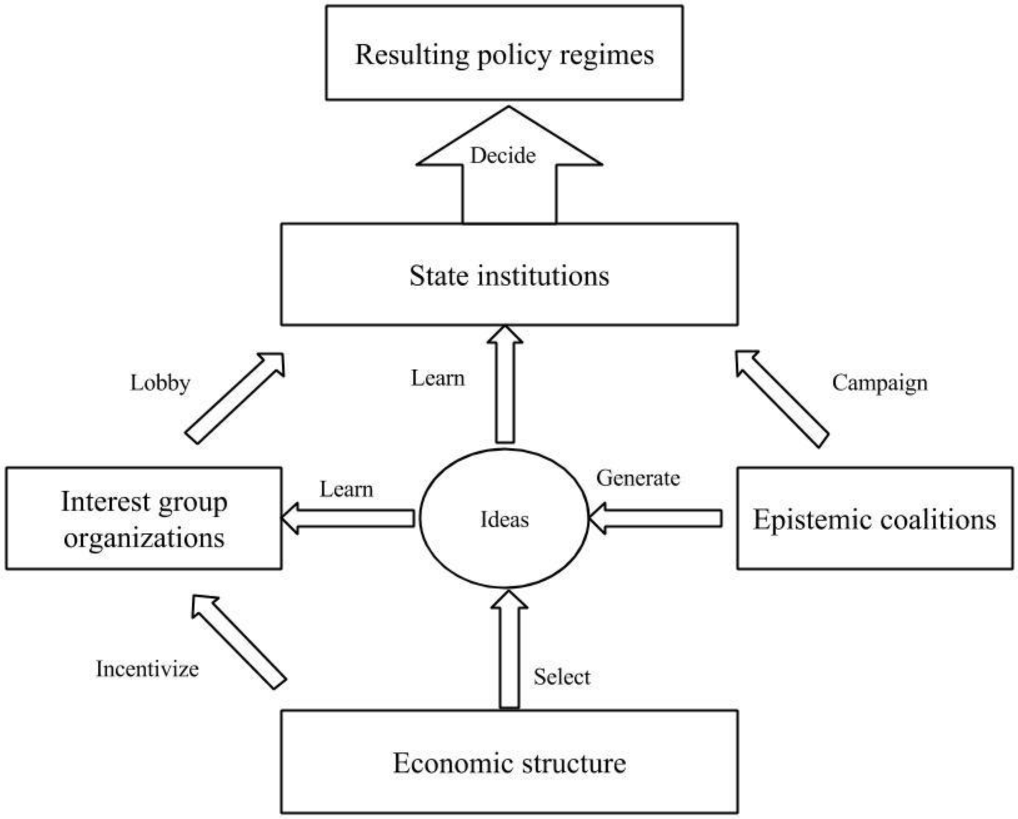


Figure 8: Ideas and economic structure

What are the relevant economic-structural characteristics that could play a role in constraining the domain of ideas by shaping stakeholder positions? In order to evaluate the argument that epistemic coalitions are having a contribution to policy, and analyze the limits of their contribution, we need a sub-theory of what the world could look like in their absence. Below I provide one, and here it is in a nutshell: Economic structure determines the *strength* of the producer sector to an important extent, but delimits its *interests* to a lesser extent, especially because much remains uncertain about what small farmers can expect from the technology. If GMO-skeptic epistemic coalitions can attach themselves to producer sector discourse, they may help define those interests. If they do not do so, and if the producer sector happens to be strong, they risk being ultimately irrelevant. And a more consolidated, capitalist producer sector is expected to be stronger politically. Now let me explain this in greater detail.

## The Economic Context of Decision-Making

I have noted above that GM seed technology comes with the promise of productivity and profit increase for the agricultural producer sector, and the risk of negative externalities to the consumers that are not reflected in short-term production costs. On this consideration, it is reasonable to take the producer sector as potential lobbyers for permissive policies; and expect them to be influential over policy in countries where they are politically strong.

How to identify producer sector strength? The share of agriculture in national employment or economic output would not help, as these are typically indicators of economic underdevelopment and nothing else. A more nuanced approach is necessary, which should start by identifying the appropriate sub-sector. Most important for policy are producers of those crops for which genetic engineering has been most relevant. A country might have an important producer sector thriving on cocoa and bananas, like Ecuador, but these are commodities where GM crop technology has been (and likely to remain) irrelevant. Such a country's government could go so far as passing *constitutional* provisions to ban GM seeds without politically alienating farmers or the biotech industry, like Ecuador did.[68] But countries that are major producers of the chief GM crops—corn, soy, cotton—seen in the table 10 below, are those where the economic gains from adoption, and by implication the opportunity costs of non-adoption, would amount to large sums. Note that in the production of these essential crops no single country enjoys a price-setting monopoly. Widespread adoption of the productivity-enhancing

[68] See article 401 of Ecuador's 2008 Constitution.

technology would be expected to lead to some decrease in commodity prices in time;[69] and because there is no guarantee that rival producers will not adopt the technology, producers in any single country could be expected to be anxious to gain access to the technology as quickly as possible. The biotech TNCs too would have an interest in pushing GM varieties into these large seed markets, and they would be strong lobbyists there. Delays or defeats of permissive policies in these places (as observed to some extent in India, for some time Brazil, and most extremely, Turkey) would appear as puzzles on this ground.[70]

Table 16: Producers of major crops of interest (million tones) in c. 2003-2004

| World ranking | Soy | Corn | Cotton |
|---|---|---|---|
| 1 | US (82.8) | US (280) | China (50.9) |
| 2 | Brazil (50.2) | China (131) | USA (36.4) |
| 3 | Argentina (38.3) | Brazil (34.9) | India (26.4) |
| 4 | China (16.9) | Mexico (20.5) | Pakistan (18.9) |
| 5 | India (6) | Argentina (19.5) | Uzbekistan (10.3) |
| 6 | N/A | India (14.5) | Turkey (9.5) |

Source: Fukuda-Parr (2007: 30).

One major lesson from research in agricultural economics is the role of factor endowments (land, labor, capital) in inducing particular kinds of innovation adoption. In countries with different factor endowments, different technological traits will be more attractive to the producer sector, as innovation will be sought to compensate for the scarce production factor.[71] It makes sense to characterize some GM traits as land-augmenting and others as labor-saving, relatively speaking: herbicide-tolerant (HT) seeds are labor-saving;[72] whereas insect-

[69] Levins and Cochrane (1996), Graff et al (2015: 676).

[70] I borrow this insight from Fukuda-Parr (2007).

[71] Hayami and Ruttan (1971).

[72] Weed control is a labor-intensive job that requires the management of a complex cycle of herbicide application and/or farm labor to manually displace weeds, adjusted for the timing of tillage, planting, and harvest. With the herbicide tolerance trait, weed control can be done with glyphosate-based herbicides during the post-weed

resistant seeds, like those which incorporate the Bt genetic event, are land-augmenting.[73] HT seeds should be the focus of lobbying efforts in land-abundant countries, and Bt seeds in those that are relatively land-scarce. This insight alerts us about what to look for while tracing the policy process, by specifying the particular GM technology of interest. (Indeed, the New World producers were primarily attracted to HT seeds, whereas Turkish and Indian producers were interested in Bt seeds). However, the point is; there are GM technologies that are attractive to both types of countries, and factor endowment in itself should not be a big determinant of policy demand. The puzzle would remain.

The composition of the producer sector should help explain the puzzle. The logic of collective action suggests that a policy choice will enjoy efficacious political support when it promises great benefits to be captured by a small number of players because the potential beneficiaries will each have a lot to gain from pressuring the government and face fewer problems of coordination while doing so.[74] Hence, a producer sector that displays greater concentration may have a higher chance of getting its way. To develop a meaningful composite measure of concentration across the entire agribusiness production chain (even when we leave the biotech TNCs out as an external constant) would probably be impossible. One has to rely on select actors and crude measures. I focus on agricultural land and farmers. Where small farmers numerically dominate the agrarian landscape, we get a producer sector with high fragmentation, which should be encountering greater problems of collective action in articulating its interests

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emergence phase and the need for pre-seeding tillage is much reduced. Although the total herbicide applied can increase, the task becomes simpler. As a result both farm management time and the labor employed for weed control are expected to decrease. See Fernandez-Cornejo and McBride (2000).

[73] See Tripp (2009a) for a discussion in the context of cotton.

[74] Olson (1965), Becker (1983).

and getting favorable public policies. Where most agricultural production is concentrated in big farms, the producer sector will be better suited to articulate its interests.[75]

Not only the ability to organize, but preferences too may differ between big farmers and small; because their expected gains (per unit land) from GM seed adoption may be different. Yes, GM crop technology should be scale-neutral at a purely technical level, since seed is a divisible input that should not come with increasing returns to scale. However, the history of agricultural innovations should lead us to doubt whether any technology can be scale-neutral once we leave the purely technical terrain. The Green Revolution seed varieties were supposed to be scale-neutral too, but in many settings they were first and more extensively adopted in larger farms.[76] Because any innovation is risky, the greater ability to accommodate risk with easier access to credit may be the reason for big farmers' pioneering behavior. Information may be more readily available to the operators of big farms too. In the US context agricultural surveys have found that larger farms and a higher education level explains which farmers adopted GM seed varieties first.[77] Hence, big farmers may anticipate being early adopters of the novel technology and reaping rents before adoption becomes universal and the cost-price squeeze due to increase production starts to bite farmers across the board.[78] The smaller farmers' attitude towards the new technology should be less determinate due to uncertainty over terms of access to a new technology and its possible impacts. In short, due to both stronger organizational capabilities and clearer preferences, where big farmers dominate agricultural production to a greater extent we may expect overall producer demand for permissive policies to be stronger. By

[75] Bates (1981), de Janvry (1981), Varshney (1993), Birner and Resnick (2010).

[76] Lipton and Lipherst (1989).

[77] Fernandez-Cornejo and McBride (2000).

[78] Levins and Cochrane (1996), Goldsmith (2001), Micheels and Gow (2013), Graff et al (2015: 676).

implication, demand for biosafety regulations to restrict or ban GM crop cultivation should remain weaker (relative to the opposite demand) in such settings.

Strong IPR over GM seeds generates a further axis of differentiation among the producer sector. For millennia, farmers have freely saved seeds from harvests to reproduce an essential means of production in-house and the "farmer's privilege" to do so was an important part of the international IPR regime until the invention of the GM seeds. IPR claims over GM seeds pose a challenge to established practice by advocating for a restriction of free seed saving. Hence, strict IPR over seed leads to not only higher input prices (which are certain, whereas realization of superior performance in particular ecosystems is not),[79] but also less farmer control over the production process. This should be more important for small and medium farmers than big ones, not necessarily for strictly technical reasons of efficient scale but because of imperfect credit markets and similar institutional phenomena. Seed saving is more common practice among small and medium farmers to save on input costs in bad years; whereas big capitalist farmers are likely to be willing to invest in the most expensive seeds every year thanks to greater ability to accommodate risk.[80] When strict IPR protection encroaches on free seed saving, smaller farmers would be agitated more. Also, if there is integration within agroindustrial input markets in a way that allows companies marketing GM seeds to tie these sales to a package of other inputs like herbicides, small farmers may incur disproportionate cost penalties when seed reproduction cannot be undertaken in the farm anymore and is dependent on such external suppliers.[81] Therefore, big farm interests could see IPR claims by TNCs as relatively tolerable, even if they are not enthusiastic supporters of such claims. Smaller farmers as well as the domestic seed

[79] See Finger et al's (2012) meta-analysis.

[80] Tripp (2001), Edmeades (2012: 260).

[81] Goldsmith (2001: 1314-17) discusses how a uniform input pricing strategy and product bundling combined with heterogeneous demand can lead to regressive welfare impacts on smaller producers.

sector, on the other hand, would seek direction from the government and guarantees that the adoption of the technology will not be to their disadvantage. The implication of this point is that where small farmers numerically dominate the agrarian landscape, we get a producer sector facing greater uncertainty about what to expect from the new technology's socioeconomic impact, and any support they could be expected to display in favor of permissive policies would be qualified, and perhaps cancelled out, by concerns over IPR.

Turning to our sample, data demonstrates that in Argentina and Brazil a larger part of agricultural production is dominated by a small number of big operators compared to India and Turkey, see Table 11.

Table 17: Agrarian structure, c. 1988-1996[82]

| | Mean farm size (ha) | Farm size distribution Gini | Ratio of small farms (%) | Land held by small farms (%) |
|---|---|---|---|---|
| Argentina | 468.97 | 0.83 | 15.1 | 1 |
| Brazil | 73.09 | 0.85 | 36.8 | 1 |
| Turkey | 5.76 | 0.61 | 67.9 | 22.1 |
| India | 1.55 | 0.58 | 76.2 | 29 |

Source: Eastwood et al 2004 reporting FAO World Agricultural Census

As an empirical correlate, in the New World cases the political clout of the agricultural sector in general is further enhanced by the fact that it is an important generator of export revenues, as seen in Table 12. Anti-GMO opposition, if it is chiefly originating from the consumer sector, would have a harder time in influencing policy in those settings.

[82] Small farm is defined as <2ha in India, <5ha for the rest. The figures refer to data from 1988 for Argentina, 1996 for Brazil, and 1991 for Turkey and India. Because farm surveys are not administered in uniform fashion around the world, the figures may not be directly comparable, but they will give an idea about the differences in the average size and distribution of agricultural holdings in these places.

Table 18: Agriculture in economic context, c. 2000

| c. 2000 | Agricultural land (ha per person) | Food & agr raw materials as % of total exports |
|---|---|---|
| Argentina | 4.72 | 42.9 |
| Brazil | 1.53 | 26.5 |
| Turkey | 0.57 | 14 |
| India | 0.18 | 11.8 |

Source: FAO and World Bank

Note that this last proposition is based on political instead of purely market mechanisms. Relying on the latter, some commentators had hypothesized that export farmers and countries they dominate, like Argentina and Brazil, would be the first to oppose GM crop cultivation in order not to lose markets (Lapan and Moschini 2002, Graff et al 2009). Pretty much the opposite have come true. This is because export orientation can simultaneously activate contrary causal mechanisms too: the export competitiveness imperative may attune farmers to productivity concerns to a greater extent than what would be the case if farmers were mainly producing for a protected domestic market. And signals from various export markets may suggest a variety of policy directions. Hence, the directly economic rationale of export orientation is unclear as far as policy direction is concerned. The political economy rationale, however, looks clearer. The structural dependence of the state on capital[83] should be more pronounced when it comes to export-oriented sectors,[84] since exports help balance the current account bill and attenuate the need for foreign borrowing, and exports seem to generate better-paying jobs[85] and contribute to

[83] Przeworski and Wallerstein (1988).

[84] For a classic treatment of this notion (although using different terms), see Hirschman (1969).

[85] This has been found as a comparison across the US manufacturing sectors (Riker 2010).

economic growth more than home-market activity.[86] All else being constant, export-oriented farmers would be politically more important farmers.

The point is that, due to both class structure and export-orientation, the agricultural sector is stronger politically in the New World cases compared to Turkey or India. Literature on the economic and political history of these places indeed attests to a more cohesive, better organized, and politically influential agricultural producer sector in the New World cases. A brief overview of this literature is in order.

"[T]he conventional way of understanding Argentine political history" is that it is "one of those Latin American countries where landowners most controlled the state, at least until well into the twentieth century" (Safford 1995: 177, also see Furtado 1963 and 1970, deJanvry 1981). Some scholars, such as Halperin Donghi (1995) challenge this narrative by pointing that the landed class in Argentina has not enjoyed the effective political power that could be expected from their central position in the country's economy and often had a conflictual relationship to the state. Still, even if they have not enjoyed "class hegemony" in this sense, they enjoyed a "natural hegemony" (Safford 1995: 177 paraphrasing Halperin Donghi): The landed class was either secure enough in its economic position to tolerate the installation of a democratic regime or it effected a return to authoritarianism and a prominent role for the conservative parties when the control of the state apparatus was seen important for purposes of influencing economic, tax, and spending policies; thus generating the turbulent history of conflict (Huber 1995: 12-13). In any event, the rural landed class, not only as a propertied elite but also qua agricultural producers directly involved in the production of exportable commodities, has been a formative actor in modern Argentine politics. The producers have maintained a boardroom pattern of consultative

[86] This is attested by both macro-level data on national growth rates, and micro evidence regarding productivity improvements for exporting firms. See Winters (2004) for an extensive discussion.

relationship with the state that is known as La Mesa de Enlace ("the contact desk") where associations like the Sociedad Rural or Federacion Agraria have a chance to directly articulate policy preferences to state managers (Lattuada 2006).

Turning to Brazil, during the Old Republic "[a]gricultural producers and exporters dominated the national Congress and held key decision-making positions within the administration." After the establishment of the New State, although enjoying less autonomy "landlords continued to play a very important political role under Vargas and during the period of restricted democracy from 1945 to 1964" (Huber and Stephens 1995: 196-197). During the two decades when the military monopolized political power, the agricultural elites were not as central to national politics as they were in Argentina, but "landlords were left in the position of ultimate authority on their estates and mostly also controlled local politics" (Huber and Stephens 1995: 197). The return to democracy enabled the agricultural producers to reestablish themselves as an interest group with the ability to influence economic policy-making through organized political pressure along a dense policy network. Speaking of the period since the early 1990s onwards, Mueller notes "a dramatic increase in the number and scope of agribusiness organizations … [V]irtually all segments of agribusiness have specific associations, and most of them have composed particular agricultural networks… Together with the official agricultural institutions … and with less formal but important organizations such as the Rural Group of Congressmen (the *Bancada Ruralista*) and the Democratic Rural Union, they compose a broad agricultural policy network" (Mueller 2009: 139).

The Turkish case provides a much different picture. Several classic works explain the relatively high autonomy of the Turkish state apparatus with the historical absence of a class of landed nobility, and the resulting symbiotic relationship between the state and politically submissive smallholding peasantry—a relationship that the Ottomans did much to cultivate and the Republican regime inherited (Mardin 1969, Keyder 1987, İslamoğlu-İnan 1994). These conditions have made it difficult for the emergence of an export-oriented capitalistic farming sector, save but in certain coastal pockets, and sustained the smallholding pattern (Jacoby 2008, Pamuk 2009). The coming of multiparty electoral politics in the 1950s ushered an era of populism and conferred on the rural population a new kind of importance (Anderson 2006). This meant that the farming population had the option of reacting to public policies through elections, however, the fungibility of that mechanisms for policy influence has been muted by the fact that the closed-list electoral system with multi-member districts exposes parties, not individual candidates, to the electoral reward and punishment cycle. Maybe more important is that the agricultural producers did not become a formative actor that drafted policies through organized interest group influence. Can and Sakarya explain the associational failures of the Turkish agricultural sector by noting that the impetus for association did not come bottom-up through popular demands, and instead it has been provided by the state (2012: 27). The chief farmer organization is the Turkish Union of Chambers of Agriculture (Türkiye Ziraat Odaları Birliği, TZOB), instituted by the state between 1958-63, and required by law to have a Chamber in every town and a delegate in every village in the country. The organizational weakness of the TZOB and its limited influence over agricultural policy is a matter of consensus in the literature on Turkish agriculture policy (Önal 2010). Member dues, seen as a tax by most farmers, are paid infrequently, and it makes TZOB dependent on the state for financial resources. Governments have repeatedly used the threat of withdrawing the TZOB's power to issue "farmer authorization documents" as a stick to discipline the organization's leaders (farmers need these documents to claim government subsidies and the authority to issue them is a major source of income for the organization). Inan et al (2005, n.p., translation mine) conclude that "in putting agricultural problems on the national policy agenda and influencing the decisions of the legislature and the executive", the TZOB's power is "much more limited compared to the non-agricultural chambers of commerce and industry in Turkey or agricultural chambers in Europe". Turkish agricultural producers have neither the parliamentary *bancada ruralista* available to their Brazilian counterparts nor the corporatist *mesa de enlace* available to the Argentine.

It is more difficult to generalize about the Indian agricultural producers' degree of influence over agricultural policy due to the vast size and diversity of the Indian countryside, and the geographical fragmentation that characterizes the country's political movements and organizations. In his now-classic treatment of agrarian transition in Asia, for example, Byres notes that there are several "agrarian questions", instead of *the* agrarian question, for a country like India (1989: 6). This very fragmentation, though, can be thought to make it difficult for the articulation of a national policy space that a producer class can have access to and hope to influence (Kohli 2004). Rural class structure and land ownership and operating patterns add a further vector of fragmentation. It is true that in pre-colonial and colonial times, Indian rural elites have had greater autonomy from the vicissitudes of the state, and greater chance to differentiate themselves from the peasantry than it was the case in Turkey. This may lead one to view the Indian rural class structure as being closer to the Latin American cases. However, in much everything else, the Indian agricultural sector joins the Turkish case in being characterized by smallholding peasantry. The large estates of the *zamindars* that were once frequent in the Indian countryside were not plantations or "Junker farms" running on hired labor; they were mostly divided and rented out to sharecropping tenants (Binswanger et al 1993). The rural gentry, including many former *zamindars*, have acted as an *agrarian* elite; enjoying a dominant position in the countryside by leasing out land and extending credit to tenant-farmers or tax-farming on behalf of remote centers of political authority. But they have not been an *agricultural* elite in the way that Brazilian coffee barons or the Argentinean growers and ranchers have been—their power and wealth have had a much more mediated connection to agricultural production, which is the domain of their tenant-farmers. The Indian "Green Revolution" from the 1960s onwards, despite criticisms about its regional biases, was an affair that was remarkable in its attention to this latter class. Birner and Resnick state that "In the case of India, the explicit political focus on smallholders in launching the Green Revolution is well documented… The Minister of Agriculture who masterminded India's Green Revolution, Subramaniam, [aimed at] a smallholder-based agricultural intensification—a goal that he had to defend strongly against internal critics and against advisors from both the United States" (2010: 1443-1444). It is telling that the political energy of Indian rural populism and its organizations, like the Shetkari Sanghatana in Maharashtra, BKU in Uttar Pradesh, TVS in Tamil Nadu, or KRRS in Karnataka, have not been directed towards breaking up and replacing a rural propertied class, but towards influencing the state in the form of demands for infrastructure provision and subsidies (Brass 1994). And the degree of that influence is generally recognized as being muted by cross-cutting cleavages of caste and ethnicity among the rural population, and in decline compared to its peak in the 1980s (Varshney 1997, Omveldt 2005). Indian agricultural sector power remains mostly an affair of rural popular sector mobilization, and it is limited by that fact.

In short, throughout the twentieth century, landowners and farmers in Argentina and Brazil have often been formative actors shaping not only agricultural and economic policy but even national politics, whereas in Turkey and India they have held defensive positions, trying to secure the state's paternalistic attention at most.

To summarize, then, this section then has provided us with a comparison strategy regarding the material setting of policy struggles. Where most of the domestic agricultural production is being done in big farms by export-oriented capitalist farmers, a TNC-domestic producer alliance for permissive policies for GM crop cultivation would be more likely and efficacious. Where smallholding peasantry dominates, the domestic producers would be less interested, and less able, to politically defend such an alliance position, because their potential gains from technology permission is uncertain (which rests on agricultural microeconomics) and at best small compared to the costs of political mobilization (which follows from collective action theory). A more consolidated, capitalist producer sector is expected to be more strongly in favor of permissive biosafety policies. In other words, economic structure determines the strength of the producer sector to an important extent, but delimits its interests to a lesser extent, especially because much remains uncertain about what small farmers can expect from the technology. If GMO-skeptic epistemic coalitions can attach themselves to producer sector discourse, they may help define those interests. If they do not do so, and if the producer sector happens to be strong, they risk being irrelevant.

Agricultural sector data, and the literature on the political history of each place reviewed above, suggests that we would expect to find a strong domestic producer sector in Argentina and Brazil, which form "most similar" cases in this particular respect. We would find the opposite in Turkey and India, which are likewise "most similar" to each other, and "most different" from the others.[87] These expectations inform my strategies of comparison. In the New World cases, stronger lobbying from interest groups would be present in favor of GM crops, in the Old World cases, lobbying would be weaker. How did the opposition groups position themselves in these

[87] I am using to the methodological terminology in Gerring (2011).

respective settings, and how did the public decision-makers respond? Differences between the experiences of most similar cases will attest to the ability of the epistemic coalitions in influencing the government, the differences between the most different cases will attest to the limits of what the epistemic coalitions can do given particular economic setting constraints. Tables 2 and 15 illustrate the processes and outcomes observed across these cases in terms of these two differences.

## **From Theory to Research**

### Observable Implications of the Argument

After all, the theoretical framework amounts to a simple argument. Because there is high economic value at stake with this policy question, the economic structure of each setting makes a difference by giving actors different degrees of political power. But because there is a lot of scientific and legal uncertainty surrounding the impact of technology, economic structure requires interpretation, and ideas too make a difference, through the agency of epistemic coalitions, by helping autonomous state managers to select from structurally relevant political options. With such a framework we learn about both what constrained policy-makers' options, and how they have made use of their options.

However, the particular theoretical form of the argument I have presented is more specific, allowing for concrete implications and letting me denote with some clarity what the world would look like if I were wrong. So, to the extent that my argument is correct, we should observe:

1. That lobbying for permissive policies has an economic logic.

1.1. Biotech companies approach regulatory agencies first for the approval of GM varieties of crops that are produced in large quantities in a given country, and focus their lobbying activities there.

1.2. Domestic producers of these crops are more inclined for permissive policies than producers of other commodities.

2. That opposition to the technology is mainly coming from outside the producer sector.

2.1. Opposition to GM crops originates from and spearheaded by urban-based consumer sector NGOs; rural producers are coopted to the opposition (if at all) later. Biosafety concerns receive much greater attention in the opposition articulated by consumer sector NGOs.

2.2. Any producer opposition to GMOs incorporates ideas revolving around the undesirability of stricter IPR that are coupled with them, and consumer aversion fears.

3. That there is an IPR conflict introduced by the technology, and this qualifies producer sector positions.

3.1. Biotech TNCs finding themselves in a monopoly position aim to extract uncompetitive rents through royalty fees. This should manifest itself as high mark-up rates evinced by vastly different (across time, space, or negotiation round) royalty fees emerging from negotiations between biotech and farmers.

3.2. Among the farm organizations, those who raise the strongest objections to the IPR restrictions and alleged monopoly practices are associations that represent smaller and medium farmers and peasants.

3.3. Where the latter kind of producers are numerically dominating, the producer sector support for permissive biosafety policies is weaker.

4. That decision-makers care about pleasing the producer sector, among other things.
    4.1. The interests of the producers have an explicit place in policy-makers' public discourse, and in their personal testimony about the policy-making process.
    4.2. The particular way in which the producer interests will be served is open to interpretation, as evinced by policy-makers holding different ideas about this question.
    4.3. Where the producer sector support for permissive policies is strong, there is little chance for anti-GMO opposition to obtain precautionary biosafety policies. GMO-skeptic opposition can nonetheless help obtaining a producer-oriented solution by challenging the legitimacy of strong IPR claims over GM crops by transnational biotechnology firms.
5. That decision-makers make use of ideas in the form of scientific, economic, legal truth statements (not necessarily corresponding to true descriptions of the world, as far as we can objectively tell) to inform their decisions.
    5.1. Policy-makers in comparable material settings with different ideas, or same policy-makers holding different ideas across time arrive at different decisions.
    5.2. Policy-makers justify their decisions (in public discourse and personal testimony) by the said truth statements.
    5.3. These truth statements are perceived by policy-makers as informing (national, sectorial, partisan) interests, instead of conceived as completely rival sources of behavior.

## Research Methodology

The above-described implications of the argument arise at various levels of analysis: some should be observable in the form of cross-country differences, some in the temporal progression of policy processes, and some in the more micro behavior of organizations or individuals that stand as stakeholders and public decision-makers. Being careful about such multi-level implications enables me to populate what may look like an (n=4) research design with many more observations. As King et al reminds "By adding new observations from different levels of analysis, we can generate multiple tests of [a theory's] implications" (1994). For example, the implications 3.2 and 3.3 should have observable traces in both cross-country outcomes (have Turkish farmers been as enthusiastic supporters of GM seeds as Argentinian ones?), and in more micro behavior across within-country geography (did smaller Rio Grande do Sul farmers present greater challenges to the TNCs IPR claims than the bigger Mato Grosso farmers in Brazil?) or organizational terrain (did the FAA—representing the medium and smaller farmers of Argentina—present greater such challenge than the more agribusiness oriented SRA? etc).

This is why my research proceeds not simply as a variation-finding comparison across countries, but buttresses the comparison with detailed case studies of each, in order to trace the decision-making process to verify that the imputed causal mechanisms were indeed in play (Hedström and Swedberg 1998, Collier 2011, Bennett and Checkel 2014). As King et al state, "process tracing and other approaches to the elaboration of causal mechanisms increase the number of theoretically relevant observations… By providing more observations relevant to the implications of a theory, such a method can help to overcome the dilemmas of small-*n* research and enable investigators and their readers to increase their confidence in the findings of social science" (1994).

Simple cross-country comparison with a "nationalistic" focus is also inadequate, by itself, to deal with questions of international interaction by way of competition or diffusion. Policy-making on GMOs does not occur in isolated settings, instead, what happens in one country affects what comes afterwards in other places by setting up policy examples and legal precedents, generating influential ideas, or changing the global market structure. From the vantage point of transnational actors like Monsanto and Greenpeace, the policy contestation occurs through a series of interlinked games played sequentially in different settings. They therefore adjust their position in each setting with an eye towards what has been going on in others, effectively creating a network where ideas, information and resources travel between countries. In large-N comparative studies utilizing regression methods such network effects arising from the lack of independence between cases are by implication relegated to the error term, and even if it is recognized that estimation efficiency (i.e. precision) is thus reduced it is assumed that the effects are not of a kind that would bias the coefficients (i.e. accuracy). The accuracy of findings from such studies thus rests on the assumption that the cases are effectively independent, which is often problematic.[88] In process-tracing analyses nested in small-N comparison, on the other hand, the danger is not the lack of independence per se, but that "the researcher will fail to identify a lack of independence between cases and will consequently reach false conclusions" (George and Bennett 2005: 34). In other words, the problem is not that what happens in Argentina affects what happens in Brazil—it always will; the problem is that the researcher does not notice this and attributes too much causal influence to something else happening solely in Brazil. Fortunately, "[p]rocess-tracing can inductively uncover linkages between cases" (George and Bennett 2005: 34). With elite interviews the researcher can ask Brazilian policy-makers whether they were responding to events in Argentina. Even where such

[88] Network analysis of large-N data, on the other hand, is still a small (albeit growing) research body in political science, its typical application has not been to questions of country-level variation, and most research with this method remains descriptive. Sophisticated models that are able to analyze both network interaction and comparative covariation (such as Exponential Random Graph Models) are, as far as empirical application is concerned, at their infancy (see Cranmer and Desmarais 2011).

testimonies are missing, the researcher can work like a careful historian on the basis of press reports and the like to take note of the sequentiality of events in different settings, with an eye towards "smoking gun" evidence about connections between them (Mahoney and Goertz 2006). Verifying these connections may require revisions on lessons otherwise generated on the basis of the "nationalistic" cross-country comparison. Such corrections to ensure inferential accuracy may reduce the parsimony of the ultimate explanation—but methodological choices always come with trade-offs, and this is a necessary one.[89]

Therefore, variation-finding comparison buttressed with process-tracing can contribute to our understanding of causal mechanisms. This is what I do in this study. Furthermore, while presenting its original data in qualitative fashion, this study makes use of a good deal of quantitative, econometric evidence in the form of public opinion surveys, and studies examining the impact of GM seed technology on crop yields, farm incomes, and the like. Such data has been cited whenever relevant in order to demonstrate the following non-obvious stylized facts that ground my theoretical propositions: 1) consumers everywhere have a bias towards GM crops (they prefer non-GM food over GM food) and often favor the banning of GM seeds; 2) farmers have a more favorable attitude towards GM crops compared to the consumers; 3) Adoption of GM crops on average result in increases in farm productivity (higher yields and/or fewer chemical inputs); 4) whether farmers profit from the productivity increase depends on arrangements (such as IPR regulations) that determine the GM seed price. These data are drawn from available secondary literature. I will now describe the sources of the original data I am bringing in support of my observations.

[89] Przeworski and Teune (1970: 20-23).

## Sources and Use of Data

The research started with a survey of the secondary literature, and identification of the country cases that would have leverage in advancing the study. Once countries were selected, first, a timeline of major events relevant to the GMO regulation for each country was prepared, structured around legislative and judicial initiatives. In doing so, the foremost primary source proved to be the US Department of Agriculture's (USDA) Foreign Agricultural Service (FAS) reports, which are unclassified observations on agricultural policy-making in countries of interest, prepared by USDA attaches to the US embassies and consulates in those places.[90] A similar source was the partly classified US embassy cables that became publicly available via Wikileaks.[91] Because the USA is an agricultural powerhouse, and home to the world's foremost biotech company, it has high stakes in correctly observing what is going on in major seed and commodity markets around the world, and because it is the world hegemon it has unique capabilities in doing so—no one can easily ignore a conversation request from a US diplomat. Hence these documents are very helpful in establishing the main events in the storyline of each country's policy trajectory and the main actors involved in the making of those events. It could be conjectured that, colored by the perceptions of the functionaries of a pro-GMO country, the information in these reports could be biased. While such probable bias should be kept in mind while reading these reports; also remember that these are not public relations communiqués and instead intended primarily (in the case of Wikileaks cables exclusively) for internal use. Indeed, they do seem concerned with reporting objectively. For example, while the reporters from Brazil

[90] These reports are available from USDA FAS Global Agricultural Information Network database at http://gain.fas.usda.gov/Pages/Default.aspx (last accessed December 2015).

[91] These cables can be searched at the Wikileaks database at https://www.wikileaks.org/plusd/?qproject[]=ps&qproject[]=cg&qproject[]=cc&qproject[]=fp&q=#result (last accessed December 2015).

inform that the leaders of the farm associations they have met are generally highly supportive of allowing GM seeds,[92] reporters from Turkey note no such observation, suggesting that Turkish farmer sector representatives were uninterested, ineffective, or ambiguous. This makes sense because interviews I conducted in these countries, and press reports and the like, also point to the same. Hence, the *magnitude* of the bias in US Embassy reporting does not seem large, and it should not really be a damning problem so long as we know the *direction* of the bias, which we do (USA is pro-GMO).[93]

Once a timeline was established, actors relevant to policy were identified. A list of relevant organizations have been prepared in partly inductively, based on US foreign service data described above, and in part deductively, based on my theoretical framework about policy stakeholders. Organizations that I defined above as "consumer sector NGOs"—active on public interest issues such as consumer rights, health, and environmental preservation are easy to identify and observe. Because their modus operandi is based on publicizing their views as much as possible, information about their activity is accessible through their own websites or press reports on them. The "producer sector" and government organizations themselves can be more opaque, so particular effort has been made to identify and access interview subjects in these places in order to understand the stances such organizations took, and any consequences their activity had. A production chain approach has been utilized to map the producer organizations and the public institutions they interacted with. An exemplary table covering main organizations through Argentinian grain (soy, corn) production chain is available as Appendix A.

[92] USDA FAS GAIN report #BR1623, "Update of Biotech Issues in Brazil," dated 7 November 2001, http://apps.fas.usda.gov/gainfiles/200111/130682651.pdf.

[93] For a discussion on how an increase in bias generated by the introduction of additional data can be justified by the accompanying increase in estimation efficiency, see King et al (1994: 66-74).

I have undertaken original fieldwork in three countries (Argentina, Brazil, Turkey) to access these institutions through elite interviews. (Elite interviews are not interviews with the social elite; they are interviews with people—be they workers, farmers or lawyers—who have unique value for accessing certain kinds of information). Non-random sampling for elite interviews is recommended when the goal is "not … to draw a representative sample in order to use interviews to make generalisations about the … full population of relevant actors, but rather to obtain the testimony of individuals who were most closely involved in the process of interest" (Tansey 2007: 767). This was precisely my goal, and once obtaining some initial access I have used a non-random "snowball" (or chain-referral) method wherein each interviewee supplied names of other potential interview subjects within the regulatory universe relevant to the policy process. Also, I made lists of relevant individuals similar to the institutional list described above, which I then used to contact individuals and/or search the Internet about their activity. The lists were prepared primarily by identifying the participants to policy-oriented conferences and workshops, generally available from the documents relating to such events. This was particularly useful for identifying scientific and legal experts, because experts like to go to conferences and workshops. An exemplary list for the case of Brazil (listing the participants to a major workshop organized by Brazil's biosafety regulation commission CTNBio, openly available from the same) is available as Appendix B.

Once in the field, semi-structured interviews were conducted by myself, in English, Spanish, Turkish and in a few cases Portuguese, but below I report all quotations in English unless particularly evocative or ambiguous language requires the inclusion of the original. Some of the interviews were tape-recorded, some of them were not, because not everyone consented to be tape-recorded. The same goes for revealing names. A total of 39 individuals were interviewed in person in Argentina (Buenos Aires and Rosario), 32 in Brazil (Sao Paulo, Campinas, Brasilia and Rio de Janeiro), and 25 in Turkey (Istanbul, Ankara, Adana); including bureaucrats, business and farm sector representatives, scientists and activists. Some of the interviews gave me the opportunity to visit research facilities and farms and observe the work being done. I also followed the press. Periodicals specializing in agriculture and agribusiness, such as *Campo* in Argentina, and *Valor Econômico* or *AgroDBO* in Brazil, were especially useful.

Interviews can be highly valuable sources of data, but they can also be misleading. People may forget things, hold subjective views, or lie (Fontana and Frey 1994, Yow 2014). For this reason, where possible I relied directly on publicly available information (already pointing to what has been divulged in the interview), and referred to interviews only in additional support. This both serves to make information more credible, and expose interview subjects less. To make information more credible, interviews have also been triangulated with other interviews and data from elsewhere. This was particularly important for interviews with actors with a high stake in the game, and in conflictual positions, whose opinions on GMO regulation disagree strongly with other actors. So, if it appeared from an interview with person/organization A that A is highly critical of person/organization B, then my next mission was to try and have an interview with B. If their accounts agreed on some information (better still, if I was also able to find information about those events in printed sources), then I would have high confidence that the information is true.

Here is a brief example of how this was done: In Turkey, the initial bureaucratic input for the design of the biosafety regime seems to have had a path-dependent effect on events afterwards, so it was necessary to identify the sources of the early bureaucratic approach. I started with interviews in the Ministry of Agriculture's various units, which revealed that the unit called TAGEM had been the bureaucratic pioneer. I interviewed the anti-GMO NGOs, and they told me that they had most contact with bureaucrats at TAGEM. I asked Monsanto representatives, who are highly critical of Turkey's biosafety regime, and they pointed towards TAGEM. I searched the US foreign service data, which yielded in an embassy cable, that "Unfortunately, Turkey's official expertise in the sector appears to be limited to one key individual—the Head of Dept of the Biotechnology Group at TAGEM—who has controlled the direction and restrictive nature of the legislation".[94] The head at the time was Vehbi Eser, named as such by all the interviewees. I then contacted Dr. Eser and had a three-hour interview with him, to ask him about the sources of his views, his interactions with the relevant opinion and interest groups, and the consequences. This example shows that although biased by subjective views, interviews can be triangulated with each other and other sources of data to obtain credible information.

[94] US Ankara Embassy cable (ref: 05Ankara 862) to Washington DC, dated February 5, 2005, last accessed at http://wikileaks.org/cable/2005/02/05ANKARA862.html in July 2014.

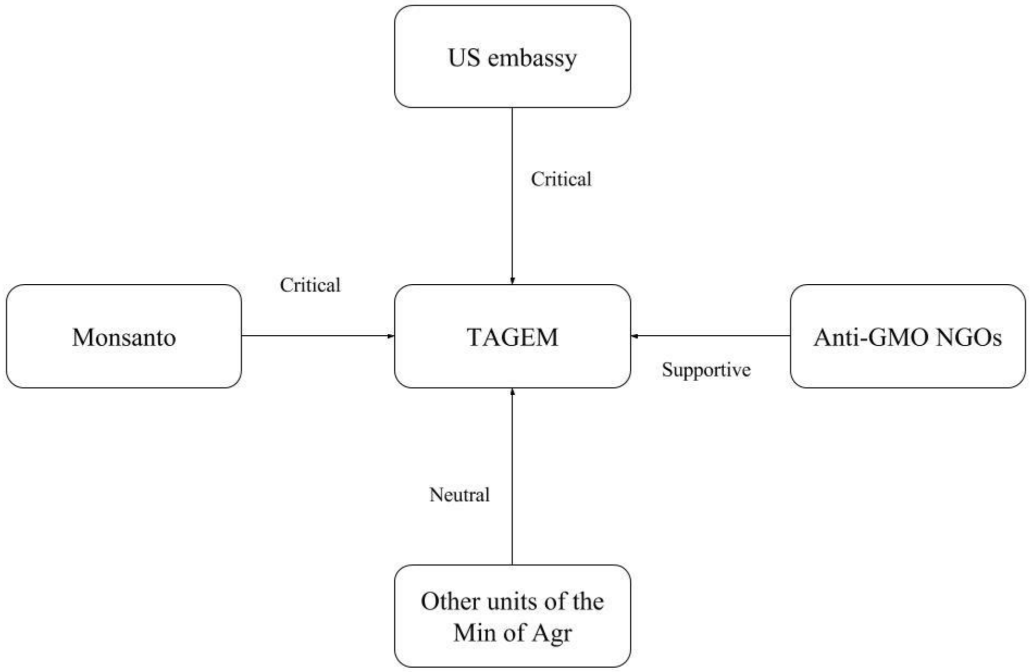


Figure 9: Interview triangulation

Due to time and resource constraints, for India I have relied on online documents and evidence from secondary literature, which is fortunately extensive, and mostly produced in English. In terms of richness of information, this is bound to introduce some imbalance between the cases. In a particular methodological sense, though, this limitation is actually an opportunity. The case of India serves as a limited test of the propositions developed on the basis of original fieldwork, on evidence produced by other authors. High-profile studies of Indian policy-making, cited in chapter VII, are available to check whether my analytical reconstruction of the Indian policy process is accurate, and readers are advised to consult them.

King et al remind that “investigators often take down the scaffolding after putting up their intellectual buildings, leaving little trace of the agony and uncertainty of construction” (1994: 13). Needless to say, so is the case here. Although described as a neat sequence above, the research processes have actually progressed in a reiterative fashion in which the researcher constantly goes back and forth between different kinds of data, and between empirics and theoretical (re)consideration.

Below I present the country cases, starting with the case of Argentina in the next chapter.

# CHAPTER IV

# THE CASE OF ARGENTINA

## Introduction

Argentina has been a country with enthusiastic acceptance of GM seeds, joining the USA and Canada in being the first to launch large-scale GM agricultural production in 1996. By 2008/09, GM seeds were sown in more than 90 percent of the land devoted to soybean, corn, and cotton production.[95] Public policies remained permissive throughout. With no specific biosafety law, the system regulating the approval of GM seed varieties materialized as a result of a series of executive decisions over the course of two decades. There is no sign that Argentina will ratify the Cartagena Protocol for Biosafety, which calls for the precautionary principle in the regulation of GMOs. No labeling of GM food or feed is required, and there is no segregation of GM from non-GM agricultural production.

The adoption of GM seeds coincided with a period of boom in Argentina's agricultural production, which, as agricultural economists conclude, both supported and was in turn helped by the introduction of the new seeds.[96] The soybean complex, especially, became a cornerstone of the country's reorientation as an agricultural export platform. Soy products (grain, soymeal, or oil) accounted for nearly a quarter of the country's export revenues by the end of the 2000s. While almost all soy production was made with the "Roundup Ready" (RR) seeds genetically modified to be resistant to glyphosate-based herbicides, however; the developer of this transgenic event, Monsanto, could not manage to extract the technology rents it aimed for,

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[95] See "Cultivos aprobados y adopción" section at ArgenBio's website for visualized annual data, http://www.argenbio.org/index.php?action=cultivos&opt=5

[96] Sztulwark (2012: 102-104).

because the farmers continued to supply seeds in-farm or from unauthorized agents. Legal and administrative change towards stricter IPR would be necessary to extinguish this practice.

None of Argentina's peak agricultural sector organizations were ready to concede to stricter IPR demands over seeds without a serious negotiation. In these negotiations Monsanto's—in collaboration with the local seed industry—proposals came to no fruition as the TNC failed to earn the trust of her interlocutors. As a result, while the biochemical transformations the technology embodied were much celebrated in Argentina, the corporate view of who legitimately owned the technology did not find acceptance. Claims for the necessity of strong IPR to sustain innovation were confronted by an epistemic coalition of farm associations and activists with a discourse of anti-monopoly and anti-imperialism. It was feared, as a spokesperson from Federación Agraria Argentina (FAA) commented, "the business of the few [wound] end up transforming this technology into an enemy of the common [good]".[97]

Amid competing pressure by various interest and opinion groups, the government ultimately sided with the farmer associations seeking access to inputs with low prices. A consensus has been effectively reached: the Argentinian agricultural producers would have favorable access to GM seeds, and the government, already retaining a lot of the agrarian rent for itself through taxes, would resist using its power to back IPR claims over the seeds. The TNCs would tolerate the weak IPR regime to maintain access to the large Argentine market. In the meantime, crucially, the government would defend the GM production complex against critics questioning its environmental and public health impacts.

Argentina, then, invented a distinctly Argentinian path in commercializing GM seeds that satisfied neither corporate nor ecological-critical views in the global debate. While it is intuitive

[97] "La nueva ley de semillas sacudió todo el espectro rural," *La Nación*, 29 September 2012.

that a well-organized sector of commercially oriented, well-capitalized farmers pushed its weight towards a permissive biosafety regime, and the government readily agreed with an eye on agricultural export revenues; the IPR conflict brought powerful actors into confrontation with each other and its resolution required a considerable degree of ideational inventiveness. "*Productivismo*," and Peronist ideas that located claims towards stricter IPR within a frame of anti-imperialism played important roles.

Below I trace the process leading to the emergence of Argentina's peculiar path, based on data from archival research (official documents, position papers by industry associations, publications by the NGOs, US embassy cables, newspapers) and elite interviews (with politicians and bureaucrats, industry spokespeople from farming and seed sectors, activists and scientists) conducted in Spanish from October 2012 to February 2013.

## The Formation of a Permissive Biosafety Regime

### Institutions From Scratch

Argentina's early launch of GM agricultural production, ready for marketing by 1996, is the combined outcome of suitable economic geography and political will supported with scientific input. The country was one of the first to be approached by the biotech TNCs. As the largest temperate-zone country in the Southern hemisphere, Argentina is a favorite site for seed development and multiplication during Northern winters. Crop varieties suitable to the US and European ecosystems could be adapted to Argentina with relatively little work, and the country's well-developed plant-breeding and seed industry was capable of the task. This made Argentina an important open-air laboratory for testing the new technology; and as a major agricultural producer and exporter Argentina would be an important seed market on its own right, too.

However, as Gabriela Levitus (PhD, biologist), the director of the biotechnology industry association ArgenBio, argues; the early introduction of GM agriculture in Argentina cannot be solely explained by a conjunction of transnational interests. "Probably from a purely economistic perspective Brazil always had more potential as a soy and corn production platform than Argentina, and the transnationals must have approached Brazil at around the same time—Brazil had a larger seed market than Argentina. But Argentina quickly turned this into action because of a unique situation: there was a high-level political decision to go forward".[98] Indeed, while in Brazil the clearing of GM seeds for agricultural production took major legislative change and court battles spread over nearly a decade, during which a divided and much confused political community discussed whether the technology was appropriate for the country; the determination of the Argentinian statesmen and the scientists they worked with provided a more suitable policy environment for the TNCs at the early phase.

The experience began in 1991 when INASE, the public agency in charge of overseeing the seed market, began receiving applications for the registration of GM seed varieties in soybeans, corn and cotton. INASE functionaries called the Secretariat of Agriculture, as they did not know how to deal with this new technology, and the Secretariat called on a meeting of scientists. The deliberations ended up with the creation of the National Advisory Committee on Agricultural Biotechnology (CONABIA) in October 1991 to advise the Secretariat of Agriculture for the approval of GM plant and animal varieties.[99] This was one of the first of its kind in the world. The then-Secretary of Agriculture Marcelo Regúnaga, who played a leadership role in the creation of the Committee, recalls: "This pioneering character implied that, at the moment of the design of the biosecurity system instruments, not many international antecedents

[98] Author's interview with Gabriela Levitus (Buenos Aires, January 2013).

[99] Pellegrini (2013). Supportive information comes from author's interviews at CONABIA.

could be relied on in this area".[100] At the time, the talks on the Cartagena Protocol for Biosafety had not begun, and the meetings of the Inter-American Institute for Cooperation on Agriculture (IICA) provided the only venue for exchange of information and policy experience. CONABIA's founding secretary Carmen Vicién (agricultural engineer and MS in rural economics) emphasizes that "the system was built piece-by-piece and perfected in the subsequent years".[101]

The regulatory system had CONABIA at its center, which received and processed the applications for GM crop varieties, authorized field trials, and asked for input from other agencies for required tests.[102] No socioeconomic evaluation of possible impacts on agricultural practice and farm communities was required. If no problems were found in environmental and food safety grounds, and if the variety in question was also cleared for consumption in important export markets, the Secretariat of Agriculture would finalize the approval of GM variety's cultivation upon the CONABIA's recommendation. CONABIA was conceived as a forum enlisting participants from public regulatory and scientific institutes as well as from the private sector. Biotechnology TNCs are not formally represented, but in fact their agents dominate the private sector presence in the committee wearing the hat of experts from industry associations. Therefore the question of whether the industry regulates itself has been raised.[103] The mixed public-private nature of CONABIA and its centrality to Argentina's regulatory system remains

[100] Regunaga et al (2003).

[101] Vicién (2003).

[102] SENASA (National Service for Agro-alimentary Safety and Quality) would evaluate the food safety tests, and the DMA (Direction of Agricultural Markets) would examine whether the variety in consideration was also approved for cultivation in foreign markets like Europe.

[103] "Since 2008 there are two representatives from the Seed Chamber (ASA) to CONABIA – one of them belongs to Syngenta and the other one to Dow AgroSciences. On behalf of the Chamber of Fertilizers (CASAFE) there is a representative who belongs to Monsanto and the other one to Bayer CropScience. CONABIA also receives experts from the Argentinean Biotechnology Forum [ArgenBio]–one of these experts is a directive from Pioneer and the other one from Biosidus (a local biotech company) … are the transnational companies just regulating their own activity?" (Pellegrini 2013: 133)

intact, despite some organizational changes in time reflecting the ever-increasing importance for GM agriculture for Argentina and the gradual sophistication of the bureaucracy in charge of it.[104]

## Deciding Amidst Uncertainty

The fact that at the time of the formation of the regulatory system there was not yet a global public debate on the GMOs can be thought to have made the job for the Argentinian policy-makers easier, as they felt little public pressure in justifying the policy design, on the one hand. On the other hand, however, scientific uncertainty was all the greater for the same reason; forcing the policy-makers to form convictions in the dark, with potentially great risks of harming public health and the economy. As of this writing, scientists worldwide still complain about the absence of properly designed long-term studies examining the impact of GM food consumption; at the time, they were harder to come by. There was no large-scale cultivation of GM crops elsewhere in the world to observe ecosystemic impacts. Should Argentina go forward and become the first country in the South to allow GM crop cultivation? Somewhere between scientific assessments and political convictions, a leap of faith should be made in order to promote an action-oriented understanding of the phenomenon; but who is going to take the first step? As Gabriela Levitus from ArgenBio puts it in characteristically Argentine fashion, "Someone has to take a decision and 'make the play' [*jugarse*] … Someone has to 'put on the trousers' [*ponerse los pantalones*] and act like a man!"[105]

[104] The executive secretariat of CONABIA grew into a Biotechnology Office in 2004, and in 2008 it was converted into a higher-profile unit called the Direction of Biotechnology. The Argentinian regulatory system is described by Martín Lema, the head of the Direction of Biotechnology at http://bch.cbd.int/onlineconferences/portal_art26/se_forum_discussiongroups.shtml?threadid=2122. Supportive information comes from the author's interview with Lema (Buenos Aires, December 2012).

[105] Author's interview with Gabriela Levitus, (Buenos Aires, January 2013).

Interviews suggest that Ms. Carmen Vicién, the expert chairing the CONABIA, took a good deal of initiative at that moment. Remembering the decision to approve the commercial cultivation of a genetically modified crop for the first time in Argentina, one observer notes, “When the decision to liberate the ‘RR’ soybeans came up there were still doubts and worries. The CONABIA experts went and talked to the Felipe Solá [Secretary of Agriculture 1993-99], and said ‘It looks good to us, but there may still be a part [of the evaluation] that is missing, maybe we should also do this and that, etc. Solá said to them ‘I am willing to sign this, but you are the experts, you have to take a decision and tell me whether this is good or bad’… It was the CONABIA people who took the responsibility to go forward, Vicién being a chief figure… What they did was historical”.[106] One of the CONABIA assessors at the time recalls: “When the first applications came, Carmen Vicién was the person who promoted a lot of things. Regunaga [Secretary of Agriculture 1991-1993 and 2001] was supportive all along. But it was Vicién who convinced Felipe Solá that this was going to be a good thing, with strategic value for Argentina”.[107]

Carmen Vicién sees herself as one among a larger group who approached the issue with a foremost concern for agricultural productivity: “There was a group of people at the National Institute for Agricultural Technology (INTA), the Secretariat of Agriculture, and the private sector who thought that this technology could be useful for the country”.[108] It seems that a desperate need to expand agricultural production made itself felt to this community due to economic circumstances. Under the President Carlos Menem, the early 1990s were a particularly hard time for the Argentine economy. In a context of heavy debt service and massive downsizing

[106] Author’s interview with Gabriela Levitus, (Buenos Aires, January 2013).

[107] Author’s interview with Moises Burachik (Buenos Aires, February 2013).

[108] Author’s interview with Carmen Vicién (Buenos Aires, December 2012).

of the public sector, agriculture would inevitably be an important sector in leading the country's new export-oriented development direction; and it was important to mobilize productive improvements in this sector since public subsidies were being withdrawn. Referring to this context, observers note that the initiative has an important component that originated from the agricultural bureaucracy, from people concerned with increasing Argentina's productivity.[109] The economic situation might have pushed the statesmen and experts to respond more positively to technological innovation and bet on the possibility of potential productivity increases when doubts arose. Maybe it made a difference that the Secretary did not choose a biochemist (like several of the coordinators of Brazil's CTNBio so far) or a physician (like the chairman of Turkey's National Biosafety Council) to lead the regulatory agency CONABIA but chose Carmen Vicién, who was an agronomist and probably more inclined to approach the issue from a productivity perspective for that reason. Vicién herself notes that the kind of knowledge available to the upper echelon of the bureaucracy mattered: "The Secretary of Agriculture was an agricultural engineer, who had also worked as university faculty, so he was familiar with the issue and there were people around him who understood agricultural technology".[110]

Following soybeans; GM varieties of corn and cotton too were approved around the turn of the century, and Argentina quickly became the second greatest grower GM crops after the USA. It should be noted that the permissive nature of the Argentinian biosafety regime are not reflective of the preferences of the general public. In a 2004 survey, 51% of the public said they prefer to consume non-GM food even if it costs more, while 22% would prefer the cheaper product. Only 12% said they believe GM crops benefit the population, while 51% said they

[109] Author's interview with Gabriela Levitus, (Buenos Aires, January 2013), and Monica Pequeño, Coordinator at the National Seed Institute INASE (Buenos Aires, January 2013).

[110] Author's interview with Carmen Vicién (Buenos Aires, December 2012).

believe big corporations, especially foreign ones, are the main beneficiaries.[111] The permissive policies were a response to favorable lobbying by the biotech TNCs, seed industry association ARPOV and farmer associations like SRA, CRA, and FAA (Newell 2009, Filomeno 2014) mediated by epistemic brokers like Dr. Vicien who stood convinced that the scientific risks did not outweigh the benefits.

## Sharing Value from GM Crops: The Case of Soybeans

Understanding stakeholder positions around the evolving challenges for Argentina's GM crop cultivation policies, requires some knowledge of the material impacts of this technology. Below I summarize how genetically modified "RR" soybeans have spread, and what impact they have had. RR soybeans is the world's most common GM crop, so this will also serve as particularly informative example for the market dynamics underpinning this policy subject.

### The Impact of GM Soy Adoption

Glyphosate-resistant "RR" soybeans were officially approved for cultivation in 1996 and they immediately took off with a rapid diffusion pattern among the farmers, coinciding with a period of boom in Argentinian soybean agriculture. As seen in the table below, in just half a decade of GM seed adoption the Argentinian soybean production more than doubled; and the country became the world's top exporter of soy.[112]

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[111] Reported in Alicia Diamante and Juan Izquierdo, Manejo y gestión de la Biotecnología Agrícola apropiada para pequeños productores: Estudio de Caso Argentina, April 2004, http://www.argenbio.org/adc/uploads/pdf/manejo_y_gestion.doc, last accessed December 2015.

[112] The main driver of the dramatic expansion of soy agriculture has been its profitability over other crops due to rising prices in the world market. However, Rodriguez' multivariate regression analysis finds that the share of GM cultivation had a positive effect on the expansion of soybean cultivation, independently from the price received for soy (2010: 192-94), suggesting that GM seeds were a catalyst of the farmers' rush for soy.

Table 19: The spread of GM soybean production in Argentina

| Season | Total soy cultivation area (ha) | Low-tilling / Total cultivation (%) | Glyphosate consumptio n (lt) | RR soy / Total cultivation (%) | Total soy production (tn) |
|---|---|---|---|---|---|
| 1994/95 | 6,011,240 | 28 | 5,000,000 | 0 | 12,133,000 |
| 1995/96 | 6,002,155 | 36 | 7,620,000 | 0 | 12,448,200 |
| 1996/97 | 6,669,500 | 43 | 12,630,000 | 1 | 11,004,890 |
| 1997/98 | 7,162,250 | 45 | 28,520,000 | 25 | 18,732,172 |
| 1998/99 | 8,400,000 | 45 | 45,430,000 | 57 | 20,000,000 |
| 1999/00 | 8,790,500 | 57 | 60,970,000 | 76 | 20,206,600 |
| 2000/01 | 10,665,000 | 62 | 82,350,000 | 87 | 26,882,912 |
| 2001/02 | 11,639,240 | 77 | 81,499,870 | 93 | 30,000,000 |

Source: Bisang and Sztulwark (2006)[113]

To evaluate the performance of the seeds, one should take into account the wider technological package that incorporates low-till planting (in which weed management is primarily done in the post-weed emergence phase), glyphosate (a herbicide class that is particularly suitable for this activity, originally developed by Monsanto under the Roundup brand), and seeds that are genetically modified to be glyphosate-resistant (hence the name Roundup Ready). Based on a 2001 survey, Qaim and Traxler (2005, with similar results in Penna and Lema 2003) find that while the use of RR seeds had no significant impact on soybean yields, and it increased glyphosate applications; it decreased other herbicide applications and the overall herbicide cost per hectare, leading to an income advantage for the farmer. Impression from the field and research in other settings (such as Fernandez-Cornejo and McBride 2002 for the USA) suggest that a major reason for adopting the “low-till—glyphosate—RR seed package” is the sheer ease of more simplified weed management.

[113] The authors report glyphosate consumption erroneously, omitting a digit in certain years, which I have corrected based on data from CASAFE.

Not all consequences of the GM soybean boom in Argentina have been salutary. First, it has created a public health problem in the form of glyphosate intoxication (possibly associated with higher cancer rates) in periurban areas close to soybean fields. That herbicide usage per unit land may be decreasing is of little significance to communities exposed to the toxic chemical when total spraying is increasing enormously in absolute terms as the entire country turns in to a giant soy farm.[114] Secondly, the technological package utilized leads to reduced labor employment for weed management. While precisely a reason for adoption for capitalist farmers, and matched by a certain increase in the employment of more skilled labor of agricultural engineers and the like, this is a cause for distress for rural laborers and a social problem.[115]

Nonetheless, from a narrow economic perspective focusing on aggregate output, the soybean boom supported by the GM seed technological package has been a blessing for the country, generating huge export revenues. After accounting for reduced labor employment and the loss of output due to crops replaced by soy, the rather critical Rodriguez concludes that "for the case of Argentina there is little place for doubt … [T]he incorporation of GM soy seeds enabled increasing the total wealth generated by the [agricultural] sector" (2010: 232).

In short, In Argentina the GM seeds seem to have displaced unskilled labor, made agriculture more profitable for the producer by reducing herbicide cost per hectare, and thus increased the land rent. The response of the market has been investment in agricultural land[116] and production of more soybeans. In generating these outcomes, the agronomic characteristics of the genetically modified seed mattered, but so did its price, together with the price of glyphosate,

[114] Arancibia (2010) details the social repercussions of glyphosate consumption in Argentina.

[115] Rodriguez (2010: 232).

[116] Rodriguez (2010: 240), Sztulwark (2012: 105), Clapp (2014), Supportive information comes from Author's interview with Sociedad Rural Argentina (SRA) economist Ezequiel G. de Freijo (Buenos Aires, February 2013).

both of which have remained low in Argentina due to reasons that have been subject of significant political dispute, as explained below.

### Price, Profitability, and the Causes of an IPR Conflict

The genetically modified RR soybean seeds have remained widely accessible and inexpensive in Argentina after their introduction; so much so that in 2000 a General Accounting Office investigation for the US Congress looked into the case, upon the American Soybean Association's complaint that Argentinian producers were able to outcompete Americans in global markets thanks to more favorable access to similar seeds.[117] A substantial difference was indeed found between the price of soybean seeds sold in the two countries—they were half as cheap in Argentina.

Table 20: Seed price, comparing the USA and Argentina

| | Bt Corn (US$ / bag) | | RR Soy (US$ / bag) | |
|---|---|---|---|---|
| | US | Argentina | US | Argentina |
| 1996-2001 average price | 86 | 80 | 17 | 9 |
| % of US price | | 93 | | 51 |

Source: Goldsmith et al (2006)

Argentinian farmers were able to access the seeds in favorable terms for two reasons: first, the existence of an informal seed market in competition with the biotech TNC's authorized agents, and secondly, the biotech TNC's problems with obtaining and enforcing a patent for the biotech innovation.

The informal seed market, in turn, comprises two types of activity. First, there is the phenomenon of farmer-saved seed. Soybean is a self-pollinated (autogamous) crop that

[117] United States General Accounting Office Testimony Before the Committee on Agriculture, House of Representatives, "Information on Prices of Genetically Modified Seeds in the United States and Argentina," June 29, 2000, available at http://www.gao.gov/assets/110/108525.pdf, last accessed December 2015.

predominantly inbreeds for reproduction, meaning that the farmer can save the product of the harvest in order to produce new seeds in-farm, rather than purchasing them anew each season. Of course, farm-saved seed comes (although with some cost for storage and the like) much cheaper for the farmer than seeds purchased on the official market.

Secondly, there is what is known in Argentina as the *bolsa blanca* ("white bag") phenomenon, i.e. seeds sold by unauthorized agents without legal sales certificates and with no contracts with biotechnology companies. Because these agents pay no royalties upstream, they can afford to supply the seeds more cheaply than what formal market contracts would require. While seed saving for self-use purposes is legal in Argentina, *bolsa blanca* is by definition illegal, and opinion is divided as to its exact nature, some arguing that it is primarily the result of the farmers' abuse of the right to seed saving (when you have a good harvest, you obtain too many seeds and sell some to your neighbors, and so on) and others arguing that it emerges mainly because the very firms subcontracted by the TNCs for multiplying and selling seeds legally are also involved in *bolsa blanca* sales for extra profits.[118] The head of INASE (the public agency for seed market regulation) argues that the high official prices charged for the GM varieties was a major reason for the explosion of *bolsa blanca* sales, which has put a pressure on the seed price since then.[119] As seen in the table below, the formal seed market share in soybean seeds decreased significantly after the introduction of the GM variety in 1996. (And the industry accuses the INASE for not diligently policing *bolsa blanca* because of clientelistic ties between unauthorized seed multiplicators and their political patrons within the government).[120]

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[118] Author's impression at the 3rd Congreso Nacional e Internacional de Agrobiotecnología, Propiedad Intelectual y Políticas Públicas (Rosario, October 23-25, 2012).

[119] Oscar Costamagna, "Bolsa Blanca: la responsabilidad es compartida," *Tiempo Agropecuario*, July 2004, p.2; cited in Also Casella, "Regalía Individual y Regalía Global," *CANPO*, http://www.grupocanpo.org/1/index.php/ley-de-semillas/276-regalia-individual-y-regalia-global, last accessed September 2014.

[120] Author's interviews.

Table 21: Soybean seed market in Argentina

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|
| Average price ($US/bag) | 7.7 | 8.2 | 11 | 8 | 7 | 10.7 |
| Total market value ($US millions) | 170 | 180 | 292 | 251 | 195 | 364 |
| Formal seed industry share (%) | 52 | 47 | 35 | 30 | 25 | 20 |

Source: Goldsmith et al (2006)

From the vantage point of the biotechnology company, the informal market is only one part of the problem of rent appropriation. The recognition of patent rights is the other part. The informal seed market should be reduced to a minimum, so that royalties passed from authorized seed distributors upstream to the biotech company for each bag of seeds sold (as per their license agreements) can be maximized. But also the patent rights over the transgenic event should be secured, in order to have a solid backing for such agreements and as an instrument for charging farmers directly in the event that the formal seed market fails. Hypothetically, the biotechnology company with a patent over the transgenic event can intercept the soy at some point in the production chain and demand royalty payment for the value added by the proprietary technology regardless of how the seeds were obtained (as they did in Brazil) (although the legitimacy of this practice would be contested).[121]

In Argentina, Monsanto has been able to solve neither of these problems satisfactorily, as we will see in detail below. The informal seed market has remained big, and a patent over the transgenic event for RR (*40-3-2*) could not be obtained. The price of the seed for the farmer remained low. So did the price of glyphosate, because Monsanto was not able to defend its monopoly on the production of this chemical either. Before narrating how these failures have

[121] Farmer organization CONINAGRO, for example, holds the position that the patent law applies only to license agreements between the biotechnology and the seed firms, and not to farmers' purchase of seeds. Roberto Seifert, "La nueva ley de semillas sacudió todo el espectro rural," *La Nacion*, 29 September 2012, http://www.lanacion.com.ar/1512410-la-nueva-ley-de-semillas-sacudio-todo-el-espectro-rural.

unfolded, two major consequences of the low input prices should be emphasized. The first is that it facilitated the very rapid expansion of the GM soybean production, serving as a catalyst for technology acceptance.[122] Secondly, low input price meant that the farmers have been able to capture most of the economic gains from the introduction of the GM soybeans. Especially useful in this regard is a comparison, available in the tables below, with GM corn, which is a cross-pollinated (allogamous) plant whose seeds are hybrids that cannot be reproduced in-farm without losing vigor, and GM cotton, over which patent rights have been secured by the biotech industry and the much smaller seed market is easier to inspect and control. Researchers arrive in different figures depending on the particular methodology and the time frame examined, but it seems clear that it was in soybeans that the farmers have been able to capture the greatest economic gains, because appropriation of technology rents have been difficult on the part of the biotechnology and seed industry sectors. Because the soybean market is much larger than that for any other crop in Argentina, this outcome is very important for the actors involved, and it defines the character of the GM crop production in the country.

[122] In a study that examines why the adoption of GM cotton in Argentina occurred relatively slowly, Qaim and de Janvry (2003) show that although the technology significantly reduces insecticide applications and increases yields, net benefits for Argentine farmers who adopted the new seeds were rather small because of its high price. They point to the contrast with the RR soy in this regard: "Unlike GM soybeans, which are not patented in Argentina and are marketed by different seed companies, Monsanto was granted a national patent over Bt cotton technology, and [Monsanto's local joint venture] Genética Mandiyú is the sole provider of Bt seeds. Farmers have to pay US $103 per hectare for Bt cotton seeds, which is more than four times the price of conventional varieties" (2003: 815).

Table 22: Rents from GM crops in Argentina, according to Sztulwark (2012) [123]

| | Innovation rents captured | |
|---|---|---|
| | RR soy (1996-2006) | Bt corn (1998-2006) |
| Agricultural producers | 87.9% | 35.2% |
| Seed industry | 10.9% | 19.2% |
| Biotechnology industry | 1.2% | 45.5% |
| Total innovation rent (million US$) | 2,434 | 249 |

Table 23: Rents from GM crops in Argentina, according to Trigo and Cap (2003) [124]

| | RR soy (1996-2001) | Bt corn (1998-2003) | Bt cotton (1998-2003) |
|---|---|---|---|
| Benefits to growers | 46.4% | 21.1% | 16.8% |
| Benefits to technology suppliers | 53.6% | 78.9% | 83.2% |
| Total benefits (million US$) | 9,648 | 400 | 16 |

In short, low input prices helped turn Argentina into the first Southern country to adopt large-scale GM crop cultivation, and one in which farmers were able to reap significant economic gains as a result. However, this has occurred despite the efforts of the biotechnology industry to extinguish the practices that set the terms of favorable access. Monsanto has tried to ban farmer-saved seed, police out *bolsa blanca*, claim royalties on Argentinian soybean exports, and evoke anti-dumping cases to keep the price of glyphosate from falling, with significant lobbying support from the government of the USA. These efforts failed to result to their satisfaction of because the Argentinian state refused to side with the TNC against the farmers.

[123] Sztulwark (2012) calculates the cost of innovation to the producers as the price difference (per unit cultivated area) between the GM and conventional seed multiplied by the area cultivated with the GM seed. The innovation rent is calculated as the productivity gains (on the basis of a 24-30 US$ per hectare cost reduction from GM seeds) minus the cost of innovation. The rents captured by the seed industry are calculated on the basis of revenues from formal seed sales. The rents to the biotechnology industry are calculated on the basis of the royalties they charge the seed distributors for each bag of GM seeds legally sold.

[124] Trigo and Cap (2003) calculate the benefits to the technology suppliers on the basis of revenues from the seeds sold, for the cases of Bt corn and Bt cotton. For RR soybeans, revenues from glyphosate sales are also added to these benefits. This is misleading as far as the total welfare gains from the GM seed usage is concerned, if the net input cost increase from additional glyphosate usage (accounting for the replacement of other herbicides) is not being subtracted from the benefits to the grower, and the authors do not mention such an adjustment.

An epistemic coalition coalescing around productivist, anti-imperialist ideas supported the government action. In the image below I illustrate the connections between particular government (non)actions, the behavior of the market, and the economic outcomes. In the next sections I describe and trace these connections in detail, and analyze the sources of the government conduct.

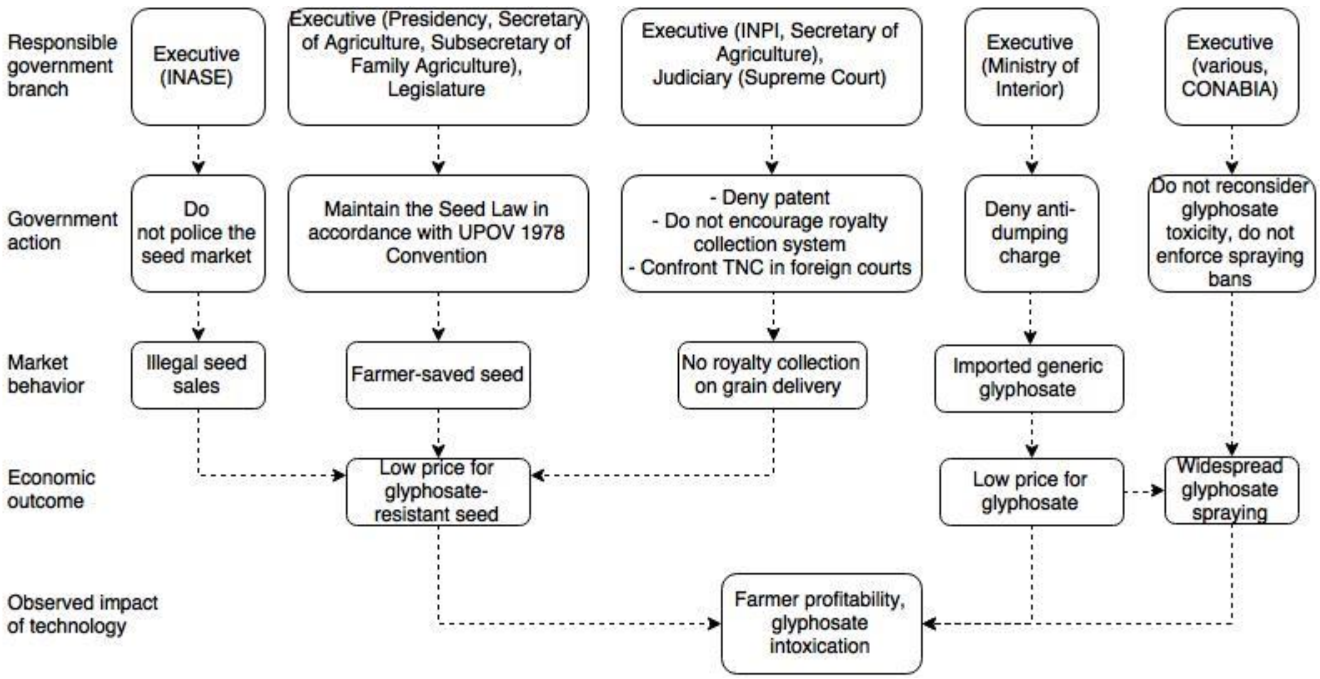


Figure 10: Institutional infrastructure of technology impact in Argentina

## <u>IPR Conflict in the Open: TNC, Farmers, and the Government Reaction</u>

### Maneuvers of the Biotech TNC

At the introduction phase of GM crops in Argentina, Monsanto was not able to assert IPR. The major reason was that Monsanto was denied a patent in Argentina for glyphosate-resistant soybeans by the National Institute of Industrial Property (INPI). This happened as a result of legal novelty and complexity combined with a political will at the Executive and

Judiciary branches to make use of available legal sources with an anti-TNC bias. TRIPS clauses were interpreted in a way that rendered Monsanto's patent application late and invalid.[125]

Moreover, Monsanto itself had a liberal attitude towards the reproduction of the technology at its introduction phase. Interviews with industry sources reveal that there was much uncertainty around regulatory survival and user acceptance at the time, and work had to be done first to secure those objectives. Miguel Angel Rapela, an Argentinian IPR lawyer and once chairman of the International Seed Federation, remembers being asked in the mid-1990s about the likely share of GM seeds in the Argentinian soy market in the near future. He expected the share to stabilize at around 50 percent, with the GM varieties constituting only one of the options in the market.[126] A Monsanto director comments, "It was a process of learning about this new business. I think that the importance of patent applications around the world, the globalization of

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[125] This is a summary evaluation, and the details are complicated. At the heart of Monsanto's troubles is the fact that it was the Argentinian firm Nidera Seeds which developed the local variety of the glyphosate-resistant "Roundup Ready" (RR) soybeans and applied for biosafety approval, while it was Monsanto who made a patent application for the transgenic event (40-3-2) that these soybeans embodied. That Nidera came to work on the event freely is the fortuitous outcome of a series of uncoordinated business decisions by several firms, through which Nidera came to acquire in 1991 the Argentinian division of the American seed company Asgrow and exclusive rights to the latter's technology stock, which happened to include Monsanto's transgenic event due to their previous collaborations in the USA. The knowledge transfer was complete when the agricultural engineer Rodolfo Rossi, the head of Asgrow's R&D division also made his move to Nidera and continued his work on GM plants suited to Argentinian climes. Monsanto made a patent application for the transgenic event only towards the end of the biosafety evaluation of Nidera's application, on 3 April 1995, and the National Institute of Industrial Property (INPI) decided that the application came in too late and refused to grant a patent. If had been granted, Monsanto would have had a "revalidation" for Argentina of its patent already obtained in the USA. INPI's rejection was based on a recent change in the patent revalidation regime and it was controversial. With Argentina's adherence to the TRIPS agreement, the time window for a "pipeline patent" revalidation application was determined as one year after the original patent. Monsanto's revalidation application came four years after the original patent grant in the US (July 1990) and hence the INPI rejected it. Nonetheless, it was not a straightforward decision, as there was controversy over just when the said TRIPS clause entered into effect in Argentina. The company sustained that this should not have been before the enactment of the New Patent Law (no: 24.481) in October 1995, which implemented Argentina's TRIPS responsibilities, and according to this line of reasoning the revalidation should have got through. However, INPI relied on a Supreme Court decision determining that the treaty had already entered into force on 1 January 1995 (with the ratification of the Law 24.425), arguing any application made afterwards—like that of Monsanto—would be bound by its clauses. Lawyers comment that the Supreme Court decision itself is not an automatic, purely technical decision, and it also affected important legal disputes in pharmaceuticals. See Newell (2009), Sztulwark (2012) and Filomeno (2014). Supportive information comes from the author's interviews with Rodolfo Rossi, IP lawyer Vanessa Lowenstein, and other industry sources (Buenos Aires, 2012).

[126] Author's interview with Miguel Rapela (Buenos Aires, December 2012).

all this, were not inside the minds of those who ran the company at the time".[127] So, at this stage technology acceptance was more important than technology rents. Besides, the widespread adoption of glyphosate-resistant GM seeds would be great news for what was Monsanto's chief business at the time: the sale of the company's brand of glyphosate "Roundup," which the farmers could then use abundantly for weed management without fear of harming their soy (hence the name of the seed, "Roundup Ready"). Pushing for an uncontested dissemination of GM seeds, and thus creating a wider market for glyphosate should have made business sense.[128]

However, after widespread acceptance, Monsanto started to take a more aggressive stance in asserting IPR, for several reasons. One reason was the wider context of the country's changing economic fortunes. Starting from January 2002 the Argentinian peso was massively devaluated against US dollar, together with some of Monsanto's local assets.[129] That year the company's revenues in Argentina declined by 30 percent.[130] Currency devaluation would also turn the terms of trade in favor of export commodities, thus enhancing the agricultural rent. In this context, Monsanto's directors might have felt that they could act more aggressively to cut a greater part of this rent.

Secondly, the firm's patent for glyphosate expired in 2000 and major rivals emerged in that business line soon.[131] By 2001 China became the major source of glyphosate and the price

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[127] Author's interviews at Monsanto Argentina (Buenos Aires, January and February 2013).

[128] Rodriguez (2008: 496). Supportive information from author's interviews.

[129] Indebted agricultural producers were running their operations by receiving credit from input suppliers in kind, to be paid back in Argentine pesos after the harvest. Currency devaluation meant the devaluation of the producers' debt, meaning a loss for the industry. Author's interviews with industry sources.

[130] "Monsanto Puts $40m Argentine investment on hold," *ICIS*, 17 October 2013, http://www.icis.com/Articles/2003/10/17/527146/monsanto-puts-40m-argentine-investment-on-hold.html, last accessed October 2014.

[131] The company actually never had a patent for glyphosate in Argentina, but it did have one in the US lasting until September 2000, which was helping indirectly: In the absence of the opportunity to sell glyphosate in the large US market, no major rival had entered this business, leaving Monsanto as a virtual monopolist on glyphosate, in Argentina as in the world. See Sztulwark and Braude (2009).

was less than a third of its 1993/94 level.[132] Monsanto demanded an anti-dumping case against China, in order to be able to charge a higher price for glyphosate. On February 2, 2004 the Argentinian Ministry of Interior decided against the case. Around two weeks ago, perhaps as a warning that was hoped to affect the Ministry's decision, the company had announced that it was terminating seed research and marketing in Argentina until seeing improvements in IPR protection, and it was going to introduce its new improved variety of RR2 soybean seeds in Brazil (which had taken anti-dumping measures on Chinese glyphosate) but not in Argentina. But the Minister would defend its decision as being in the "interest of society … because it protected the competitiveness of an industry vital to the development of the Argentine economy".[133] It seems that Monsanto decided to go after capturing a greater share of the value in seed after starting to lose its lucrative business in glyphosate.[134] By this time, the company had also gone through organizational changes that got it rid of its older focus on chemicals and made it a "life sciences" company with an interest in capitalizing on its plant biotechnology knowledge.[135]

Lastly, the private company's aggression was conditioned by the power asymmetry between the North and South American agricultural interest groups. We have noted above that US soybean producers were protesting against the high GM seed prices in their country vis-à-vis

[132] Trigo et al (2002).

[133] "Argentina Denies Monsanto Glyphosate Dumping Charge," *ICIS*, 4 February 2004, http://www.icis.com/Articles/2004/02/04/555437/argentina-denies-monsanto-glyphosate-dumping-charge.html, last accessed October 2014.

[134] Various industry sources concur with this assessment.

[135] Monsanto used to be a chemicals company. After a series of mergers and acquisitions, during which Monsanto first bought many of the major seed companies of the world, and then was taken over itself by a pharmaceutical firm which rid it of its chemicals division, Monsanto metamorphosed into an actor specialized in agriculture. The reorientation was complete when Monsanto was reestablished as a separate company in 2002. See "Company History," on Monsanto's website, http://www.monsanto.com/whoweare/Pages/monsanto-history.aspx, last accessed October 2014.

Argentina.[136] This should provide the background not only to Monsanto's newfound aggression but also to the high-profile involvement of US officials in pressuring the Argentinian government for a new approach to IPR for seeds in mid-2000s—a pressure vividly documented in Wikileaks cables.[137]

The company's efforts at asserting IPRs unfolded at various levels. First, and most controversially, there have been alleged reports of individual farmers and cooperatives receiving notices from the company, demanding that they agree to a payment deal with Monsanto or face adverse legal consequences—a bluff, it seems, because seed saving was permitted under the current Seed Law, which was made in accordance with the UPOV 1978 Convention, and no patent relating to soy seeds was validated.[138] Furthermore, and less confrontationally, Monsanto joined hands with the leading firms in the Argentinian seed industry, under the sector organization ARPOV, in an effort to establish a system of good practice through voluntary agreements with farmers. With the agreement, farmers pledge to buy seeds only from authorized agents, not resell them, use them in accordance with the proper instructions (and the package of advertised inputs), and pay "extended royalties" for their saved progeny; in return for a guarantee of high quality products and better technical support. But because only a part of the farm sector participates in this voluntary market institution, and in order to have more room for maneuver in determining the price; the TNC-local capital coalition also tried to enlist coercive state power for

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[136] In the US; Monsanto increased the price of its soybean seeds (in which it effectively controlled the majority of the market) as soon as it had to cut the price of glyphosate against emerging rivalry. In Argentina, however, the higher the seed price was set, the smaller the share of certified sales became. So, addressing the issue of IPR was in order (Sztulwark and Braude 2009).

[137] A summary of highlights from these cables is available from Santiago O'Donnell, "El Santo Preferido de la Embajada," *Pagina 12,* 3 March 2011, http://www.pagina12.com.ar/diario/elpais/1-163369-2011-03-03.html.

[138] Industry sources relate a case in Casilda, Santa Fe, where a local farm association received such a warning (it was not clarified if the company involved was Monsanto or another firms invested in proprietary seeds). When the association turned to courts to ask for a legal opinion, the company—having learned it—asked them to drop the case because it was desisting from making charges and the issue came to a close. Also see Rodriguez (2008).

better policing of *bolsa blanca* through the National Seed Institute (INASE) and for legislating restrictions on seed saving by farmers. The closure of the informal seed market in this way would have increased both the revenues of authorized seed suppliers and the royalties they passed upstream to the biotechnology industry. But the state would require some consent from the farmers in order to establish such a system. How did the farmers respond?

## Farmers' Reaction

Throughout most of the twentieth century, Argentinian agricultural producers have maintained a boardroom pattern of consultative relationship with the state that is known as *la mesa de enlace* (which could be translated as "the contact desk"). For many decades now, the private sector presence at the *mesa* has comprised four peak organizations. The SRA (Sociedad Rural de Argentina) is the most influential one. Founded in 1866 by large landowners of the pampas who also had interests in finance and trade, the SRA has been described as "more than a professional association, … a reference for the Argentine upper class," and "[having functioned] as a de facto Ministry of Agriculture before a real one was created" (Filomeno 2012: 140-41). CRA (Confederaciones Rurales Argentinas) was founded in 1942 to represent the medium and large rural producers from the interior of the country against the overwhelming influence of the SRA, though it largely converged with the latter in its political stance with the rise of Peronism. FAA was founded in 1912 by smaller producers—mostly tenants in the pampas of the Santa Fe province and the interior Buenos Aires—who saw their interests in conflict with the SRA and the trading companies; and it espouses a discourse that is antithetical to the more liberal economics associated with the SRA. It was joined in 1956 by CONINAGRO (Confederación Intercooperativa Agropecuaria), a national organization created by cooperatives of medium and small rural producers. In short, the four peak organizations are distinguished from each other by crosscutting cleavages of geography and class, but a coalition pattern uniting the big landed interests associated with the SRA and CRA on the one hand; and the comparatively smaller rural actors around FAA and CONINAGRO on the other, is generally recognized.[139]

Starting from the early 2000s, the politics of the country's macroeconomic orientation brought these peak organizations closer to each other than ever. The global commodity boom had dramatically increased the profitability of export agriculture. In this context, the successive Kirchner governments stepped in to tax agricultural exports, in order to direct resources to domestic consumption and to subsidize the manufacturing sector. Agricultural producers were disgruntled: what the Peronist government saw as windfall revenues to be redistributed they were seeing as a legitimate market outcome. The climax of the dispute came in 2008 when Cristina Kirchner's government tried to introduce mobile tax rates for commodity exports that would move together with the world price of the commodity. In response, the sector organizations joined hands for a major protest, complete with road blockades, that paralyzed the economy for weeks.[140] Even though this particular tax measure was then defeated in the Congress, persisting government retentions produced a context where agricultural producers would not be welcoming moves restricting their access to cheap inputs with new IPR measures.[141] The peak organizations had their differences in how they viewed IPRs, but none were ready to concede without a serious negotiation.

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[139] I borrow the description of *la mesa de enlace* from Filomeno (2012), who relies largely on Lattuada's (2006) research on this topic. Supportive information comes from my interviews at the Argentinian rural sector organizations (Buenos Aires and Rosario, October 2012-February 2013).

[140] For a detailed treatment see Giarracca and Teubal (2010).

[141] Various industry sources concur with this assessment. Also see Filomeno (2012).

Various ideas for reforming legislation in order to introduce stricter IPR over seeds, negotiated by the stakeholders with the mediation of the Secretariat of Agriculture (which is a branch of the Ministry of Agriculture, Livestock, and Fisheries), can be summarized in terms of two approaches.[142] The first, which started to be discussed in 2003, was oriented towards suppressing the practice of seed saving. It proposed to limit the right to seed saving to the seed quantity originally purchased, aiming to curtail unauthorized seed multiplication for sales purposes. An alternative proposal, which was found by farmer organizations as a more grave attack on the existing practice, would base the limitation on a certain cultivation area (50 ha for the producers of grains and oilseeds like soybeans, for example), barring farmers operating on bigger land from saving enough seeds for their own use. Furthermore, the biotechnology industry entertained the idea of banning seed saving altogether when GM seed varieties were in question. Reform proposals following this earlier approach came to no fruition due to a clear rejection by the farmer organizations (especially the FAA) who did not want to lose the farmer's right to seed saving.

The second approach, materialized in public discussions from 2005 onwards, was oriented towards creating a "global royalty" (*regalía global*) system that would enable effective remuneration to the industry without directly dealing with seed saving. Following already existing models in Europe, the project would create a fund out of fees charged on the farmer's sale of wheat and soy. The fees would be reimbursed to farmers when they bought seeds officially. The remaining money accumulating in the fund would be shared by seed companies

[142] I borrow the classification in terms of two approaches, and the basic description of each, from Aldo Pedro Casella, professor of agrarian law and an external consultant to the FAA. See Casella (2008), as well as Casella's contributions within FAA's 2005 (February, printed in Rosario) publication *Patentamiento y regalías en semillas: Un país que resigna soberanía. Accionar y posición de Federación Agraria Argentina.* Supportive information comes from my interview with Also Casella (Rosario, February 2013) and the head of the ASA; Miguel Rapela (Buenos Aires, December 2012).

owning the plant variety protection (PVP) rights to the proprietary seed varieties in use, and 5 percent would be retained by the state to subsidize public research for areas and plants neglected by the private sector. In effect, the system would be charging seed-saving farmers a fee in order to remunerate and subsidize private and public plant-breeding research.

This approach, while coming close to achieving an agreement, seems to have fallen through because of a lack of trust between the parties involved. The seed/biotechnology industries wanted to introduce alongside the global royalty system a cultivation area limitation (65 ha) above which seed saving would be prohibited regardless (40 percent of agricultural producers, and 80 percent of all production would then be covered by the ban), and require all farmers to purchase seeds anew after three years. There were those within the SRA—the organization representing big farming interests—who demanded the size limitation to be set at a higher level, and also questioned the need for seed renewal after three years, arguing that the opportunity of maintaining profits on existing varieties in this way would precisely disincentivize research for new seed development on the part of the industry.[143] Also, the SRA leadership, while in principle favoring the idea of a subsidy for public research in order to "break monopolies in seed supply," did not seem to trust the government to use the public retention for the declared purposes.[144] Sources from SRA comment that farmers generally did not like the idea of global royalties because it resembled a tax in its form while the sector was already resentful of the government retentions on exports.[145] The more left-wing FAA was not comfortable with the

[143] See SRA President Lucioano Miguens' remarks reported in "La Sociedad Rural Discrepa con el Proyecto Official para Semillas," *Infocampo*, January 28, 2005, http://infocampo.com.ar/nota/campo/1179/la-sociedad-rural-discrepa-con-el-proyecto-oficial-para-semillas, last accessed September 2014.

[144] See SRA vicepresident Hugo Luis Biolcatti's remarks reported in "Relativa conformidad con el proyecto oficial de pago de regalia," *Infocampo*, January 26, 2005, http://infocampo.com.ar/nota/campo/1171/relativa-conformidad-con-el-proyecto-oficial-de-pago-de-regalias; last accessed September 2014.

[145] Author's interviews at SRA headquarters (Buenos Aires, February 2013).

idea that state power was being called forth in order to establish what is in essence a guarantee of remuneration for the private seed industry. A lawyer working with the FAA comments that "The cost of administration of the system, for example, would be met by the fund… This is a capture of state power for private interest protection".[146]

Maybe more importantly for the success of the project, while domestic seed companies were divided in their support, Monsanto was not enthusiastic about a system that was not clarifying the status of the property claims relating to transgenic events. In FAA circles the impression was that the TNC was more interested in establishing control than in remuneration and prices per se.[147] Indeed, even SRA, which generally adopts a less inflammatory rhetoric towards the TNCs, was questioning Monsanto's sincerity about coming to a reasonable agreement with farmers.[148] Farmer organizations have never been sure, if this kind of system is put in place, that Monsanto would not be unilaterally trying to charge them for the transgenic event—in addition to what they would be paying to the fund for the germplasm owned by the seed firms.[149] It is difficult to determine with certainty who said exactly what; but it is obvious that the TNC failed to earn the trust of the Argentine farm sector organizations—a failure that worked against the credibility of seed reform proposals.

As the biotechnology/seed industry coalition found it difficult to change the rules for the seed market due to farmer opposition, Monsanto decided to take a different approach and go alone by intercepting soy export shipments to claim royalties. This time, they found themselves with direct confrontation with the Argentinian state, as narrated below.

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[146] Author's interview with Aldo Casella.

[147] Ibid.

[148] See SRA quotes in both *Infocampo* citations above.

[149] Interviews with industry sources. Confusion and disagreement on this matter was still a dark cloud over the negotiations in 2012. See "La nueva ley de semillas sacudió todo el espectro rural," *La Nacion*, 29 September 2012.

## Government Response

By 2005, glyphosate-resistant RR soybean was king in Argentina, contributing to employment and taxes alike and making good publicity for the global legitimacy of the technology, but Monsanto was unable to derive much profit from it. Support from the Argentinian state was not forthcoming. The Ministry of Agriculture could not, or would not, convince the farmer organizations to agree on paying royalties for the seeds in one way or another. Several members of the US administration stepped in to discuss Monsanto's complaints. During the discussions with American partners the Argentinian government officials maintained that in the absence of a patent the charging of royalty fees on behalf of Monsanto was a private affair with the farmers and there was not much that they could do. Interviews with Monsanto employees at the time and Wikileaks cables alike reveal that Miguel Santiago Campos, who served as the Secretary of Agriculture during the critical period of 2003-2007, was believed to be withholding support and even actively obstructing the negotiations.[150]

"I was the person who signed the approval for Monsanto's glyphosate-resistant corn, their first GM corn in our country" a frustrated Campos remembers. "The very same week they came to me and revealed their intention to make a claim in European ports to take a share from Argentinian soy exports".[151] By that time several drafts for a new seed law had been negotiated to no avail. In September 2004 Monsanto made public the threat of blocking Argentina's soy exports to Europe—where the company did have a patent for glyphosate-resistant soy—if no resolution to the conflict was found soon. Although declaring this idea as "extortive" and "unacceptable," the Secretariat of Agriculture agreed to come up with a plan for royalty

[150] US Buenos Aires Embassy cable (ref: 07BUENOSAIRES254) to Washington DC, dated 8 February 2007, last accessed at http://www.wikileaks.org/plusd/cables/07BUENOSAIRES254_a.html in October 2014.

[151] Author's interview with Miguel Santiago Campos, Buenos Aires, January 2013.

collection in forty-five days. That the company had just managed to agree with Brazilian and Paraguayan soy producers on royalty collection was no doubt a factor.[152] However, the negotiations with the producer organizations in Argentina came to no fruition.

Starting from March 2005, Monsanto initiated customs proceedings in Netherlands, Denmark, Spain and UK ports to detain ships carrying soy grain, soy oil or soymeal from Argentina, claiming that the cargo contained the company's infringed intellectual property. The cargo belonged to European branches of transnational commodity traders, whom Monsanto asked to pay a royalty of US$ 15 per ton of imports, warning that if they did not agree more ships would be detained. In a few months Monsanto started legal proceedings in these countries to obtain court decisions and oblige a royalty payment.

What happened in Europe was important for several reasons. The proceedings would take at least a year and the judicial uncertainty could turn European importers away from Argentina. At the time Europe imported 11 million tons of soy from Argentina annually and US$ 2.5-3 billions were at stake.[153] Furthermore, in the case of an agreement to pay royalties, the cost would be surely passed back to Argentinian producers. Although the company argued that the royalty fee was just symbolic of the recognition of a property right, Rodriguez estimates that, equating to around 1.6 billions of Argentinian pesos per year it would mean the extraction of 17 percent of all agrarian rent associated with soy production in Argentina (2008: 500-501).

Secondly, the handling of the trials would be of definitive nature to IPR law. Not only would crucial articles of the European Commission Directive 99/44 on biotechnological inventions be tested for the first time but also the case would constitute a reference point for legal and political discussions over IPR around the world. Bernard Remiche, a Belgian lawyer

[152] Filomeno (2012); Sztulwark and Braude (2009).

[153] Remiche (2008).

who participated in the trials, remarks that if Monsanto's argument won the case, "the cow that eats the soymeal, the ham that comes from the cow, and the restaurant that sells the ham" could be liable to the company's property claims.[154]

To many observers the act seemed an ominous step in consolidating corporate control over the global agrifood chain from the soil to the table. It reinforced Monsanto's image as the Darth Wader of the new agribusiness model. Inside the company quarters the atmosphere was different, though. "It was a great headache. There was intense discussion within the company about the decision to go to Europe. We, the Argentinians working here at the Argentina subsidiary [fully owned by the St Louis, Missouri-based Monsanto], opposed the idea. But the US headquarters felt obliged to make a move because of the US Congress' inquiries into the company's activities in Argentina".[155] The US legal norms, and the power of the US farm lobby, forced the company to take all possible measures to demonstrate that there was no price discrimination against American producers. Using patent rights in Europe to push for an agreement was seen as one thing that could be done.

Back in Argentina, there was as much confusion about the proper response. The trials were officially between Monsanto and the importing firms in Europe. But the results would determine the terms for the country's most crucial export activity. The biggest agrarian organization, SRA, believed that the soy farmers had hardly any choice but to come to an agreement with the company.[156] However, the Argentinian government decided to get legally

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[154] Remiche (2008).

[155] Author's interview with a director from Monsanto Argentina (Buenos Aires, January 2013).

[156] Rachel Nellen-Stucky and François Meienberg, "Harvesting Royalties for Sowing Dissent? Monsanto's Campaign against Argentina's Patent Policy," last accessed in October 2014 at http://www.biosafety-info.net/file_dir/433248854be1af7b4.pdf. Supportive information comes from Miguel Campos' public presentation at 3º Congreso Nacional e Internacional de Agrobiotecnología, Propiedad Intelectual a Políticas Públicas (Rosario, 23 October 2012).

involved as a third party (*amicus curiae*) and make a case against Monsanto. It was far from being a straightforward decision. “Because of the technicality of the issue, no one outside the Secretariat of Agriculture understood the importance of these trials. The general perception, especially at the Ministry of Foreign Affairs and at the Treasury, was that we were going to lose and we had to give in,” recalls one of Argentina’s lawyers. The diplomatic embarrassment and the sheer workload of the engagement with the trials caused a constant revision of the commitment. But partly thanks to lobbying by the FAA, the government authorities stood convinced that winning the case would be crucial for Argentina’s economic interests. “Campos [secretary of agriculture] was an agronomist, he understood the technology, and he understood what is at stake—that was important”.[157]

The legal case made was equal parts techno-scientific and ethical-normative. Whether any transgenic DNA could be found in soy oil originating from transgenic soybean seeds was discussed, as well as whether a company’s European patent rights over the transgenic seeds extended to semi-processed commodities imported from elsewhere. In the end the effort paid back. The government obtained a favorable declaration from the Internal Market and Services Directorate-General of the European Commission in August 2006. In the following couple of years, all the trials ended with judgments against Monsanto.[158]

All of this has happened despite considerable pressure on the government in the diplomatic circles. Monsanto’s business in the country has been among the highlighted discussion items during President Cristina Kirchner’s several talks with the American

[157] Interview with Vanessa Lowenstein, IPR lawyer (Buenos Aires, February 2013).

[158] Remiche (2008). Supportive information from the author’s interviews.

administration.[159] The pressure for policy change was not exclusively from "foreign" sources. There have been influential figures within the agricultural bureaucracy who saw strengthening of IPR as a requirement for sustaining innovation. Trying to build legitimacy for the seed market reform by decoupling it from the debate over the transgenics, they stressed that the reform would increase the returns to seed firms investing in plant-breeding research—many of which were domestic—regardless of whether the seeds they developed featured transgenic events or not. By 2012, the renewed efforts for reform gave rise to visible cleavages within the administration. The Subsecretariat of Family Agriculture—an agency focusing on the needs of indigeneous communities and small peasantry—confronted the Secretariat of Agriculture by declaring its veto for any proposal that would restrict seed saving. Notwithstanding such internal disagreements, however; the overall result the Argentine press was observing was an inertia against change towards stricter IPR: liberal, pro-agrarian *La Nación* commented that over this issue for once the Peronist Kirchner government was in unison with the farm sector.[160]

It seems that taking measures that would give a greater slice of the agrarian rent to the foreign biotechnology industry seemed like something that the government could pass on. The Kirchner governments saw their job as the reconstruction of Argentina's national industries after a long period of involution and a final collapse in the 1999 crisis, and fighting income inequality that stood at levels unprecedented in the country's history. The government cadres' understanding of what would be feasible and legitimate in this task departed dramatically from that of transnational capital. An essay by Enrique M. Martínez, the president of INTI (the public

[159] Christian Sanz, "El Fin Del Progresismo: Cristina Se Reunió Con La Polémica Monsanto En EEUU," *Tribuna de Periodistas*, 16 June 2012. http://periodicotribuna.com.ar/11605-el-fin-del-progresismo-cristina-se-reunio-con-la-polemica-monsanto-en-eeuu.html

[160] "La Propiedad Intelectual de las Semillas Divide al Gobierno," *La Nación*, 22 November 2012, http://www.lanacion.com.ar/1529112-la-propiedad-intelectual-de-las-semillas-divide-al-gobierno .

agency to promote advances in industrial technology), originally published on INTI's news bulletin and circulating in discussions among specialists, gives an insight.[161] In announcing his organization's position on agrarian debates the bureaucrat argued—reminiscent of Gereffi and Korzeniewicz's (1994) academic work—that global capitalism was running on global value chains. Dominant transnational actors appropriated the majority of the value generated thanks to their command of proprietary knowledge or brand rights. The extant mode of agricultural production in Argentina displayed one such chain. The grower had to buy inputs like seeds, herbicides and fertilizers from monopolistic firms and sell his produce to export handlers that were likewise highly concentrated. In such a context the State had to intervene with taxes and other measures to extract value from the chain and spread it among the links, but first and foremost to the weakest ones, i.e. the peasantry ("*chacarero común*"). Otherwise, there would have been little difference from the days when a few British processors were handling Argentine livestock and also determining the country's agricultural policy. The argument is exemplary of the reasoning the government cadres used to justify the policies to themselves and their supporters.

In the end, the IPR regime for GM soybeans in Argentina has remained unchanged, to the dissatisfaction of the TNC and their diplomatic supporters. But things may change in the future. As more TNCs enter Argentina with their GM seed varieties and apply downward pressure on prices, perils of monopoly have been becoming less relevant. TNCs other than Monsanto have evaded taking an equally confrontational attitude against Argentinian civil or public organizations, although they too have experienced certain problems in enforcing patents and the

[161] Enrique M. Martínez, "Posición Del I.N.T.I Sobre Conflicto Con El Campo." Published in INTI's bulletin on 20 May 2008.

informal seed market is still a major problem in securing returns to investment.[162] Also, as domestic firms develop genetic engineering skills, public authorities may become more convinced by the argument for stronger IPR and have an easier time justifying a reform in that direction.[163] (This, at least, is the expectation at the leading South American biotechnology firm Bioceres as they place their bet on investing in transgenic plant research).[164]

In other words, the day may come when it will no longer be justified to call Argentina as a case of weak IPR. If and when that happens, it will be interesting to discuss what exactly has tipped the balance. In either case, however, it will remain of great significance that during nearly two decades of the introduction of GM seeds, while commodity prices in global markets stood at record levels, the Argentine farmers were able to access inputs in favorable terms as they expanded production and financed the country's economic development with enormous export revenues and taxes. And the struggle so far has already ruled out certain options for the future. An overly expansive legal interpretation of patents rights over transgenes, for example, was a casualty at the European theatre of Argentina's confrontation with Monsanto.

Argentinean domestic producers thus stand as the current winner of their conflict with the Monsanto. Against activists from the consumer sector, they did not have a great conflict on

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[162] Corn seed varieties utilizing Syngenta's patented GA21 event were approved by the seed market agency (INASE) without the Swiss company's authorization, although Syngenta later took the infringers to court and won. Author's interviews at Syngenta also revealed complains that the patent office (INPI) does not have the capacity to process foreign patent applications rapidly enough (though pharmaceutical sector leaders believe that such delays are a result of deliberate nationalistic policy, see various American Chamber of Commerce memoranda at http://www.amchamar.com.ar/index.html. Supportive information comes from author's interviews at Syngenta and AMCHAM (Buenos Aires, December 2012).

[163] Already, the governmental discourse is drawing on this conception to justify moves towards reconciliation with biotechnology TNCs. After a June 2012 meeting with Monsanto in the USA, for example, President Cristina Kirchner told the Argentine press "We now respect patents, given that we too are holding patents of our own." (The video of the press conference is available at http://www.youtube.com/watch?v=N0UGR_UvcGA, last accessed October 2014).

[164] Author's interview with Federico Trucco, CEO of Bioceres (Buenos Aires, February 2013). Supportive information from interviews at Bioceres headquarters in Rosario (January 2013).

biosafety to begin with. As the director of the biotechnology industry association ArgenBio comments, "Even those NGOs who oppose biotechnology have little activity in this area, even those which have much more visibility in other countries".[165] A one month-TV campaign instigated by Greenpeace Argentina in July 2001 was the major action against transgenic products the country saw.[166] The bureaucrats at SENASA (public agency responsible for food safety inspection, including transgenics) comment that they were able to win over the Greenpeace activists by inviting them for a day-long workshop in which the activists could see and understand the methods used by the agency in its decisions.[167]

What eventually became a topic of heated public debate in the country was not the safety of the GM food itself but the impacts of glyphosate spraying, which is a crucial input in the GM soy (and much of GM corn) production method. National attention to this issue was provoked by an activist group called "the mothers of Ituzaingó".[168] The mothers were from a neighborhood in the city of Cordoba that was bordering soybean farms, and they believed that glyphosate exposure was the cause of widespread cancer in their community. (Conducting their own independent survey with the help of local physicians they demonstrated about 200 cases of cancer among 5000 inhabitants).

Provoking inconclusive responses from the government authorities, the mothers' persistent activism over the years has been supported by organizations like the Foundation for Environmental Protection (FUNAM) and Grupo de Reflexion Rural—a left-wing intellectual movement questioning the virtues of the country's agribusiness orientation. In April 2009,

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165 Gabriela Levitus from ArgenBio. Interview at http://www.publitec.com/system/noticias.php?id_prod=144, no date, sounds like 2011

166 Burachik and Traynor (2002).

167 Author's interview with Andres Maggi, Coordinator of Biotecnology and Industrial Products at SENASA (Buenos Aires, February 2013).

168 The story of the mothers of Ituzaingó is borrowed from Arancibia (2013).

experimental findings by Dr. Andrés Carrasco associating glyphosate exposure to embryo malformations made the front pages of Argentine newspapers, and Carrasco was quoted to say, "Science is urged by powerful economic interests, and not by the quest for truth and the welfare of the people." During the public debate that ensued afterwards, the Minister of Science and Technology felt obliged to address the issue on TV. The government responded with commissioning some surveys of the scientific evidence on the impacts of glyphosate, but has not acted on them. Although there are court decisions and provincial laws—hardly implemented—that ban glyphosate spraying within 2500m of urban areas, the federal government has resisted enacting a law, and the toxicological classification of glyphosate ("low toxicity, implying no risk") has not been changed either.[169]

## Conclusion: Assessing Epistemic Coalition Input

In Argentina, the rapid spread of glyphosate-resistant GM seeds has displaced unskilled labor, made agriculture more profitable for the producer by reducing herbicide cost per hectare, and thus increased the land rent. The response of the market has been investment in land and increased agricultural production. Impact assessments suggest that the domestic farmers captured a greater share of the gains from the boom than the biotechnology TNCs did. In generating these outcomes, the technical quality of the transgenic event did matter, but two institutional constructions were also crucial: The price of the glyphosate-resistant GM seed, and the price of glyphosate, both of which have remained low in Argentina due to reasons that have been subject of significant political dispute.

[169] Arancibia (2013).

In these political disputes, amid competing pressure by various interest and opinion groups, the government ultimately sided with the farmer associations seeking favorable access to inputs. The emerging consensus was that the Argentine agricultural producers would have favorable access to GM seeds, and the government, already retaining a lot of the agrarian rent for itself through taxes, would resist using its power to back IPR claims over the seeds. In the meantime, crucially, the government would defend the GM production complex against critics questioning its environmental and public health impacts. But the public awareness over the dangers of unrestrained glyphosate spraying has been growing. Argentina's permissive policy regime for GM agricultural production, hitherto resting on a feigned ignorance of environmental externalities, may have to take a direction towards a more hands-on approach, forcing the agricultural sector to internalize the costs.

In Argentina the material interests underpinning the policy debates are quite concrete and openly articulated, and one can talk of epistemic coalition input in a relatively weak sense, involving mostly legal expertise. Early in the debate, in the 1990s, an epistemic coalition in favor of what is called in Argentina as "productivismo," i.e. support for national developmental productive capacity, biased the public decision-makers to build a permissive biosafety regime and err on the side of going forward with GM crop approvals when they had doubts. This coalition included members of the agricultural bureaucracy and regulatory scientists like Carmen Vicien. When GM crop cultivation began, and reasons for a potential IPR conflict with the biotech TNC emerged, lawyers became the defining figures in the dominant epistemic coalition. Argentinean lawyers like Aldo Casella and Vanessa Lowenstein, and the European partners they worked with, like Bernard Remiche, were influential in forming, or reinforcing, beliefs about the illegitimacy of the expansive IPR demands of the biotech TNC. Pro-active bureaucrats like the

Secretary of Agriculture Miguel Campos (who was an upper-level bureaucrat under the Ministry of Agriculture, Livestock and Fisheries) or Enrique Martinez of the National Institute for Industrial Technology (INTI) also took part in the coalition. Conversely, at the ministries of Treasury and Foreign Affairs where TNC influence is always held with great esteem, there were the assumption that Argentina's national interest lied in going along with the TNC demands rather than risking a major confrontation, and that the Argentinean side would not have the legally stronger case in a confrontation. Instead of simply appealing to interests, epistemic coalitions put forward their stances in terms of understanding and knowledge, and accuse their detractors for not *knowing* enough, or not *understanding* well enough. Talking supportively about Campos' position in this debate, for example, lawyer Lowenstein says, "he was an agronomist, he understood the technology, and he understood what is at stake—that was important … Because of the technicality of the issue, no one outside the Secretariat of Agriculture understood the importance of these trials".[170]

The combination of a strong, cohesive, well-articulated agricultural sector; the presence of epistemic brokers who were interested in questioning the IPR demands of the biotech TNC, and the absence of a major opposition questioning the biosafety of GMOs, makes Argentina a somewhat overdetermined case disposed to generate a pro-domestic producer policy choice. The case of Brazil, where there *was* a robust, active, confrontational anti-GMO mobilization among consumer NGOs, shows more clearly the limits of what an opposition to GMOs can achieve in the presence of a strong domestic producer sector, but also the limits of what the domestic producers can do vis-à-vis the biotech TNC in the absence of supportive epistemic brokers and allies.

[170] Author's interviews.

## CHAPTER V

## THE CASE OF BRAZIL

### Introduction

"Two people were shot dead and eight wounded Sunday in a clash between members of landless peoples' organizations and armed guards protecting a farm owned by the Swiss-owned biotech company Syngenta Seeds in Santa Tereza do Oeste, a small town about 340 miles west of Curitiba, the capital of Parana state. In addition to wanting the land for settlement, the landless movements that agitate for agrarian reform oppose and sometimes target companies like Syngenta that work with genetically modified organisms (GMOs)". Thus reported the US consulate in Sao Paulo with a cable to Washington DC in 2007.[171] At that time Brazil was at a crossroads regarding its policy regime on GMOs. During the previous decade the country saw a regulatory, judicial and political battle over whether to go forward with GM agriculture. By early 2007 a backlog of 500 transgenic events were waiting for the government's approval for commercial release.

Earlier, it had seemed as if GM agriculture could easily have bright prospects in this country. Brazil is one of the world's major agricultural producers and exporters, and one with land and water resources that may allow for a significant expansion of agriculture still. On the north-south axis, the country spans several climatic zones. Southern Brazil joins Uruguay and Argentina's Rioplatense provinces to comprise a temperate and mildly wet zone that is well suited for grain and soybean production. GM seed varieties available from Argentina could be readily used in the states of Rio Grande do Sul, Santa Catarina, and Parana, and it would take a

[171] US Sao Paulo Consulate cable (ref: 07SAOPAULO879) to Washington DC, dated October 31, 2007, last accessed at https://wikileaks.org/plusd/cables/07SAOPAULO879_a.html in July 2015.

few years to adapt them to the more tropical climes of further north. Befitting the geographic placement of the two countries, therefore, it would seem logical that Brazil follow Argentina by a couple of years of time lag, roughly speaking, in its exposure to GM seeds and the formation of its policy regime. And such was the case initially. By 1995 Brazil had a permissive Biosafety Law put in place, setting up a National Technical Commission of Biosafety (CTNBio) to decide on GM crop approvals. Before this regime could produce tangible results however, its functioning was interrupted due to an effective anti-GMO coalition of statesmen, scientists and activists, who were concerned over environmental preservation and consumer rights as well as socioeconomic issues like landless peasants' access to resources. The anti-GMO coalition used courts to challenge CTNBio's authority to decide on GMO approvals and also mobilized their representatives in the same commission to veto any approvals. While the federal government had to rely on provisional measures to annually legalize the harvest from actually existing GM cultivation on the ground, anti-GMO governors declared their states GMO-free. Brazil thus came to have a *contested policy regime*. The contest would take nearly a decade for its resolution with a new Biosafety Law in 2005-07 in favor of a relatively permissive regime for GM agriculture. In the meantime, the biotech TNC and the farmers, which had previously formed a coalition to push through the technology through regulatory hurdles, found themselves in disagreement over how to manage royalty fees concerning the intellectual property over the seeds (the payment of 7 billion US dollars were at stake). Once the biosafety contestation was resolved largely in favor of GMOs, the opposition became increasingly irrelevant to policy, and farmers found themselves alone in their disagreements over IPR relating to the seeds provided by the biotech TNCs. So the IPR dimension of the policy debate also witnessed contestation, but the results of the contestation remained largely favoring the TNC position. A system of royalty collection on grain delivery that started to work despite the farmers' opposition returned technology rents to the TNC. As a result, while the technology seems to be working well agronomically, impact studies can barely document net profit improvement for the farmers from the adoption of GM seeds (da Silveira and de Carvalho Borges 2007). Had there been a different kind of epistemic coalition, centering on an opposition to the property claims associated with the technology and generating public mobilization for that purpose, the government reaction to the TNC IPR enforcement maneuvers, and the economic impact of the technology for the farmers, could have been different.

Below I trace the process of Brazil's policy trajectory, based on data from archival research (official documents, position papers by industry associations, publications by the NGOs, US embassy cables, newspapers) and elite interviews (with politicians and bureaucrats, industry spokespeople from farming and seed sectors, activists and scientists) conducted in Portuguese and Spanish from February 2013 to May 2013.

## The Contested Biosafety Regime

### Technocratic Input Faces Opposition

The issue of genetic engineering arrived at the gates of the Brazilian regulatory universe as a primarily medical concern. Two figures were influential in the early design of the Brazilian biosafety regime (indeed they would go on to become the first two presidents of the CTNBio): Laila Macedo (formerly Oda), a microbiologist working at Brazil's chief public health research institute Fundação Oswaldo Cruz, and Luis Antonio Barreto de Castro (emphatically known as Luis ABC in Brazil's agricultural circles), a plant scientist at the public agricultural research corporation EMBRAPA. Laila Macedo tells, "In the late 1980s and early 1990s there was a biosafety law draft in circulation. At the time it was seen more as an issue of r-DNA research for pharmaceutical purposes. Agriculture was not the focus. So the Congressional commission sent the draft to the health institute, and the head of the institute sent it to me. We started to work on it and then realized its relevance to agriculture, so we teamed up with EMBRAPA".[172] At the latter Luis ABC became involved as he was already heading a unit for molecular research towards developing biofortified soy.

These figures envisioned an enabling regulation that would open the way for research and commercialization in the area without much interference from the non-scientific bureaucracy. "The bill [we created] featured a powerful CTNBio directly under the president. The idea was to evade inter-ministerial competition".[173] Although co-sponsored by the vice-president of the republic, however, the bill would not pass unchanged. In a bid for organizational aggrandizement, the Ministry of Science and Technology wanted to integrate the CTNBio into its own organization, and convinced President Cardoso to make that change.[174] In the end, the commission turned out to be weaker than originally intended, and its organizational location invited conflict with rival bodies such as the Ministry of Environment, due to disagreements over where each organization's bailiwick ended.

Only in retrospect these potential fault lines emerge. Despite arguing over organizational structure, official circles were dominated by a pro- GMO attitude, dubbed as the "Cardoso consensus" (Jepson et al 2008) after the pro-business President. The biotech industry welcomed the formation of the regulatory commission, as it opened the way forward for GM agriculture. So

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[172] Author's interview with Laila Macedo (Rio de Janeiro, April 2013). For supportive information see the interview with Macedo, "Dizendo "não" à uma nova tecnologia", published at http://www.brasiloeste.com.br/2003/11/dizendo-no-uma-nova-tecnologia/, Nov 17, 2003.

[173] Ibid.

[174] Interviews.

Monsanto applied for the approval of its glyphosate-resistant (Roundup Ready) soybeans for cultivation in Brazil. Commercialization would occur though a deal with the public corporation EMBRAPA, which provided the suitable local seed variety. (In the meanwhile, Monsanto was buying the leading private seed companies FT Sementes and Agroceres to improve its own germplasm stock in Brazil).[175] In 1998 CTNBio issued the approval. Ministers of Agriculture (Francisco Turra) and Science and Technology (Carlos Bresser-Pereira) were supportive of going forward, so was the CNA (Confederação Nacional da Agricultura—the peak association of representing farmer-agribusiness integration).[176] Before this approval was put into effect, however, the decision was challenged in courts by opposition.

The opposition was two-pronged. On the official side there was the Ministry of Environment, and the Ministry of Health. These organizations were not only alarmed by what they saw as overreach into their regulatory territory, but also informed by the precautionary skepticism of certain scientists among their ranks, leading the Minister of Environment (Jose Sarney Filho) to speak critically of GMOs. A later chair of CTNBio comments: "During the time of the biosafety conflict there was some disagreement among the scientific community. Agronomists were all in favor. But some others were more precautious. There were those molecular and genetic scientists who were themselves studying processes related to genetic engineering, but who were precautious about possible impacts outside the lab once the GMOs are released to the environment".[177] On the civil society front, the major consumer rights organization IDEC and Greenpeace were the focal point of activism. Launching a highly publicized consumer campaign "Brazil free from GMOs," these organizations "adopted the

[175] See Table 8.

[176] Menache (2000). Author's interviews.

[177] Author's interview with Dr. Filardo Filho (Brasilia, May 2013).

European anti-GM discourse … directly challenging the depoliticized technical approach characteristic of the Cardoso consensus" (Jepson et al 2008).

The opposition also came in stages. At first consumer rights and environmental preservation were the main concerns. Once such concerns turned GMOs into a contestable topic and a GMO-skeptic discourse was put into circulation, actors questioning Brazil's capitalist, export-oriented agricultural development trajectory got on board with the debate. These actors were chiefly the landless people's organization MST, the agricultural workers union CONTAG, and the human rights organization Terra de Direitos. Observers at the US Embassy noted, "[t]hese groups allege that biotechnology will be damaging to small farmers because of increased dependence on this technology and the high cost of GMO seed".[178] As an observer comments, "The Vía Campesina movement, to which the MST is linked, talks, for example, of food rights and food sovereignty and the need for peasants to be independent of the clutches of global agribusiness. For the marginalized rural poor in Brazil this chimes well with many of their concerns. Even when they often know little about GM crops, seeing Monsanto as the enemy, allied to a Brazilian state reluctant to engage in any meaningful rural reform, produces a convincing storyline to which people have signed up in numbers" (Scoones 2008).

## Biosafety Debate: Opinions and Interest Groups

The opposition prompted court action in 1999. The legal issue was whether CTNBio had the authority to approve crops without requesting an environmental impact assessment (EIA), demonstrating that transgenic organisms posed no threat to the environment. The consumer organization IDEC filed a lawsuit arguing that GM soy was substantially different than

[178] USDA FAS GAIN report #BR1623, "Update of Biotech Issues in Brazil," dated 7 November 2001, http://apps.fas.usda.gov/gainfiles/200111/130682651.pdf.

conventional soybeans (which is a claim at scientific truth)[179] and by constitutional measures only the environmental ministry could issue a report permitting its release to the environment. Later the ministry's own administrative arm for environmental protection (IBAMA) and Greenpeace joined in support. During the course of the trials other legal grounds were also evoked: insect-resistant crops should be considered a subject of the previous legislation on pesticides, commercialization of GM crops could not occur without labeling of GM food, etc. In response a federal judge issued a restraining order against the commercial release of GM soybeans and thus began a period of practical moratorium on Brazil's GM crop approvals. The moratorium involved lawsuits going on in various courts spanning Brazil's federal structure, attempts by state governors to declare their territory GM-free, Congressional debate over a new law to clarify areas of bureaucratic responsibility, and attempts by a weakened Cardoso administration to go around the courts and the Congress by executive decrees (details of the judicial, legislative and executive action in this period can be found elsewhere).[180]

The debate was not handled only through legal arguments. The courts were presented with arguments about the desirability of GMOs, or the lack thereof. Biosafety was the main ground of concerns. One judge was led to describe GMOs as "organisms that could give rise to a strange civilization of aliens with venomous physiognomy, to compromise definitely, in real terms, and not fictitious, the survival of future generations of our planet".[181] In the eyes of many,

[179] Establishing "substantial equivalence" between GM and non-GM varieties of a plant is an important part of most, including Brazilian, biosafety approval procedures.

[180] A good account is provided in Jepson et al (2008). Further details are available in Portuguese in Menache (2000) and in English at USDA FAS GAIN report #BR1623, "Update of Biotech Issues in Brazil," dated 7 November 2001, http://apps.fas.usda.gov/gainfiles/200111/130682651.pdf.

[181] *"[O]rganismos que darão origem a uma esquisita civilização de aliens hospedeiros com fisionomia peçonhenta, a comprometer definitivamente, em termos reais, e não fictícios, a sobrevivência das futuras gerações de nosso planeta*" (translation mine), quoted in a letter sent on 26 August 2003 by Luis Antonio Barreta de Castro, the first chair of CTNBio, to his sucessor Erney Camargo, reproduced in www.inovação.unicamp.br/colunistas/colunistas-

the fact that the technology was to be supplied by a TNC with questionable reputation was a factor that added to the salience of biosafety risks. Luis ABC; the chair of the CTNBio complained that the radical factions of the campaign …"accuses, judges, and condemns [the pro-GMO advocates] through veritably fascistic lenses … as if scientifically defending the transgenics would immediately be in the service of the multinationals".[182] Monsanto's lead lawyer in Brazil (who had an abortive attempt to become a Catholic priest before studying law), recalls: "According to the activists, we were Monsatan! I, once preparing to become a priest, had become the devil's advocate, in their narrative".[183] It should be noted that the opposition did not only come from radical activists—the prestigious Brazilian Society for the Progression of Science (SBPC) too was criticizing CTNBio for rushing the decision for the approval of Monsanto's GM soy without adequate scientific data.[184]

It was the activists, however, who also took the debate from the courtrooms and to the public. In June 2000 IDEC announced that eleven GM food products were on the shelves of Brazilian supermarkets. Through the latter part of 2000 and into 2001, Greenpeace led protests at supermarkets across the country.[185] "The World Social Forum in Porto Alegre in January 2001 was an important focus for protest, and continued to be so in the follow-up events of 2002 and 2003, attracting many international activists from around the world. In 2001, over 1,000 MST workers invaded a Monsanto experimental farm in Rio Grande do Sul, destroying five acres of

luiz-abc.shtml with the title "Apocalípticos levaram o Brasil a cinco anos de obscurantismo," Last accessed April 2013.

[182] "*Esta facção radical, ... julga e condena com base em ótica fascista própria... Se algum dia seguir pelo caminho que escolhi, de defender cientificamente os transgênicos, estará imediatamente a serviço das multinacionais*". Luis Antonio Barreta de Castro, Ibid.

[183] Author's interview with Alcides Morali (Sao Paulo, April 2013).

[184] This view was articulated by Dr. Glaci Zancan, the vice-president of SBPC, in a seminar organized by the Brazilian Senate during 8-10 June 1999. For background see Menasche (2000) and the transcribed text is available at https://groups.google.com/forum/#!topic/soc.culture.brazil/01fFR-_8g8Y, last accessed December 2015.

[185] Scoones (2008)

GM soybeans. They were joined by the French farmer activist José Bové, who was arrested for participating. Anti-GM mobilization now hit the international press and attention increased with the Action- Aid-facilitated citizens' jury in Fortaleza" (Scoones 2008). NGO activism was effective in creating public awareness and popularizing the opposition. In summer 2001, Greenpeace commissioned a national survey (to be conducted by "the most important opinion survey institute in Brazil," observes the US embassy) about the public acceptance of GMOs in Brazil. "The results of the survey indicate that 74 percent of the Brazilian population prefers conventional food products rather than those produced with GMOs because they don't have sufficient information about the possible health risks and environmental impact. Also, 67 percent of the people interviewed believe that planting of GMO crops should be prohibited".[186]

In the meantime, despite the public opposition among the consumers, and an ongoing moratorium on GM crops, "much of the legal maneuvering in elite circles was irrelevant to what was growing in the ground" (Herring 2007: 142). A report issued in 2002 by a Congressman exposed widespread planting of GM soy in southern Brazil despite the legal moratorium that prevented any varieties to be officially released in the country. Herbicide-tolerant (HT) soybean seeds (of the same kind Monsanto had filed for approval in Brazil) had been smuggled from Argentina, and were being reproduced and re-crossed by Brazilian producers. The farmers seemed to find the simplification and greater flexibility of crop management provided by HT seeds attractive.[187] Comparing the above quoted public opinion survey with views within the agricultural sector, the US embassy attachés observed that "[t]here is no reliable survey of

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[186] USDA FAS GAIN report #BR1623, "Update of Biotech Issues in Brazil," dated 7 November 2001, http://apps.fas.usda.gov/gainfiles/200111/130682651.pdf.

[187] This is the conclusion inferred by da Silveira and de Carvalho Borges (2007) based on the results of a farm impact study by Roessing and Lazzarotto published in 2005. The latter finds some reduction in input costs offset by payment of technology fees to the biotech company and slightly lower yields, with little net pecuniary gain for the farmers overall. Supportive information comes from author's interviews.

Brazilian farmers' perceptions of GMOs. However, most leaders of farm organizations support the approval of GMOs in Brazil to remain competitive with Argentine and American farmers ... Most traders of agricultural products in Brazil advocate the planting of both GMOs and non-GMOs in Brazil [in order to take advantage of premium prices for non-GM food in niche markets]".[188] Around the same time, a survey conducted on behalf of the chief agricultural producers association CNA suggested an 80 percent acceptance (opinion-wise) rate of GM crops among Brazilian farmers, while among the food processing industry, who would be exposed more directly to consumer aversion, acceptance was lower.[189]

The Cardoso administration was known for its neoliberal, pro-business attitude and enjoyed warm relations with agribusiness, with a good showing of *bancada ruralista* (the name conventionally given to the political representation of big agriculture in Brazil) politicians among their ranks.[190] The administration tried to fight off the NGO-led opposition and perhaps send a message to the courts by displaying unity and resolve. A joint inter-ministerial declaration was issued in support of the pro-GMO agenda and the CTNBio's authority over the matter. The environmental minister José Sarney Filho too was forced into submission despite his initial misgivings and the fact that his ministry's bureaucrats were involved with the opposition.[191] But the administration was weakened by corruption scandals and general dissatisfaction with the economy, and so it was unable to muster strength for a major initiative in the Congress towards a conclusive rearrangement of the biosafety regime. The resolution of the conflict had to wait for the emergence of a new political equilibrium with the Workers Party (PT) taking the Presidency

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[188] USDA FAS GAIN report #BR1623, "Update of Biotech Issues in Brazil," dated 7 November 2001, http://apps.fas.usda.gov/gainfiles/200111/130682651.pdf.

[189] USDA FAS GAIN report #BR5618 "Annual Agricultural Biotechnology Report," dated 12 July 2005, http://apps.fas.usda.gov/gainfiles/200507/146130270.pdf

[190] Filomeno (2014), Jepson et al (2008).

[191] Jepson et al (2008).

from January 2003. PT's ascendancy presents an interesting political variable because the party came to power promising to block the GMOs, but it would end up establishing a new, more permissive biosafety regime, due to pressure from soy growers and supportive opinions from influential scientists (added to the constant lobbying by the TNCs). This is explained in the next section.

### The Workers' Party Resolves the Debate, Unexpectedly

Initially, a PT government looked like the last thing the biotech industry would have wanted, as the party's stance on GM agriculture was all but supportive. Both the NGOs oriented towards the biosafety agenda and the agrarian opposition centering around the MST and CONTAG had organic relationship with the party, and provided it with rank and file. During Cardoso's term in office, PT-ruled states had provided bastions for the anti-GMO opposition. In the southernmost state of Rio Grande do Sul (RS), PT-affiliated governor Dutra declared the state GM-free in 1999 and, with an effort to thwart the smuggling of GM seeds from Argentina, began to set up a certification system for conventional crops to guarantee the commodity chain for European markets. State officials also mounted legal cases against biotechnology companies conducting experiments in their state and challenged CTNBio's exclusive jurisdiction over biosafety governance by reclaiming authority through environmental regulation in their territory.[192] State deputies from PT proposed to make Rio de Janeiro and Santa Catarina too legally GM-free.[193] When PT leader Lula da Silva became President, observers expected such an approach to become influential on a national scale.

[192] Jepson et al (2008).

[193] Menache (2000).

However, the PT administration ultimately took a different path. The change in policy was triggered by events in export markets but not in a way that vindicates straightforward “market power” predictions. (Main markets for Brazilian soybean is shown in table 24 below). At the time, most exports went to the EU, where despite a precautionary regulatory framework GM soybeans were not banned, yet there was a premium price for non-GM soy in the market. China was the second, but rapidly growing, export destination, and its government had maintained an ambiguous attitude in its GMO policy, itself waiting for the clarification of broader international trends. Then, in early 2002, China imposed biosafety rules that required all importers to issue a safety certificate stating whether they were handling GM food. If anything, this was a move towards a more demanding regulatory regime on behalf of China. (Indeed, as late as in 2014 Brazil’s foreign ministry was complaining that the adoption of GM seeds was creating problems in exporting to China).[194] Yet, at the time it had the side effect of partially legitimating the cultivation of GM crops because it forced the Brazilian government to choose between ordering the incineration of the soybean harvest in the southern states, which was known to be GM, or officially recognize its existence despite the ongoing moratorium.

Table 24: Soybean exports from Brazil, 2000

| Destination | Share in total |
|---|---|
| EU | 64% |
| China | 15% |
| Other | 11% |
| Japan | 5% |
| Norway | 5% |

Source: Brown-Lima et al (2010)

[194] “UPDATE 1-Monsanto, soy exporter royalties dispute rages on in Brazil,” *Reuters*, 23 October 2014, http://www.reuters.com/article/2014/10/23/brazil-monsanto-exporters-idUSL2N0SI32220141023

To deal with the situation without hurting farmers and exports to China, in March 2003 Lula signed a presidential decree to recognize and temporarily permit the sale of GM soybeans, exempting that year's harvest from regulatory provisions under the 1995 Biosafety Law.[195] Similar decrees were issued during the next couple of years too, provisionally legalizing the cultivation of GM soy until a new law was made, while also decreasing the 4% threshold previously established for tolerance for GM food products in Brazil,[196] reflecting an ongoing ambiguity on behalf of the administration. For all sides to the debate the ambiguity was far from ideal. For Monsanto, it presented a mixed blessing because with each harvest the provisionary decrees were legitimating GM crop cultivation little by little, however without fully recognizing the TNC's right to collect royalty fees for the seeds, which had been disseminated illegally. Agricultural Minister Roberto Rodriguez (an industry leader himself, as the former president of the agribusiness association ABAG-Associação Brasileira do Agribusiness) was promising that the government would not leave domestic producers in legal limbo. The pressure for the liberation of GM seeds at least among capitalist producers was such that one idea in circulation at the time was to include the issue within a law package that would allow government redistribution of private land, a proposal agribusiness otherwise detested— in other words, the issue of GM seeds was seen important enough to become a *quid pro quo* for agrarian reform.[197] On the other hand, Environment Minister Marina Silva, who enjoyed a strong personal

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[195] Author's interview with then Minister of Agriculture Roberto Rodriguez (Sao Paulo, April 2013).

[196] USDA FAS GAIN report #BR3613 "Brazil Approves Biotech Soybeans," dated 1 October 2003, http://apps.fas.usda.gov/gainfiles/200310/145986266.pdf.

[197] The law under question would be the Provisional Measure 192, which the Congress was asked to vote into law. "The measure has been under debate because some congressmen want the text changed to prohibit government purchase of land that has been invaded by the landless movement. Many invasions occur as a way to force the government to purchase and redistribute certain tracks of land. Including biotech soybean planting in this controversial PM is seen as a way for the President to force Congress to pass the bill, since there is significant political pressure to liberate biotech soybean plantings." USDA FAS GAIN report #BR4624 "Senate Passage of Biosafety Bill," dated 8 November 2004, http://apps.fas.usda.gov/gainfiles/200410/146117670.pdf.

following, was vigorously opposed to the GMOs, and arguing for a total ban, in alliance with consumer organizations, Greenpeace, and landless peasants movement MST.[198] A new law was needed to break the impasse, for which the government had to take a clear stance.

That stance was taken with the passing of a completely new Biosafety Law in March 2005. The law clarified the CTNBio's authority over the regulation of GMOs, opening way for the approval of new varieties. It established a more scientific basis for this authority by requiring all members to have PhD-level academic credentials in relevant scientific fields and thus eliminating the previously existing seats for the representatives of both consumer and business groups. Implementation regulations augmented the maximum limit of glyphosate residual tolerated in food products 50 times, from 0,2 mg/kg to 10 mg/kg, freeing the farmers' hand in abundantly applying glyphosate with their glyphosate-resistant seeds.[199] Although it would take two more years of contestation to make CTNBio fully functional, during which the sides continued to combat over decision rules within the commission to create an institution to their own liking,[200] the spirit and the direction of the law was already clear. The consumer

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[198] Ibid.

[199] Other countries like UK similarly increased glyphosate tolerance in food once approving GM crop cultivation. The scientific consultation relating to the Brazilian decision is explained in the SINDAG's (agrochemicals industry association) memo "Considerações sobre: Comentários do Eng. Agr. Valdir Izidoro Silveira, Assistente Técnico da Vigilância Sanitária/Divisão de Alimentos da Secretaria de Estado da Saúde do Paraná na data de 28 de março de 2006", available at http://www.mma.gov.br/port/conama/processos/5FDD59FA/ParecerSINDAG-DrValdir_3103.pdf, last accessed July 2015.

[200] A more permissive draft of the law was changed at seven points due to objections by the President. Although this was lower than the sixteen changes that Marina Silva had asked for, it was also not ideal for the pro-GMO side. The law changed the composition of CTNBio from 18 to 27 members and required 2/3 majority for decision-making. Both the US observers and the major agricultural producers association CNA saw this as a concession to the opposition. Because the latter was able to find enough dissenting members within the commission, no GM variety approval decisions could be taken until March 2007. Things changed that month when Lula signed a new law changing the decision rule within CTNBio. Shortly afterwards the first GM corn varieties were approved after having waited for 9 years for a decision. Also, originally, a Conselho Nacional de Biossegurança (CNBS), consisting of ministers of the government, had the authority to revise and if necessary override CTNBio approvals. In June 2008, this role was also eliminated, with CTNBio scientific decisions becoming conclusive. The contestation over Brazil's biosafety regime for GMOs was then practically over. For views of the actors mentioned see Getúlio Pernambuco, "Biotecnologia: Inviabilizadas comercialização e pesquisa de OGMs," *Canal do Produtor*, 13 January 2004, available at http://www.canaldoprodutor.com.br/comunicacao/artigos/biotecnologia-inviabilizadas-

organization IDEC, which had spearheaded the court action against GMOs, declared in a few weeks that with this new law "the transgenic lobby has won."[201]

What led to this belated, contested victory? Insiders explain the change in the PT administration's attitude with the combination of two things: pressure from major agricultural producers, and the supportive views presented by the scientists from relevant public institutions. A regulatory affairs manager at the Bayer Crop Sciences (a biotech TNC) comments that "all in all, it was mainly the growers' pressure to the Ministry of Agriculture which changed the game. Scientists like Walter Colli were influential in accelerating things".[202] Dr. Colli agrees.[203] A lawyer from Monsanto thinks that "President Lula was convinced by EMBRAPA's [Brazil's prestigious public agricultural research institution] positive presentations on the issue".[204] Earlier, EMBRAPA had a GMO-skeptic constituency among its experts,[205] the union of workers associated with the institution explicitly took part in the anti-GMO platform,[206] and the chair Clayton Campanhola was known to be precautious.[207] By mid-2000s, however, an attitude more in favor of GMOs started to dominate EMBRAPA. A paper by Dr. Mauricio Antonio Lopes was

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comercializacao-e-pesquisa-de-ogms (last accessed December 2015), "Venceu o lobby dos transgênicos," *Revista do IDEC*, April 2005, available at http://www.idec.org.br/uploads/revistas_materias/pdfs/2005-04-ed87-politicas-biosseguranca.pdf; USDA FAS GAIN report #BR1623, "President Signs Regulatory Decree on Biosafety Law," dated 29 November 2005, http://apps.fas.usda.gov/gainfiles/200512/146131664.pdf. Supportive information comes from the author's interviews.

[201] "Venceu o lobby dos transgênicos," *Revista do IDEC*, April 2005.

[202] Author's interview with Denis Lima (Sao Paulo, March 2013).

[203] Author's interview with Walter Colli (Brasilia, May 2013).

[204] Author's interview with Alcides Morali (Sao Paulo, April 2013).

[205] Author's interviews with Elibio Rech (EMBRAPA) (Brasilia, May 2013), Leila Macedo (CTNBio) (Rio de Janeiro, April 2013), Alcides Morali (Monsanto) (Sao Pulo, April 2013).

[206] SINPAF (Sindicato dos Funcionários da EMBRAPA) joined the anti-GMO coalition in June 2000, with a manifesto titled "Razões para dizer não aos transgênicos na agricultura." See Menasche (2000).

[207] Author's interview with Elibio Rech (Brasilia, May 2013), a molecular biologist at EMBRAPA.

important in changing the discussion—he later became EMBRAPA's president.[208] The then-Minister of Agriculture Roberto Rodriguez argues that official presentations by a group of experts led by the prestigious plant scientist Dr. Ernesto Paterniani was influential in legitimizing the producer sector's demand towards a more permissive regime: "The role of the academics was fundamental in convincing the government and the Congress".[209]

Hence, the pressure from agricultural producers put the liberalization of GMOs on the agenda, and the support of influential scientists was a necessary ingredient to move it forward. The result was a change in the views about the desirability of GM crop cultivation held at the top echelons of the government, such that agricultural production agenda practically defeated the agenda associated most strongly with the ministry of environment. Roberto Rodriguez recalls: "After all this debate, there was a cabinet meeting with all the ministers where Lula announced the new law opening way for GMO approvals. One of the ministers objected, 'But Sir, the opposition to the GMOs is in our party program!' to which President Lula responded, 'The party's program says one thing, but the country's program prefers something else'".[210] The Minister of Environment Marina Silva later resigned because of her growing isolation within the government due to her views on GM crops in addition to other environmental issues. She was also going to leave the PT to start a green movement towards a bid for her own Presidency.

Thus, the biosafety regime was liberalized. In a few years most soy and corn grown in Brazil was GM. Due to the enormous size of the country's land under cultivation, this made Brazil the largest producer of GM crops after the USA.

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[208] Author's interview with Antonio Marcio Buainain, an agricultural economist who has worked with FAO, among other institutions (Campinas, March 2013).

[209] Author's interview with Roberto Rodriguez (Sao Paulo, April 2013).

[210] Author's interview with Rodriguez. whose original words (for quoting Lula) at this point were in Spanish: "'*la programática del partido dice algo, pero la programática del país prefiere otra cosa*."

Table 25: Share of GM cultivation for major crops in Brazil, c. 2010

| Crop | Area cultivated with GM seeds |
|---|---|
| Soy | 75% |
| Corn | 56% |
| Cotton | 25% |

Source: James (2011)

Once GM seeds became free, the issue of the appropriation of the surplus they generated came to fore. Farmers and Monsanto found themselves in disagreement. Their interaction, with interventions from the courts and the government, led to the formation of an IPR regime that has been largely supportive of Monsanto’s demands, to the dissent of important farm groups. This is explained in the next section.

## The IPR Regime: TNC Ascendant

### The Legacy of the Biosafety Debate

The contestation over the biosafety regime, which lasted roughly from 1998 to 2005-2007, occurred around an axis where consumer rights, environmental, and landless peasant movements were on one side, together with public institutions (such as the ministries of Environment and Health) to which they enjoyed greater access; and on the other side were commercially-oriented farmers (especially of soy, especially from the South) and the biotech industry, supported by favorable public institutions (such as the Ministry of Agriculture); with scientific experts and their institutions (such as EMBRAPA) playing a pivotal role and increasingly siding with the latter. During this time, there was little evidence of dialogue and idea exchange between the farmers and the opposition. Consumer organizations like IDEC, and

Greenpeace, were of manifestly urban nature.[211] It does not seem to have helped for a dialogue that they recruited the landless movement (MST) and the National Confederation of Agriculture Workers (CONTAG) for the cause. The herbicide-tolerant GM seeds the farmers were embracing were displacing hired labor by making weed management simpler—if anything this presented an objective difference in interest between the landless rural workers and farmers.[212] Besides, the two classes have been separated by more insurmountable differences in their vision over land relations and agrarian development at large. All in all, the opposition and the farmers have remained disconnected. Once the biosafety contestation was resolved largely in favor of GMOs, the opposition became increasingly irrelevant to policy, and farmers found themselves alone in their disagreements over IPR relating to the seeds provided by the biotech TNCs. As a close observer of IPR debates in Brazil concludes, "[r]arely have attempts been made to link soy growers' demands to broader issues, such as national or food sovereignty. These links could give birth to a broader coalition against Monsanto … There is no collaboration between APROSOJA-RS, APROSOJA-MT [regional soy grower organizations] and NGOs or rural social movements" (Filomeno 2014: 104).

### The Mechanics of Collecting Technology Rents

Once it hit the national news that GM soy seeds embodying Roundup Ready technology smuggled from Argentina were spreading in southern Brazil and the government was forced to do something about it, Monsanto started considering a number of alternatives for monetizing its intellectual property here. They were also, as in Argentina, under pressure from the US farm

[211] Newell (2008).

[212] The labor-displacing effect of HT seeds has been documented for the case of Argentina (Rodriguez 2010: 232). This effect is matched with an increase in the employment of more skilled labor in logistics (to handle the increased production) and agricultural engineering (to handle the technology).

lobby to prevent the Brazilian farmers' free access to a technology for which US farmers were paying. In Brazil, technology fees could not be collected as part of seed sales because GM seed sales were not legal yet, neither it was obvious that they would ever be. Besides, even if seeds were legal, farmers could avoid paying by planting saved seed, as they were already doing in Argentina. Consequently, Monsanto's Brazilian legal team conceived of the idea of charging unlicensed Roundup-Ready growers an "indemnification fee" for having used the patented technology, at the point where they would deliver their grain to trading companies storing, processing and transporting the product to (mostly export) markets. For this plan to work, the trading companies stood as the gatekeepers, so they had to be negotiated first. Initially, they were not predisposed to get involved in a distributional conflict to help monetize Monsanto's intellectual property. "They said, 'We support your intellectual problem, but this is your problem'," recalls Rick Greubel, then president of Monsanto Brazil.[213]

However, the company began tracking ships leaving southern Brazilian ports, eventually intercepting a ship in the port of Trieste, Italy, carrying a large shipment of soybeans. Local customs action, maybe leading to trials, would be taken on the ground that the shipment contained Monsanto's unremunerated intellectual property. The trading company decided to negotiate and the result was an indemnity fee agreement. As in many other countries, Brazil's agricultural commodity exports are handled by the four multinational "ABCD" traders (ADM, Bunge, Cargill, Dreyfus)—given this concentrated structure, it was possible for Monsanto to come to an agreement with all of them (and the smaller processors and cooperatives they work

[213] Interview with Rick Greubel reported in Bell and Shelman (2006: 8).

with) quickly. As a result, Monsanto was able to structure a royalty collection scheme based on a contractual arrangement illustrated in the following figure.[214]

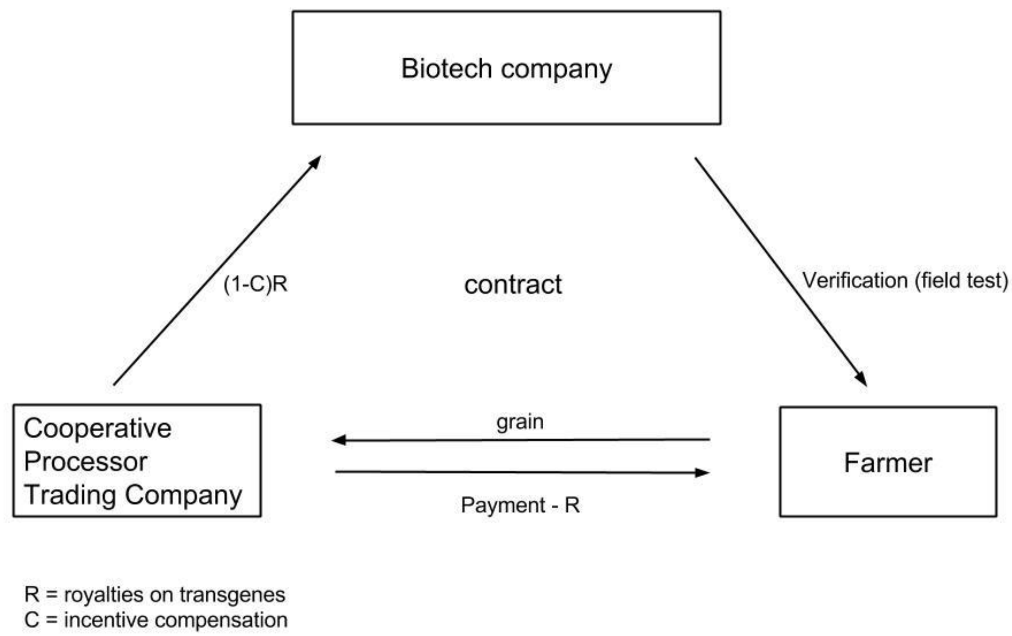


Figure 11: Mechanism for collecting tech fees, from de Avila Monteiro and Zylbersztajn (2011)

In this point of delivery (PoD) system, processors/traders collect the royalties on the genetic technology based on the ton of soybean grain delivered by farmers, keeping a percentage of the royalties as compensation, and passing the rest to the biotech TNC. To deliver their grain to the trader, the farmers agree to pay royalty or have their grain tested for GM content (which, if found positive, would result in a higher indemnity fee). Once the biosafety conflict was over and GM seeds were legally for sale in Brazil, the farmers were also given the choice of either paying the royalty at the point of grain delivery or showing invoices documenting that they purchased

[214] Bell and Shelman (2006), de Avila Monteiro and Zylbersztajn (2011), and author's interviews within the industry.

the season's seed through a contract with Monsanto (in which the technology fee would be internalized into the seed price already, but at a lower rate, thus giving the farmers an incentive to purchase seeds with a contract each season rather than reproducing them in farm).[215] For this additional step to work, local seed distributors were another actor that Monsanto needed to get on board. At first, ABRASEM (seed sector association) issued a public note alerting its members to abusive aspects of contracts being presented by Monsanto to local seed companies that multiply and sell GM seeds, recommending that such contracts should not be signed. However, after a round of negotiations, Monsanto agreed to assign a larger share of the royalties to local seed companies, which resulted in ABRASEM supporting the system.[216]

But what about the farmers' view on this exchange? It seems fair to say that for the farmers the situation emerged as a fait accompli. It is highly likely that many of the farmers who were exchanging the illegal Roundup Ready seeds—which spread even to MST settlements—were doing so without necessarily knowing that the variety had been bred with R-DNA methods, or giving much thought to the idea that they could be charged technology fees at one point. Monsanto issued newspaper ads only in 2003 notifying farmers that Roundup-Ready soybeans were protected by patents and the company would be charging for the right to use the technology.[217] According to APROSOJA-RS (soy growers association of Rio Grande do Sul), FARSUL (agricultural federation of Rio Grande do Sul), and the FETAGRS (agricultural workers association of Rio Grande do Sul), the system was imposed unilaterally by the company.[218] Rick Greubel, then president of Monsanto Brazil, comments "If there was one error

[215] Ibid.

[216] Filomeno (2014: 93).

[217] Bell and Shelman (2006: 8).

[218] Filomeno (2014: 90).

in our execution it was that we focused too much only on the exporters early in the process".[219] Monsanto's strategy of setting up the system without a prior negotiation with the farmers attracted criticism of otherwise sympathetic observers within the industry and policy circles, and provoked reaction from farmers, as explained in the next section below.

### Farmer Reaction to the IPR Regime

As soon as the PoD system started working dissatisfaction arose among farmers regarding both the form and the level of royalty collection. In part, the reaction is due to the sense of imposition of external control. As a soy grower from Sao Paulo's interior explains, it is "the feeling that this whole thing is too compulsory, like a tax. When the soybean enters the storage house, part of it is automatically confiscated [by the local cooperative] to pay for the royalty—they register it under my name not as the 1000 which I delivered, but 1000 minus the royalty share".[220] In part, the reaction is due to the fact that such control enables the technology-supplier to benefit from situations of doubt. As noted above, after a certain point farmers were required to show invoices to document that they obtained the seeds legally from Monsanto or pay indemnity fees. If a farmer, having already paid for the technology as part of such seed purchase, delivers more grain than what would, based on the average calculation established by Monsanto, spring from the amount of legally purchased seed, the surplus is then declared as the product of illegally obtained seeds and becomes subject to the higher indemnity fee. This punishes the more efficient farmers who are able to make their inputs perform above the average.[221]

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[219] Interview with Rick Greubel reported in Bell and Shelman (2006: 8).

[220] Author's interviews (Campinas, March 2013).

[221] Author's interviews.

The reaction is also in part due to the level of fees, which are determined in ways that look arbitrary or exorbitant to farmers—not an unreasonable suspicion given conditions of monopoly. The monopolist does not calculate the price on the basis of the cost of production of the technology, as a perfectly competitive market would have it, but on the advantages that the technology provides to the user.[222] As advantages vary, the royalty rate is changed: Monsanto attempts to increase it in years of a good harvest, while farmers may think that it is the weather and other factors that were responsible for the surplus. During the 2003/04 soy season Monsanto agreed to charge R$0.60 per soybean bag of 60 kilos, but wanted to double the value to R$1.20 for 2004/05. In reaction, soy growers pressured the government to add clauses in that year's provisional measure (the new Biosafety Law was still not officially in place) that could be interpreted to preclude royalty collection.[223] A cooperative of medium and smaller producers in Campo Novo, Rio Grande do Sul also started court action and obtained in January 2005 an injunction stating that producers cannot be compelled to pay royalties, because they had the right to save seeds under Brazilian laws, which was, however, overruled one month later by a higher court.[224] These measures are evidence of challenge against the TNC's methods, and the farmers' dissatisfaction, but by and large royalty collection has continued.

It is telling that the anti-GMO opposition enlisting consumer, environmental and rural workers organizations did not engage closely with these disagreements, and instead, at a remove from most farmers, constructed the socioeconomic dimension of its narrative on a vague

[222] This insight is borrowed from agricultural economist José Maria da Silveira (author's interview, Campinas, March 2013. Indeed, in the Indian context (where the relevant technology is the insect-resistant Bt seeds), according to the press, a top representative of the company explained that the trait value charged is relative to the additional income that farmers earn from Bt seeds. See Latha Jishnu, "An Odd Royalty Calculus," *Business Standard*, 24 June 2010, http://www.gmwatch.org/index.php/news/archive/2010/12317-monsantos-odd-royalty-calculus.

[223] Provisional Measure 223, which became Article 7 of Law 11,092/05. See USDA FAS GAIN report #BR5601, "President Signs Law for 2004/2005 Biotech-Soybean Crop," dated 14 January 2005, http://www.fas.usda.gov/gainfiles/200501/146118494.pdf

[224] Filemeno (2014: 91).

opposition to the multinationals, plus the "Terminator" (GURT) seeds, the fears connoted to which seem to go beyond questions of economic distribution.[225] Their activism in that area should not be dismissed as inconsequential—the 2005 Biosafety Law opening way for GM seeds banned the GURT not as a foregone conclusion but as a concession to the opposition[226] (and there are already law drafts to overturn the ban).[227] However, the opposition did not lend its support to the court action challenging Monsanto's methods for collecting royalties for the GM seed technology because, unlike most farmers, they have framed the technology itself as illegitimate and undesirable.

## Government Intervention, or Lack Thereof

The role the government chose to play in this conflict becomes particularly interesting when the case of Brazil is put in comparison with Argentina. Why was Monsanto successful in establishing this PoD system in Brazil and not in Argentina? When I asked this question to my interview subjects in Argentina, many offered a cultural explanation, arguing that there is a culture of respect for private rights in Brazil while in Argentina there is not. Monsanto's Brazilian team does not think so: "Everybody thought that it would be too difficult to organize, especially in a place like Brazil where the culture does not favor private property rights".[228] In chapter IV, it was shown that Monsanto tried to intercept Argentinian ships at the European ports

[225] "On 22 March 2006, a day of action against terminator technology was declared in which, for example, 300 rural workers demonstrated in Curitiba against the suspension of the moratorium preventing the cultivation of terminator seeds. The decision of the 8th meeting of the Conference of the Parties of the Convention on Biological Diversity (CBD) held in Curitiba, Paraná to uphold the moratorium on the use of terminator seeds was used by Vía Campesina to lend credibility and support to this campaign" (Newell 2008).

[226] This is the opinion of the spokespeople from the biotech industry's representative institution in Brazil, AGROBIO (author's interviews, Sao Paulo, March 2013).

[227] Filomeno (2014: 89).

[228] Interview with Rick Greubel reported in Bell and Shelman (2006: 8).

to force the Argentinian producer sector for a similar royalty collection agreement. Differently, in Argentina the government got involved and lent its weight to the opposing side. Jerry Steiner, Monsanto's executive vice president of commercial acceptance at the global level, credits the successful implementation of PoD in Brazil in part to the important role that political leaders played: "The turning point came when the politicians decided to allow us to pursue this as a commercial issue instead of turning it into a political debate. Government leaders were committed to getting a system in place and even facilitated several meetings between the parties".[229] Indeed, the Brazilian Ministry of Agriculture, while being relatively pro-active for a permissive bio-safety regime legalizing GM seeds, did not took a side in the debate over the royalty fees and this allowed Monsanto's (a wealthy, unitary actor; enjoying the diplomatic support of the USA) power to predominate.

The imperatives of the existing IPR laws were not crystal clear about how to deal with this novel situation. The Law of Industrial Property forbade patents on the whole or parts of living beings, but it allowed (in line with the TRIPS agreement) patents on biotechnological processes that create GM plants, thus possibly extending protection to products obtained through these processes. On the other hand, Law of Protection of Cultivars and the Law of Seeds recognized (in line with UPOV 1978 convention) the right of rural producers to save seeds and even allowed producers to exchange seeds among themselves, but with the PoD payment system Monsanto was getting around this issue and charging royalties regardless.[230] The laws left enough room for interpretation for a decisive government to impose a policy if need be. Earlier, Minister Rodriguez had spoken in favor of a system where royalty fees would be charged only as part of seed sale contracts—an idea more acceptable to the producers—and not on the basis of

[229] Interview with Jerry Steiner reported in Bell and Shelman (2006: 10).

[230] See Filomeno (2014) for the details of these laws.

the grain delivered, in a joint statement with the Argentinian Secretary of Agriculture. Afterwards, however, no concrete action was taken by the Brazilian state.[231] Minister Rodriguez explains, “My approach always is to have clear laws, and then to let the private market actors play their own game… My friend Miguel Campos, as Argentina’s Secretary of Agriculture, took a fight with Monsanto. He tried to convince the ministers of six South American countries to sign a common memorandum following his own policy of siding with the producers against Monsanto in the royalty collection conflict. I saw that all the other countries wanted to stick to a liberal position of non-interference and I also remained in that position”.[232] Given the great weight a combined Brazilian and Argentinian initiative would carry within South America, Rodriguez’ “policy-taking” approach is somewhat curious. According to Newell, behind this turnabout was aggressive lobbying by Monsanto on the Brazilian government, which was concerned with not harming its own bargaining position by declaring support to Argentina (2009: 43). According to APROSOJA-MT (the soy growers federation of Mato Grosso state, where the seeds spread later than in Rio Grande do Sul), the Brazilian government mistakenly assumed, based on the statements of a few rural leaders, that most soy producers had agreed with the method of payment designed by the biotech TNC.[233] According to a mid-level bureaucrat from the Minister of Agriculture, the inconsistences in the Brazilian government’s reception of the GMOs prevented them to develop a conscious strategy on the IPR front: “The government wouldn’t be able to take part in the negotiation over something that was not legal…The government could not get involved in the matter in a consistent strategic manner, and when you

[231] The sequence of contradictory public positions is described in greater detail in Filomeno (2015: 57-58, 93).

[232] Author’s interview with Roberto Rodriguez (Sao Paulo, March 2013).

[233] Filomeno (2014: 93).

don't have your strategy, you become an object of somebody else's strategy. Monsanto followed a very clever strategy".[234]

## IPR Conflict in Courts

Upon being denied the support of the executive, some producer organizations took the matter to courts. Several lawsuits can be subsumed under two broad challenges to the TNC's interpretation of property rights. One challenge came from soy producers of the southern state of Rio Grande do Sul (RS), where the GM seeds made their first entry to Brazil. RS is a region of medium and small farmers (in Brazilian standards),[235] traditionally oriented somewhat towards the left of the Brazilian political spectrum. In early 2009, a coalition of about three hundred and fifty local producer associations in RS started a class action against Monsanto, objecting to the entire system of royalty collection, and claiming the right to save seeds at no charge. They argued that the The Law of Protection of Cultivars recognized their right to save seeds, and therefore patent protection Monsanto evoked (on the basis of the Law of Industrial Property) to back royalty charges was invalid, because UPOV convention of 1978, to which Brazil was a party, prohibits "double protection"—meaning that any species eligible for cultivar protection laws cannot be simultaneously protected by a stricter instrument such as an industrial patent.[236] The associations were asking back all royalties extracted since 2004, amounting to R$14 billions. (Monsanto's argument is that genetic transformation processes are Industrial Property, while

[234] Author's interviews at the Ministry of Agriculture (Brasilia, May 2013).

[235] Median rural property in the state of Rio Grande do Sul is 2,000 acres (de Avila Monteiro and Zylbersztajn 2011: 35). Compare with footnote 238.

[236] Filomeno (2014: 94). Supportive information comes from the author's interview with Néri Perin, the lawyer for the class action (Brasilia, May 2013).

Protection of Cultivars applies to the germplasm, so there is no double protection).[237] Initially the producers gained ground when a judge decided in their favor in April 2012, ordering Monsanto to stop collecting royalties, and return those collected since 2004 or pay back a minimum of US$2 billion.[238] Monsanto, however, has appealed the decision.

The second challenge came from the Mato Grosso state (MT), where GM seeds spread later. MT is a region of frontier colonization where new tracts of the Amazonian forest are claimed for agriculture every year, resulting in much larger land holdings than in RS, and where in-farm seed saving is less common.[239] In September 2012, FAMATO, the peak agricultural federation of this state, started a lawsuit with a somewhat more technical focus, aimed at, it seems, gaining bargaining power against Monsanto and preventing abuse. The focus of the argument was an examination concluding that Monsanto's patents on the transgenic RR and RRBt technologies had actually expired in 2010. The organization demanded from Monsanto a refund of royalties paid after the expiration in double amount. (Monsanto's argument is that the "pipeline patents" mechanism in Brazilian law would actually imply a later expiry date). In June 2013, Brazilian Superior Court of Justice confirmed the patent expiry thesis.[240] The TNC is now questioning the constitutionality of elements of the Law of Industrial Property on which the

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[237] On the prohibition of double protection in IPR, see Dutfield (2003).

[238] "Monsanto may lose GM soya royalties throughout Brazil," *Nature*, 15 June 2012, http://www.nature.com/news/monsanto-may-lose-gm-soya-royalties-throughout-brazil-1.10837

[239] Median rural property in the state of Mato Grosso has approximately 8,000 acres. By 2005, saved seeds were 58% of soybean seeds in Brazil's Midwest region including MT, compared to 90% in the south (de Avila Monteiro and Zylbersztajn 2011: 35). Climate and soil conditions should be partly responsible for the big difference in seed saving, as it is less economical to do so in more tropical climes.

[240] On pipeline patents see "Brazil: Monsanto defeated," 4 June 2013, http://iptango.blogspot.jp/2013/06/brazil-monsanto-defeated.html (last accessed December 2015).

decision is based; in the meantime producers are paying royalties to an independent deposit account.[241]

In response to these initiatives reflecting widespread farmer dissent and risking the payment of billions of dollars in refunds, Monsanto has offered, in negotiations with major producer organizations, to give Brazilian farmers a discount on the much awaited new generation RR2 Intacta seeds (of 18.5 reais, equaling US$8.15, per hectare, or 16 percent off the 115 reais per hectare price) if they signed an agreement promising not to sue the company for royalties paid in previous years. Initially the offer was not received well. Glauber Silveira, head of Brazil's soybean growers association APROSOJA, said farmers should not sign and should continue pursuing royalty claims in court: "We believe producers are being tricked into signing a contract that will get them trapped to Monsanto for every new technology".[242] After negotiations, however, in April 2013 it was announced that the nation-wide soy growers federation APROSOJA dropped its own lawsuit against Monsanto, and FAMATO from Mato Grosso expressed support,[243] while the Rio Grande do Sul chapter of APROSOJA remained opposed.[244] "Although the contract could be seen as a compromise in which soy growers obtained a discount because of their partially successful efforts in courts, it was a short term gain at the expense of the long-term rights of farmers as users of IP[intellectual property]-goods" (Filomeno 2014: 100). As of this writing, various lawsuits are currently in progress, challenging particular patents,

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[241] Filomeno (2014: 99).

[242] "Monsanto Modified-Seed Royalty Agreement Opposed by Groups," *Bloomberg Business*, 20 February 2013, http://www.bloomberg.com/news/articles/2013-02-20/monsanto-modified-seed-royalty-accord-opposed-by-brazil-groups.

[243] "Brazil soy group says to end legal dispute with Monsanto," Reuters, 9 August 2013, http://www.reuters.com/article/2013/08/09/monsanto-brazil-lawsuit-idUSL1N0GA00720130809

[244] Filomeno (2014: 100).

the restrictive contracts Monsanto is offering in return of providing access to the new seeds, or the entire system.

## The Exit Reaction and the Case for Conventional Seeds

So, IPR rules over GM seeds remains in favor of TNC demands. As a result, a good portion of Brazilian farmers are spending an effort to keep their production non-GM. They are motivated by the pull factor of the premium price for non-GM output in export markets, and the push factor of high royalty fees for GM inputs. However, because the biotech TNCs have by now purchased the major seed companies in Brazil, and through their operations have been promoting almost exclusively the development of patented GM seed varieties, farmers are increasingly finding it difficult to find elite non-GM seeds.[245] Under these conditions, keeping a robust supply of non-GM seed requires explicit market coordination efforts. ABRANGE is an association that devotes itself to the task of constructing a parallel production chain, called Soja Livre ("Free Soy"), by connecting farmers and retail chains interested in non-GM soy production and also suppliers of inputs compatible with this kind of production. ABRANGE executive director Ricardo Tatesuzi de Sousa explains, "Having a substantial non-GM seed option is necessary for the market to regulate itself, so to say, by balancing the prices. It's an issue of having the right to choose. That's why the motto for our Soja Livre program is 'cultive sua liberdade de escolha'

[245] Author's interviews with industry and Ministry of Agriculture sources. Also see Filomeno, who notes that "According to sources from APROSOJA-MT and ABRANGE, there were indications that Monsanto had been encouraging local seed multipliers to reduce the proportion of non-GM seeds produced" (2012). Similar complains have been articulated in the US context. A survey (Gray 2010) in the agriculture-intensive counties of Illinois (USA) asked farmers in 2009-2010 if they had access to high-quality corn seeds that were not genetically modified to contain Monsanto's Bt insecticide trait. In all seven counties, at least 32 percent of farmers said "no," and in one county the figure was 47 percent.

[cultivate your freedom of choice]. In the USA and Argentina you don't have that choice any more".[246]

For ABRANGE, the major source of non-GM seed lines is the public agricultural research institute EMBRAPA—"no one else does it anymore," Sousa argues. EMBRAPA not only continues to work on breeding non-GM plant varieties, but also invests in public interest-oriented biotechnology research, such as the development of biofortified beans that would, when ready, be supplied to farmers free of royalty fees or other subsidized forms.[247] EMBRAPA is run as a state economic enterprise and ranks among the country's biggest companies. However, since it has been experiencing problems with generating investment capital, the big debate in Brazilian agriculture currently is whether EMBRAPA should be partially privatized—biotech TNCs are known to be interested. For the many opponents of this idea, such an action could jeopardize the "country's interests and food sovereignty".[248] The president of the National Union of Agricultural Research and Development Workers (SINPAF) comments that a privatized EMBRAPA would be pressured only to invest in the most profitable areas of agribusiness; and the needs of family agriculture, which corresponds mostly to the production of domestically consumed foodstuff, would be marginalized in research priorities.[249]

For the time being though, through EMBRAPA, Brazil is regarded as the developing world's biggest agricultural research spender outside China. It seems that where agricultural producers are pressured in one area, breathing space is sought and to some extent found

[246] Author's interview with Ricardo Tatesuzi de Sousa (Sao Paulo, March 2013). Also see ABRANGE president César Borges de Sousa's article "Mitos transgênicos," *Valor Economico*, 12 April 2012, http://www.valor.com.br/opiniao/2664802/mitos-transgenicos, last accessed December 2015.

[247] Author's interview with Filipe Teixeira, EMBRAPA's Head of Business Secretariat (Brasilia, May 2013).

[248] "EMBRAPA vive dilema por competitividade," *Valor Economico*, 21 March 2012, http://www.valor.com.br/empresas/2579668/embrapa-vive-dilema-por-competitividade, last accessed December 2015.

[249] Quoted in ibid.

somewhere else. In the USA, Monsanto represents "national capital" and has enjoyed strong state support in IPR despite some resentment from the farm sector, which otherwise enjoys high net production subsidies.[250] In Argentina, the government compensates the farm sector for heavy taxation of agriculture by keeping weak IPR rules over agricultural inputs despite TNC pressure. In Brazil, in response to tight IPR rules that come about mostly due to TNC pressure, public research and development in inputs is promoted far more extensively than in Argentina.

## Conclusion: Assessing Epistemic Coalition Input

Brazil has had a contested policy regime. The contestation over biosafety legislation, which lasted roughly from 1998 to 2005-2007, occurred around an axis where consumer rights, environmental, and landless peasant movements were on one side, together with public institutions (such as the ministries of Environment and Health) to which they enjoyed greater access; and on the other side were commercially-oriented farmers (especially of soy, especially from Southern Brazil) and the biotech industry, supported by favorable public institutions (such as the Ministry of Agriculture); with scientific experts and their institutions (such as EMBRAPA) playing a pivotal role and increasingly siding with the latter. The opposition enlisted some members of the agricultural research and development community; and respectable scientists disagreed over whether initial GM approval tests were made too hastily. Initially the opposition managed to put a halt on approvals and generated doubts about whether

[250] 142 patent infringement suits against 410 farmers and 56 small businesses in more than 27 US states; in which the firm has won more than $23 millions from its targets, are reported in "Monsanto vs. U.S. Farmers," a report by the Center for Food Safety, 2005, available at http://www.centerforfoodsafety.org/files/cfsmonsantovsfarmerreport11305.pdf, last accessed December 2015. In 2009, the US Department of Justice began investigating whether the company's activities in the soybean seed markets were breaking anti-trust rules. In November 2012 Monsanto announced that it had received official notification that the inquiry was closed without any enforcement action. See "Monsanto Notified that U.S. Department of Justice Has Concluded Its Inquiry," *Monsanto*, http://www.monsanto.com/newsviews/pages/monsanto-notified-that-us-department-of-justice-has-concluded-its-inquiry.aspx, last accessed December 2015.

Brazil would ever allow GM crop cultivation. However, the pressure from agricultural producers put the liberalization of GMOs on the agenda, and the support of influential scientists, such as Walter Colli, Mauricio Antonio Lopes, Ernesto Paterniani, was a necessary ingredient to move it forward. The result was a change in the views about the desirability of GM crop cultivation held at the top echelons of the government, such that agricultural production agenda practically defeated the agenda associated most strongly with the ministry of environment. Both the way the opposition became influential, and the way it was defeated are characterized by epistemic coalition-type ideational struggle around the policy choice.

During this time, there was little evidence of dialogue and idea exchange between the farmers and the opposition. Once the biosafety contestation was resolved largely in favor of GMOs, the opposition became increasingly irrelevant to policy, and farmers found themselves alone in their disagreements over IPR relating to the seeds provided by the biotech TNCs. Under the supposedly left-wing PT government, "state autonomy" was realized against the greater part of the public, and PT's own base, who opposed GMOs; but not against the TNC, who asked for and got strict IPR. A system of royalty collection on grain delivery that started to work despite the farmers' opposition returned technology rents to the TNC. As a result, while the technology seems to be working well agronomically, impact studies can barely document net profit improvement for the farmers from the adoption of GM seeds (da Silveira and de Carvalho Borges 2007). Had there been a different kind of epistemic coalition, centering on an opposition to the property claims associated with the technology and generating public mobilization for that purpose, government reaction to the TNC IPR enforcement maneuvers, and the economic impact of the technology for the farmers, could have been different.

The case of Brazil, where there *was* a robust, active, confrontational anti-GMO mobilization among consumer NGOs, shows clearly the limits of what an opposition to GMOs can achieve in the presence of a strong domestic producer sector. This leads to the conclusion that a frontal campaign against the GMOs is likely to be doomed to irrelevance where the domestic producers are strong because the stars are then aligned for permissive policies as two favorable stakeholders meet. The case of Brazil also shows the limits of what the domestic producers can do vis-a-vis the biotech TNC in the absence of supportive epistemic brokers and allies.

The next chapter examines the case of Turkey where civil society mobilization similar to the one observed in Brazil launched a confrontational anti-GMO campaign, and in the absence of a well-organized producer sector in favor of the adoption of the new technology, managed to get GM crop cultivation banned.

## CHAPTER VI

## THE CASE OF TURKEY

### Introduction

The regulation of genetically modified organisms (GMOs) entered Turkey's public agenda in the late 1990s and, after a decade of stalemate between competing pressure groups amidst intense public debate, it ended up being resolved with complete prohibition of GM crop cultivation in Turkish territory by the 2010 Biosecurity Law. The Minister of Agriculture Mehdi Eker describes the outcome: "We have banned GM farming by law. We are conservative and not liberal on this question. Because Turkey's ecology, geography, agri-strategic value requires that".[251] Why did Eker's pro-business government, while adopting "liberal" regulations on many other economic questions, choose to block GM farming categorically? What processes led the government to decide that Turkey's said qualities required such an extreme—compared to policies elsewhere, even most countries within the neighboring European Union (EU)—measure?

The outcome is intellectually puzzling. In previous decades, Turkey had been one of the major adopters of the Green Revolution seed varieties. When it came to GM seeds, there were economic interests to be served by a permissive regulatory regime. Turkey is one of the world's top cotton producers and one of the top importers too, due to high demand from its large textile and clothing industry. The UNDP and WB expert Fukuda-Parr (2007) expresses surprise that Turkey did not adopt large-scale GM cotton farming despite the large potential productivity gains. The country is also an important producer of corn and struggles to attain self-sufficiency

[251] Bakan Eker: 'GDO'da Muhafazakarız.' *Haberler*. January 11, 2012. http://www.haberler.com/gdo-da-muhafazakariz-3259828-haberi/

in that crop. Seeing the potential market, transnational biotech corporations (TNCs) approached Turkish authorities for field trials of GM cotton and corn varieties in 1998. As will be discussed in detail below, the major association of industrially oriented farmers expressed interest in these varieties and opined that they could be a viable option. The agrifood industry similarly opposed strict restrictions regarding what kind of ingredients they would be allowed to use. The US embassy actively lobbied for a permissive regime. In the end, however, these actors saw defeat. Why did the statesmen become convinced that the public interest laid elsewhere? When the rather prohibitive Biosecurity Law was voted in the Parliament, the only opposition was on the grounds that the law was too lax. How come?

Let us dispel two possible explanations of Turkey's prohibition of GM farming that may immediately come to mind. First, is it somehow because Turkish society is predominantly Muslim? In fact, despite that an Islamic anti-GMO movement (gathered around the NGO Gıda Güvenliği Hareketi) has existed in Turkey, arguing that GMOs are the devil's work and their consumption is religiously forbidden; such opposition emerged rather late, after the tone of the policy debate had already been set up through years of activism by a left-leaning, secular movement. Besides, the anti-GMO argument of this particular Islamist group is far from being a universally recognized imperative of Islam in or outside Turkey.[252] Other Muslim countries like Egypt and Iran, where religious considerations normally carry much greater weight in public decision-making than in Turkey's secular polity, have been permissive to GM farming, even experimenting with ambitious programs for R&D in this area.[253] In any case, archival research and elite interviews demonstrate that religious justifications played only a minor role in policy

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[252] Worldwide, scholars of Muslim creed and jurisprudence are as much divided among themselves as those of other monotheistic religions, and prestigious institutions like the International Islamic Fiqh Academy hold that there are no rules within Islam against genetic engineering (Omobowale et al 2009).

[253] See annual ISAAA (International Service for the Acquisition of Agri-biotech Applications) briefs.

debates over the GMOs in Turkey.[254] In short, it is not clear that Islam would require Turkey to ban GM farming, nor did the government ban GM farming because of such a belief.

A second line of thinking could center on the influence of the GMO-skeptic Europe. Was Turkey's prohibitive regime caused by its EU membership prospects? We have to qualify the answer and note three facts in this regard. First, even though enthusiasm for EU accession influenced policy-making in Turkey in the early 2000s, it soon became clear that membership would not become a serious prospect until the day the diplomatic-military conflict over Cyprus would end, and faced with such unlikely odds the Turkish government put the harmonization of Turkish law with EU norms in the back burner by the mid-decade. Had the process continued in full force, conformity over the regulation of the GMOs would be the least of their concerns, given many other higher-profile political issues awaiting resolution. If the Turkish regulations ended up taking the European framework as a model to some extent, this should be understood not as the working of an international constraint but as a product of choice—a choice not repeated for many other issue areas that would actually matter more for EU membership prospects.[255] Furthermore, even though *some* European countries have maintained a national moratorium against GM cultivation in their territory, this was not required by EU law; and farmers in countries like Spain, Poland and Germany have been growing GM crops. When European observers attended the study groups for drafting Turkey's biosafety law, they noted that it was going to a direction too stringent.[256] Thirdly, however, Europe influenced Turkey in

[254] In addition, Veltri and Suerdem's (2011) formal content analysis of Turkish newspaper articles on the GMO debate demonstrates that Islam as a worldview was associated with two different representative frames, one weighing benefits and risks against each other and arguing for a mild precautionary stance justified with religious prudency, and the other viewing the GMOs, among other things, as part of a Jewish conspiracy to capture the world's food sources.

[255] See Cengiz and Hoffman (2014) for a scholarly update on EU-Turkey relations.

[256] See opinions by Rodolphe de Borchgrave, a market analyst who had participated in auditing EFSA, and Dr. Piet van der Meer, a biologist who had served EU and member governments in the capacity of consultant, expressed in a

the sense that the anti-GMO opposition built on ideas and advocacy strategies used earlier by the European opposition groups in constructing their influential narrative, in which, interestingly, the EU institutions did not fare favorably. European and Turkish opposition groups alike have viewed EFSA (EU agency responsible for GMO monitoring) as the biotechnology TNCs' "puppet" for being too permissive.[257] In short, the EU would not require Turkey to ban GM farming, nor did the government *have to* care much about what the EU would require. The influence over Turkish policy-making came not so much from the EU institutions themselves as from an EU-skeptic European public.

Therefore neither Islam nor Europe determined Turkey's choice. This chapter demonstrates that Turkey's prohibition of GM farming (and its rather restrictive regime of approvals for GMOs at large) was the outcome of an ideational battle over how GM seeds work, what they are good for, and why they may or may not be needed. The majority of the farm sector, consisting of small producers that are weak and dependent on State for their organization, never articulated a clear view over the GM crops, even though they became the protagonists of narratives told by other, urban-based groups. A concern for preserving biological diversity made statesmen and domestic scientists skeptic towards the potential gains from the GM crops. It was feared that GM seeds would make Turkish farmers dependent on transnational biotechnology corporations (TNCs) for seed supply through biological and/or intellectual property rights (IPR) restrictions. These concerns were joined by popular fears over the food safety risks from GM food, addressed masterfully by an epistemic coalition of activists that constructed a

January 2010 workshop organized by the Federation of Food Industry Associations in Ankara, available in print as *GDO Gerçeği: Gıda Sanayisinde Biyoteknoloji—Ulusal Biyogüvenlik Yasası Tasarısı Çalıştayı Notları*. Ankara, 2010.

[257] Baykan (2012) analyses the connections between the European and Turkish anti-GMO groups. The subject will be taken in greater detail below.

comprehensive anti-GMO narrative that tapped on social norms, ideology and selective scientific evidence. The narrative became a causal factor in the making of policy in part because the statesmen were convinced by its truth, and in part because the narrative held an important sway among the public, pushing the statesmen to send a clear message by taking extreme measures.

In this chapter I trace the process leading to the emergence of Turkey's particular policy regime, based on data from archival research (official documents and their drafts, position papers by industry associations, publications by the NGOs, US embassy cables, newspapers) and elite interviews (with politicians and bureaucrats, industry spokespeople from agrifood, farming, and seed sectors, activists and scientists) conducted in Turkish over the course of 2011-2014.

## Introducing GM Crops: Bureaucrats, Experts and the Civil Society

### Initial Reception by the Bureaucracy

In 1998, Mehmet Uyanık was heading the Department for Seed Affairs at the Ministry of Agriculture when an American company presented a dossier for importing a GM corn seed variety. At the time, the country had no public regulations regarding the production and consumption of GMOs.[258] Agricultural scientists and practitioners had little familiarity with them. Basic science in biotechnology was still at an infant stage. When Turkish Academy of Scientific and Technological Research (TÜBİTAK), upon its establishment in 1982, prepared a twenty-year vision for the country's science policy for the 1983-2003 period, biotechnology was not among the highlighted priority areas. Advanced research in biotechnology, starting with the

[258] Author's interview with Mehmet Uyanık (July 2012, Ankara). For conventional seeds, Turkey typically required performance tests to one year, allowed companies to submit data from their own tests, and readily approved almost all varieties proposed for registration (Gisselquist et al 2002).

establishment of the Middle Eastern Technical University's multidisciplinary institute in 1989, was far from generating a robust research output yet.[259]

Given the relatively low degree of scientific capacity overall, it was not surprising that the state bureaucracy's knowledge regarding the GM crops was rather thin. The Ministry of Environment saw it fit to leave GMO regulation to the Ministry of Agriculture, and within Agriculture, the Directorate-General of Agricultural Research (Tarımsal Araştırmalar Genel Müdürlüğü, TAGEM) was considered to be the appropriate address to handle the issue, partly because TAGEM was Turkey's national focal point for the UN Convention on Biological Diversity and the ongoing talks for the Cartagena Protocol on Biosafety.[260] This decision proved to be fateful, as the TAGEM bureaucrat Vehbi Eser (PhD, plant-breeding) would assume in time a defining role in Turkey's response to GM crops, not so much due to the official weight of his position as a mid-level bureaucrat, which was quite limited; but due to knowledge he held in a rather esoteric subject and the self-confident and pro-active manner in which he asserted his knowledge in conversations with his interlocutors inside and outside the state bureaucracy.[261] The Embassy of the decisively pro-GMO USA would later describe Eser's role in striking terms: "Unfortunately, Turkey's official expertise in the sector appears to be limited to one key individual—the Head of Dept of the Biotechnology Group at TAGEM—who has controlled the direction and restrictive nature of the legislation and is expected to angle for the position of head

[259] Haspolat (2004).

[260] Bureaucrat Ercan Velioğlu's comments in a workshop organized by the Ekoloji Kolektifi, the proceedings of which were later published as *Görünmez Elin Ekolojisi* (Ankara, 2009). Supportive information comes from my interviews at the Ministry of Agriculture (2011-2012, Ankara).

[261] Author's interviews with statesmen, industry and farmer representatives, and NGOs, (2011-13, Ankara and Istanbul).

of the new biotechnology agency".[262] Dr. Eser has held a deeply skeptical view of GM crops' environmental impact as well as the motives of the TNCs that develop these varieties, and he admits that participation in Cartagena meetings was very influential in his view of the subject: "We learned a lot there".[263]

That information about the GMOs within the agricultural bureaucracy was limited, and that the available information was concentrated at a unit highly influenced by the Cartagena Protocol's biodiversity-oriented framing of the issue provided the GM crops an unwelcoming policy environment from the start. The non-cooperative relations between the TNCs and the mid-level bureaucracy made it difficult for the TNCs to communicate their vision and form an alliance with the farmers. A crucial case in point is the predicament of GM crop field trials. Finding the GM seed case on its desk, TAGEM decided that special field trials would be undertaken for GM seed varieties to see how they would perform in Turkey's ecosystems before a full approval procedure could be formulated.[264] Permissions were granted, to be carried out during 1998-2000, to the American firms Monsanto and Pioneer Hi-Bred for field trials of three crops—cotton, corn, and potato, genetically modified to express herbicide- or insect-resistance.

One strategy of the biotechnology TNCs worldwide has been to communicate promising results from GM seed field trials to the farming community and thus generate local demand for the seeds in order to exert public pressure in favor of permissive policies. (TNCs have even been accused of staging *faits accomplis* whereby illegally distributed GM seeds gain widespread use before any regulations are officially adopted). In Turkey, the results of field trials have never reached the public, and their outcome remains a mystery in the agricultural community. The

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[262] US Ankara Embassy cable (ref: 05Ankara 862) to Washington DC, dated February 5, 2005, last accessed at http://wikileaks.org/cable/2005/02/05ANKARA862.html in July 2014.

[263] Author's interview with Vehbi Eser (August 2012, Ankara).

[264] Haspolat (2004).

common understanding is that the Ministry of Agriculture withheld the results and never publicized them; but various actors impute different reasons for this. Anti-GMO activists like Ahmet Atalık from the Chamber of Agricultural Engineers believe that the Ministry shared the companies' desire for positive results but that the trials demonstrated the failure of the GM varieties, so together they opted for secrecy.[265] The author's interviews, however, point to a very different picture: relations between the TNCs and the Ministry (especially TAGEM) are marked by mutual suspicion. Monsanto wanted to turn the trials into a public event and invite high-level bureaucrats including the Minister of Agriculture Hüsnü Yusuf Gökalp (PhD, agronomist) himself, in addition to representatives from the influential Adana Farmers' Union. Apparently they were prevented from doing so due to lack of cooperation by TAGEM, which was officially responsible for the trials and which wanted to keep the GM seed issue under its bailiwick. Bureaucratic sources, on the other hand, assert that the results were not disclosed because the companies breached certain terms of the agreement in their conduct relating to the trials.[266]

Pro-GM advocates furthermore claim that the seeds performed rather well in trials. Aktas and Yurdakul (2005), in a working paper that seems to have gone unnoticed in public debates, cite some results on trials for Bt corn in Çukurova.[267] These results indicate that the GM seeds were associated with yield increases (due to reduced damage by pests) of around 30-35% compared to non-GM high-yield hybrid seeds. The projected impact on farmer's gross profit would be uncertain, though: if increased production translated to lower commodity prices by around 30%, farmer profits would actually decline under the price differentials assumed for the

[265] Quoted in Baykan (2012: 191). Supportive information comes from my interview with Ahmet Atalık (Ankara, August 2011).

[266] Author's interviews. Note that, fearful of the unauthorized release of GM varieties, Ministry of Environment issued a communiqué in June 1999 asking governors to inspect the production and sale of unregistered seeds.

[267] The authors report the source of the results as "Şen et al (2002), cited in Koç (2003)".

expensive GM seeds. These trial results, if correct, encapsulated the policy conundrum faced by the policy maker concerned with national economic interests. The technology promised productivity increases, but whether Turkish farmers could reap economic benefits from it would depend on the monopolistic/oligopolistic pricing strategies of the technology supplying TNCs.

As TAGEM bureaucrats were ambivalent about the results, advice was sought at a higher level. In late 1999, the State Planning Organization formed a special expert committee to discuss the available information and develop a national policy for biotechnology and biosecurity, in order to provide input for Turkey's 8$^{th}$ Five-Year Development Plan. The report is worth looking at in some detail, as it is a striking attempt by the state to solicit expert consensus on the matter viewed comprehensively as a policy question.[268]

## The Official Experts

The committee's final report, co-written by more than a dozen participants and reflecting the diversity in their opinions, is marked with an ambivalence in its framing of genetic engineering applications, torn between viewing them as inherently perilous and arguing for a blockade on the one hand, and promoting national capabilities in this potentially strategic area to preempt foreign monopoly, on the other. The report states that "GMOs' impacts on the environment and human health cannot be determined with scientific precision yet and debate continues over the existence and the magnitude of the associated risks. However, instead of waiting for these debates to come to conclusion and uncertainty to disappear, [we] recognize the need for accepting the Precautionary Principle and already setting up the normative framework accordingly" (p, 29). At the same time, and somewhat in contradiction with the report's highly

[268] Devlet Planlama Teşkilatı, Sekizinci Beş Yıllık Kalkınma Planı Biyoteknoloji ve Biyogüvenlik Özel İhtisas Komisyonu Raporu, Ankara, 2000.

suspicious framing of the virtues of GMOs, it is predicted that genetic engineering applications in agriculture will continue to grow in importance, and Turkey too should launch an initiative for scientific progress and industrial growth in this area, making it a priority area before and over pharmaceutical biotechnology. Misgivings about foreign corporate control over the technology is the dominant sentiment running through the report, so much so that, in an opinion appended to the report, chemical scientists Tunçer Özdamar and Pınar Çalık criticize the selection of agricultural biotechnology as a priority area for public research not least because "the words 'priority area,' being reminiscent of the propaganda language used by foreign corporations, is ill-suited to the spirit of this report," p. 56).

The State Planning Organization's expert panel, then, displayed a conviction that there was high scientific uncertainty regarding the virtues of the technology, that foreign ownership made the uncertainty all the more ominous; and that Turkey should nevertheless invest in this area to attain national capabilities. Perhaps some of the participants thought that TNCs were not to be trusted for all the relevant information regarding the risks associated with the products they were marketing, but access to information would be easier when the products can be developed domestically—added by the confidence that public biosafety monitoring capacity would improve enough by the time when such domestic production capacity was reached. Maybe others had a purely nationalist bias hidden behind the risk discourse: Public health and biodiversity risks were of significance only when there were no organized domestic interests marketing the products generating the risk. (Both ways of thinking would ultimately influence policy: arguments by the MPs participating in the Parliamentary debate for the Biosafety Law draft show as much, as will be seen below). In any case, TNC control through IPRs, by magnifying the fears associated with scientific uncertainty, made permission for the GM crops a non-attractive option for the time being.

Consequently, Turkey abandoned GM crop field trials, and public decisions regarding the matter were postponed until the making of a comprehensive law on biosafety. Work on such a law began in September 2002 under the auspices of the UN Environmental Program Global Environmental Facility's (UNEP-GEF) biosafety program and a team at TAGEM, again, was in charge of the effort. EU regulations were taken as a source of ideas, although there was no obligation to model Turkey's regulations after the European model.[269] By 2004, the project resulted in a law draft that was circulated for discussion within the government.[270] The draft—a detailed 80 articles laid out in 23 pages excluding the appendices—marked a regulatory approach that was obviously precautionary. "Zones of genetic diversity" would be established and GM cultivation would not be allowed close to these zones as well as close to areas devoted to organic agriculture. Those who applied for approval of GMOs for either cultivation or consumption (read, firms marketing them) would be responsible for any harm to consumers and the environment that resulted because of the defects of the organism, "including defects that were not noticed with the extant knowledge and technology at the time of commercialization;" and the burden of proof for harm was defined in a loose manner.[271]

The text thus laid down many reservations about GM crop cultivation but, crucially, did not yet categorically ban it. It should be fair to count this draft, prepared with little input from the NGOs,[272] as a reflection of the autonomous preferences of the small bureaucratic circle that

[269] Arzu Önal and Birgül Güner from the core bureaucratic team preparing the draft make this point clear (author's interviews, August 2011 and July 2012, Ankara).

[270] 2004 draft, titled Ulusal Biyogüvenlik Kanun Taslağı, obtained from TAGEM.

[271] See articles 36 and 33(e).

[272] For a list of organizations participating in the workshops see the document described above.

disproportionately controlled knowledge over the matter at this early stage, before the issue became a matter of public debate.

## Enter Civil Society

Turkey's agricultural bureaucracy thus proved a difficult partner for the biotechnology TNCs. Soon, the regulatory process saw engagement from a combative civil society platform, and this further intensified the resistance to the GMOs and locked Turkey's policy regime into a prohibitive path.

Up until 2004, there was no indication that the larger public had heard of the GMOs. A few alarming articles appeared in small environmental magazines. Ecology-minded activists interested in the local and organic food movement were organizing workshops to share information among themselves, and by the turn of 2004 they decided to launch a movement dedicated to the GMOs. Among them, Arca Atay, Levent Gürsel and Mebruke Mayram penned a manifesto and started to invite NGOs to take part in a No-To-GMO Platform.[273] Describing GM cultivation as a totalitarian technique that destroys all other (ecological, etc.) forms of agriculture, the manifesto called for the prohibition of GM seeds.[274]

Although motivated by a political vision that characterized GMOs as an instrument for the undesirable expansion of the corporate industrial-agricultural complex, the Platform activists recognized the need to engage with the scientific arguments for and against this technology. Levent Gürsel Alev, one of the initiators of the movement, says "The scientists who talk to the

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[273] The founding of the No-To-GMO Platform and the progression of their activities is narrated in Baykan (2012). Supportive information comes from the author's interviews with Fevzi Özlüer from Ekoloji Kolektifi (Ankara, August 2011), Uygar Özesmi from Greenpeace Mediterranean (İstanbul, August 2011), Ahmet Atalık from the Chamber of Agricultural Engineers (Istanbul, August 2011).

[274] The "Yaşam Patentlenemez" declaration is available at http://bianet.org/english/print/41053, posted August 21, 2004. Also see http://www.greenpeace.org/turkey/tr/news/gdo-ya-hay-r-platformu-kuruldu/

media claim that the GMOs are not proved harmful for the health [sic]. We want to know what is [actually] going on in order to refute this argument".[275] Expert knowledge would be required and the activists formed three committees in the areas of science, health, and law to scan the technical literature on these matters—their efforts would culminate in the organization of a national conference in 2008.[276] Scientific research on the particular characteristics of Turkey's plant biodiversity or population epidemiology (like the idea that resistance to the Kanamycin class antibiotics, a possible side-effect of the consumption of GMOs by humans, would be a particularly serious problem for Turks because of greater incidence of tuberculosis in among their number) have been cited in order to argue for a precautionary regime. The joining of the influential Chamber of Agricultural Engineers in 2005 was important in giving the Platform access to greater expertise. The Chamber's chairman Gökhan Günaydın (PhD in economics, with prior training as agronomist) would later launch a career as a politician partly building on his vocal stance on the GMO debate and related environmental and food safety issues.

The Platform was homegrown but transnational sources helped shaped its experience both through ideational inspiration and, to a lesser extent, organizational support. The impetus for action that gave the Platform publicity in Turkey came when the transnational environmental organization Friends of Earth (FoE), in anticipation that the USA would turn the EU's ongoing moratorium on the GMOs to a trade dispute at the WTO, launched a "Bite Back" campaign to publicize arguments against the GMOs and shift the ground for debate. As part of the campaign the FoE would tour Europe with a giant "monster tomato" balloon (referring to the GM Flavr Savr tomatoes marketed in the USA). Turkey was not included in the plan, until Turkish activists noticed it and wanted to stage their own version. The initial point of contact came in March 2004

[275] Interview with Levent Gürsel Alev, quoted in Baykan (2012).

[276] Ekoloji Kolektifi, *Görünmez Elin Ekolojisi* (Ankara, 2009).

when a Turkish environmentalist group attended meetings with the FoE during a visit to Brussels. When they returned to Turkey, the Platform decided to work on a monster tomato tour in Turkey.[277]

The "monster tomato" toured Turkey during September and October 2004. The campaign received media attention and provided the context to insert food scientist Candan Gurakan's research documenting transgenes in tomatoes and corn sold in the country. The finding was framed in national news with the titles "Frankenstein food" and "poison";[278] and a public outcry ensued. When the Platform's tour ended with a concert in the capital of the nation, the Minister of Agriculture Sami Eken felt the need to meet the activists at the demonstration site and give an appeasing talk. The campaign was concluded with a demand for broader public discussion for the biosafety regulatory framework in the Parliament. The Parliament would respond by calling a public hearing in March 2005.

In the meantime, however, the mainstream media's attention gave the Platform's views exposure to a degree that they probably had not expected. While this was good news for the cause, a certain shift in focus also occurred. The initial ecological, anti-capitalist orientation of the core members of the Platform faded into the background in the reception of the message, as the public was much more interested in a possible food scare.[279] Popular soccer commentator Erman Toroğlu was heard pontificating on the perils of the GMOs amid his warnings that vegetables with growth hormones could (undesirably) lead to homosexuality. (Thanks to his popularity and past work as groceries wholesaler Toroğlu also found a seat in the Parliament's

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[277] Baykan (2012).

[278] Hülya Ünlü, *Akşam*, October 21, 2004.

[279] Fevzi Özlüer from the Ecology Collective, an early initiator of the Platform stresses this point. Author's interview.

public hearing).[280] The monster tomato image, and popular commentary handled carelessly by the mainstream media led to widespread public fear about GM vegetables—although in fact GMOs are much more relevant to field crops like cotton, corn and soy. With vegetable sales collapsing, and growers burning the maquettes of Erman Toroğlu in protest;[281] farm and agrifood interests found themselves having to form opinions regarding the GMO debate and weigh in on the regulatory process to protect their interests.

## What About Producer Interests?

### Agrifood Industry: Reluctant Lobbyists

Providing more than a tenth of the country's industrial output and employment, Turkey's agrifood industry (processors who handle agricultural commodities and process them into food and feed) is large and thriving. The sector's political representation is handled by the Federation Of Food And Drink Industry Associations Of Turkey (TGDF),[282] led by a small number of large firms, including the American Cargill. How did the sector position itself vis-à-vis the GMO debate?

Biotechnology TNCs expected the agrifood industry to help push for a more permissive regime. Hamit Esin, Monsanto's regulatory manager in Turkey recalls, "During the 1998-2003 period Monsanto became infamous in Europe for going aggressively and all alone against the public. We in Turkey did not want to face the same predicament and sought to form a broader coalition".[283] The agrifood industry could be a natural ally because a restrictive regime

[280] "Toroğlu: 'Türkiye'de kanser riski haritası yok'," *Vatan,* March 17, 2005.

[281] "Çiftçilerden Erman Toroğlu'na protesto!.. Maketini yaktılar!.." *Milliyet*, October 22, 2004.

[282] *Türk Gıda ve İçecek Sanayi Envanteri 2010*, Türkiye Gıda ve İçecek Dernekleri Federasyonu, 2011, Ankara.

[283] Author's interview with Hamit Esin, August 2012, Ankara.

encompassing the production and consumption of the GMOs would mean not only lost business opportunities in the seed market but also difficulties in supply chain management for food and feed processors. To Monsanto it was obvious from the work being done at the Ministry of Agriculture's TAGEM unit that such a regime was in the making, and they tried to mobilize the agrifood industry, especially poultry interests (which relied on imported soy and corn for feed) to pay attention to the regulatory process. There was not much response, however. The industry's regular point of contact at the Ministry was the Directorate-General of Protection and Control (Koruma ve Kontrol Genel Müdürlüğü) overviewing issues of food safety and imports; and seeing little action there, they did not want to disturb the status quo, which was just fine with no regulations on the matter and no public attention.

However, the status quo was not as safe as they assumed. In 2000, after the Biotechnology Expert Committee's report discussed above, the Ministry of Agriculture not only discontinued the field trials but also began writing a decree that would demand GMO-free certificates for all food and feed imports to Turkey. "Unawares of the complexities of identity preservation of non-GM ingredients; the Ministry folks thought that this was just an ordinary certificate, whereas it would actually raise the costs of imports dramatically," Esin comments.[284] When this regulation was heard of, the feed industry panicked and called for a close-doors meeting with the participation of scientists, and thus convinced the Ministry bureaucrats that it would not be feasible to implement the regulation as intended. The US Embassy observes that the industry became much more engaged with the regulation process afterwards. One thing they fought for was ending TAGEM's monopoly on the issue and getting the Directorate-General of

[284] Ibid.

Protection and Control to develop expertise and acclaim a greater role.[285] (The Embassy itself would become actively involved to make sure that GMO regulations would not prejudice imports from the USA).

Once the No-To-GMO Platform started a public debate over the matter and calls for complete prohibition of GMOs were made, it was obvious that the industry had to take a high-profile stance. In December 2004, responding to the Monster Tomato campaign, the TGDF organized a public conference for a discussion of the GMOs, and publicized the proceedings under the title “The GMO Truth.” In the preface to the publication, biotechnology scientist Selim Çetiner highlighted that the conference was held with the participation “not of the American firms that produce this technology but of qualified experts from EU countries where there is the greatest consumer reaction to this technology.” Çetiner was quick to note that contrary to widespread belief the EU regulations allowed production and consumption of the GMOs, and countries like Spain produced much of their corn in this way.[286]

Food industry leader Rint Akyüz says, “Our conference delayed the finalization of the regulatory regime by five years because they [bureaucracy] realized that they did not know about the various dimensions of the issue. They did not know the costs entailed”.[287] After some rounds of public consultation the government responded by shelving the law-making effort, probably waiting for the public attention to subside and the worldwide trends and international rules to materialize a bit more—the resolution of the trade dispute between the USA and the EU would

[285] US Ankara Embassy cable (ref: 03Ankara6214) to Washington DC, dated October 3, 2003, last accessed at http://wikileaks.org/cable/2003/10/03ANKARA6214.html in July 2014. Supportive information comes from author’s interviews within the industry.

[286] GDO Gerçeği, Modern Biyoteknoloji Genetiği Değiştirilmiş Organizmalar ve Gıda Güvenliği Konferans Notları, İstanbul 2004.

[287] Author’s interview with Rint Akyüz (August 2012, Istanbul). Akyuz chairs Rota, one of Turkey’s major companies in food processing and commodity trade. He has served as the vice president of the TGDF and the president of the Association of Starch Producers.

be particularly important.[288] Public attention would never completely fade away, however; the activists were bent on ensuring that. In 2008, the No-To-GMO Platform started another campaign called "Food, Water, Seed are Rights, No to GMOs." Again, it was the food safety aspect that caught greater attention and caused a public questioning of the delay in the making of a biosafety law. By this point, exclusively food safety-focused NGOs, such as the Europe-inspired Slow Food Turkey (*Fikir Sahibi Damaklar*) or the Halal-oriented Food Safety Movement (*Gıda Güvenliği Hareketi*), and individuals such as Professor Kenan Demirkol (medical doctor), started to dominate public debates with their highly visible output.[289] Surveys showed that a great majority of the public was aware of the GMOs (Tuna and Ozdemir 2009), and 64 percent would not buy such food if given the choice (Basaran et al 2004).

After the campaign, a skirmish ensued along previously established lines. First, to appease the public the Ministry of Agriculture issued a decree banning the production and importation of all GMOs. Stakeholders from all sides protested, arguing that the issue required a proper law and not a hastily drawn-up bureaucratic decree, and the latter was repealed in courts. The agrifood industry organized another conference to provide input for the law to be made.

In the end, with its lobbying efforts the agrifood industry managed to preempt the most undesirable parts of the regulatory bill, and maintain a case-by-case approval regime for the import of food and feed containing GMOs (while banning their cultivation in Turkey) when the Biosafety Law became official in 2010, but the design of the regime is far from making the industry happy. TGDF regularly complains about the rising input costs.[290] An industry-sponsored

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[288] This is the impression of several lower and mid-level bureaucrats as well as industry spokespeople and activists. Author's interviews.

[289] Demirkol's (2010) book "GMOs: The Modern Slavery" and Food Safety Movement leader Kemal Özer's (2010) "Satan on the Plate" were widely covered in Turkish media.

[290] Ebru Erdoğan. "Yemezler değil, zaten yemişiz!" *HT EKONOMİ*. July 9, 2012. http://ekonomi.haberturk.com/makro-ekonomi/haber/757411-yemezler-degil-zaten-yemisiz. Supportive information

study estimates the cost of regulation at $1 billion.[291] Although the anti-GMO activists seeking a complete ban on GM food imagine a state bureaucracy succumbing to the wishes of the food industry, what the latter has achieved is more fairly described as damage control. The industry had to fight an uphill battle to convince the public and the state bureaucracy in a debate started by the anti-GMO camp. As the US Embassy observes, “The affected industries [have been] late to act in lobbying the government for more rational [i.e. pro-GMO] legislation”.[292]

Furthermore, the industry was only able to prevent the worst from their viewpoint in GM import approvals, and it did not provide the kind of support Monsanto hoped for a coalition to advocate the introduction of GM agricultural production in Turkey. Hüseyin Arslan, the CEO of the leading commodity trader Arbel, recalls that in the late 1990s “scientists from certain US and Canadian institutions contacted us to tell that they could help us [preparing] for GM production, and that this could benefit our firm. We opposed the idea because of complications that could arise in the future”.[293] Reminding that the industry prefers to supply their ingredients from wherever it is cheaper, another industry leader explains that “We do not have specific interests relating to whether GM crops are grown in our country. Those who could actually have an interest, like the seed industry, have remained passive. When there is so much controversy over the matter, we are not going to stick our neck out”.[294]

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comes from the author’s interviews with Rint Akyüz (described above) and Rukiye Ün, Director of Technology at Cargill (August 2012, Istanbul). Also note that although the approval of GMOs for consumption in food is officially an option, companies who made such applications so far had to withdraw them after publicity campaigns by various constituent organizations of the No-To-GMO Platform.

[291] Brookes (2012). Main sources of loss are estimated to be diversion of corn trade to certified non-GM suppliers and the substitution of soy with derivatives, both of which result in higher prices. Part of this loss to the industry is in effect a subsidy for domestic producers of corn.

[292] US Ankara Embassy cable (ref: 04Ankara5980) to Washington DC, dated October 21, 2004, last accessed at http://wikileaks.org/cable/2004/10/04ANKARA5980.html in July 2014.

[293] Osman Arolat, GDO Tartışması ‘Kayan Gündeme’ Konu Olunca. Dünya. January 24, 2009. http://www.dunya.com/gdo-tartismasi-kayan-gundeme-konu-olunca-72555yy.htm.

[294] Author’s interview.

**Domestic Seed Industry: Infant Industry Protection and Competing Visions**

But where did the domestic seed industry see its interest? And were their preferences influential on policy? Research reveals that what the domestic seed industry would gain and lose was indeed an important consideration for policy making, but their interest was understood to be competitive, instead of complementary, to that of the TNCs; as a result of interaction between the private firms and their interlocutors in the public bureaucracy.

Turkey's fledgling private industry has been growing with the state's support. In the 2000s the plant-breeding and seed industry received a push by the state (under the JDP government that would come to prohibit GM seeds), through regulations that opened way for fully capitalistic market relations in seed supply. In 2006, while the drafts of the Biosafety Law were being hotly debated, Turkey replaced its four decades-old Seed Law with a new one. Together with the Plant Breeder's Rights Law adopted two years earlier, and the ratification of the UPOV 1991 Convention soon after, this amounted to a major change towards stricter IPRs. The laws make plant variety protection explicit, rule out the production and exchange of seeds that are not registered and certified, and they require seed trade to be practiced by authorized commercial agents only. Seed saving and exchange between farmers are exempt from these requirements if they remain for self-use purposes and magnitudes and do not become trade practice.[295] So far, the state has used the carrot of subsidies instead of the stick of policing in order to encourage farmers to use certified seeds purchased from their proper authorized suppliers.[296] Farmers are paid higher in support payments if they can document their use of certified seeds (in addition; production subsidies are allotted directly to the seed industry). In

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[295] For an evaluation of developments in seed market regulation see Dr. Süleyman Karahan, PANKOBİRLİK, Türk Tohumculuğu ve Tohumculuk Sistemleri, 2011.

[296] Also see Atalan-Helicke and Mansfield (2012: 137-38).

cotton, for example, the difference paid is 20 percent of the *prim* paid to the farmer, and this indirect subsidy of the seed industry received a domestic bias in 2012 when imported seeds were excluded from this practice.[297]

Activists criticized these policies as steps in extinguishing local, ecologically sustainable farm practice to please corporate industrial interests. However, unlike in the case of the GMO regulation they were not able to influence policy; because both the domestic seed industry and the agricultural bureaucracy viewed the issue differently in this case: Corporate control over the farmer's seed is not the same if it is practiced by the domestic industry, which would have no chance in developing GM varieties but which constitutes a formidable player in non-GM seeds for a number of crops including corn and cotton.

The infant industry protection argument has indeed been voiced by the seed industry during the GMO debate. Chairman of the Turkish Association of Seed Industry (TÜRKTED) Mete Kömeağaç says, "unfortunately, Turkey is not ready for GMO technology… If we start to import GMOs before preparing ourselves technologically, we will be in the position of potential buyers, but if develop our own technology, we can sit at the negotiating table with better footing".[298] Industry leader Fahri Harmanşah explains nicely: "If the use of GM corn had been allowed in our country, [seeds of] domestic corn hybrids would lose out in competition. That is why our interests currently require a restriction … We should nonetheless prepare for the GM

[297] Gümrük ve Ticaret Bakanlığı Kooperatifçilik Genel Müdürlüğü 2012 Yılı Pamuk Raporu. January 2013. See page 29. Also in 2012, new restrictions for seed importation were adopted. This is Turkish Seed Industry Association's (TÜRKTED) interpretation of the Ministry of Agriculture's regulation "Tohumculuk İthalatı Uygulama Genelgesi (2012/1)." Report obtained from TÜRKTED.

[298] "Experts Agree Turkey Needs a Bio-Security Law, But Clash Over Content," *Today's Zaman*, June 14, 2009, http://www.todayszaman.com/newsDetail.action;jsessionid=SeMSUh+GP0VVO04G7rtblUr+?newsId=177993&columnistId=0.

technology and develop the capacity to use them in the future … It is possible that the Bt varieties could be useful to Turkey's agriculture".[299]

It is not clear if the industry leaders had held this view before GMO-skepticism was already influential on policy circles. The key bureaucrat behind the policy, Vehbi Eser, talks about having had to convince the industry that liberalization of GM seeds would not be in their interest.[300] Also, support for the idea has not been universally shared across the industry—there are those who question the wisdom of pursuing nationalist protection in an age of globalization, or the odds that the national industry can learn to compete in modern biotechnology applications without first apprenticing to the TNCs.[301] But it is certain that the bureaucracy and some of the industry leaders converged at one point on the idea that promotion of the domestic seed sector should be a public policy priority; and blocking GM seeds as a protectionist measure, at least temporarily, could help.

Nonetheless, the industry was not able to foresee the extreme character the finalized law was going to take—pushed by the urge to appease the public outrage against the GMOs—and it was not altogether happy with the result. For example, the Biosafety Law established a zero tolerance policy towards the import of unapproved varieties of GMOs. This rule exposes seed firms importing research and breeding material to the risk of breaching the law because of adventitious presence of GM material, thus discouraging research activity. Sector leaders fear

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[299] Author's interview with Fahri Harmanşah (August 2012, Ankara). Harmanşah is the manager and partner of Tasaco Seeds. He chairs the Association of Fertilizer Importers, is a board member at TÜRKTED and TSÜAB, and he formerly served at the Ministry of Agriculture.

[300] Author's interview with Vehbi Eser.

[301] Especially see the publication by TÜRKTED, titled Türkiye Tohum Sektörü, dated May 2009, and available at http://www.turkted.org.tr/images/yayin_isf.pdf. Supportive information comes form the author's interviews, see the previous footnotes in this section.

that because of such extreme restrictions the industry will start to lose ground, overturning the progress made over the last decades.[302]

## Farmers: The Silent Protagonists

Farmers, while appearing as the protagonist of the narratives told by other actors, were the relatively silent stakeholder in the debate. Overall, farm sector, consisting mostly of small producers that are highly dependent on the state and with a low degree of institutionalization in their organization, has not been articulate in policy advocacy.

The formally most representative farmer organization is the Turkish Union of Chambers of Agriculture (Türkiye Ziraat Odaları Birliği, TZOB). TZOB is a corporatist organization that was instituted by the state between 1958-63, and required by law to have a Chamber in every town and a delegate in every village in the country. The organizational weakness of the TZOB and its limited influence over agricultural policy is a matter of consensus in the literature on Turkish agrarian structure. Member dues, seen as a tax by most farmers, are paid infrequently, and it makes TZOB dependent on the state for financial resources.[303] Interviewees across the pro- and anti-GMO divide concur in recalling that the TZOB as an organization had no concrete position on the GMOs and had almost no engagement with the policy debate. Zeki Ertugay (PhD, food science), a politician active in the making of policy, says, "In our agricultural sector, producer organization exists only in theory, not in practice. TZOB has been deficient in articulating the economic rights of the sector it is supposed to represent".[304] This evaluation was repeated with only slight variation in words by spokespeople from the state bureaucracy, non-

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[302] Reported by the former Minister of Agriculture Sami Güçlü in an interview. "Bir yol açılması gerekiyordu biz o yolu açmaya çalıştık," *Tohum* (4), January 2012.

[303] Inan et al (2005).

[304] Author's phone interview with Zeki Ertugay, July 2012.

farm private sector, and the No-to-GMO Platform, even if they disagree over how the interest in question should be conceived. Observers note that the TZOB's attention is too much focused on maintaining good relations with the governments and ensuring satisficing commodity support programs to be preoccupied with complex matters relating to productivity, technology and biodiversity.

Other farm sector organizations, lacking a similar degree of geographical width and vertical penetration, are by definition associated with more special interests, although they may be much more cohesive. Founded in 1930s Adana Farmers' Union (Adana Çiftçiler Birliği, AÇB) is the oldest among them and probably the most influential, deriving its importance from the Adana (Çukurova) region's strategic place in Turkey's economy. (Regularly supplying more than a quarter of all the country's yearly corn and cotton and tightly integrated with manufacturing, Adana carries great weight in agricultural policy).[305] AÇB has been described as the chief organization of big, commercially oriented farming in the country, and a representative of the collision of interests among agroindustry, big farm, and agrifood sectors.[306] AÇB's secretary Oana Çorat has been a rare voice by publicly questioning the idea that completely banning the GM seeds would be Turkey's best choice, and arguing that Turkish cotton and corn farmers could definitely use help from GM (especially Bt) varieties. Çorat comments that AÇB took part in official meetings with the state bureaucracy to push for a more permissive regime, but ultimately proved unable to have sufficient influence, faced with a GMO-skeptic bureaucracy and vocal opposition from the NGOs.[307]

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[305] Güngör (2005).

[306] See, for example Sadettin İnan, "150 Bin Çiftçiyi Yok Sayan Çiftçi Birliği," *Milli Gazete*, March 13, 2014.

[307] Author's phone interview with Oana Çorat (June 2014). Çorat's views were previously publicized by Gila Benmayor, "Adanalı Çiftçinin Derdi Türban Değil GDO," *Hürriyet*, February 8, 2008.

It is telling that once the debate seemed to be lost for certainty and the 2010 law banned GM farming in Turkey, the AÇB had to shift the focus of its discourse and started criticizing the fact that while Turkish farmers cannot use GM seeds they nonetheless have to compete with commodity imports originating (and maybe gaining advantages) from such seeds, amounting to unfair competition.[308] Cotton producers from the export-oriented Aegean region too went through a similar strategy readjustment. Although lamenting that the GM seed ban amounts to foregone cost reduction opportunities, they have sought to "turn this disadvantage into an advantage at the marketing stage," the Chairman of the Izmir Commodity Exchange explains, by initiating a project for branding Turkish cotton and textiles as GM-free.[309] This kind of repositioning should be seen as an indication that the regulatory regime is not a function of protectionist interests advocated by the farm sector, because it did not originate from their demands and they do not appreciate it as a protective shield.

There are farm sector organizations that took an active stance supporting the No-To-GMOs Platform, like the Confederation of Farmer Unions (Çiftçi-Sen). A left-wing organization that enlists with the transnational peasants coalition Via Campesina and seeks to advocate for small farmers' interests, Çiftçi-Sen was formally created in 2008 and has since struggled to prove to courts its right to existence because Turkish law did not seem to have place for an independent farmers' union besides the state-sponsored TZOB discussed above. Çiftçi-Sen's public voice is largely confined to the activities of its leader Abdullah Aysu, who has been a vocal critique of neoliberal market reform in the agricultural sector. With regard to the commodification of the seed through certification requirements and so on, he writes that

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[308] Ibid.

[309] Interview with Barış Kocagöz, President of the National Cotton Council and The Izmir Commodity Exchange. "'Made in Turkey' Üstelik GDO'suz," *Radikal*, December 15, 2010.

“[p]reventing the farmer from saving and using seeds derived from his own produce, i.e. the capture of the seed by corporations, means the capture of agriculture by corporations”.[310] With regards to the GM seeds, Aysu argues that they are unable to reproduce; and because they oblige the farmer to purchase them anew yearly they reduce the farmers to highly dependent workers of the corporations, in addition to destroying biodiversity.[311]

The last farm sector group that has to be considered is the organic and ecological producers. In the early 2000s, before the GMO issue became a topic of full-fledged public debate, commercially oriented organic producers organized themselves as the Association of the Producers and Industrialists of Organic Products (ORGÜDER) and started to apply pressure to try and receive public recognition and subsidies with the Organic Agriculture Law of 2004. Organic producers also started to propagate the idea, around the agricultural bureaucracy circles, that Turkey is uniquely well suited for organic production and its expansion should be actively encouraged by public policies and protected from threats to its survival. The policy makers came to interpret GMOs to be one such threat (which is not a straightforward conclusion—the US law, for example, allows GM contamination in certified organic products). Those stakeholders who complain about the overly restrictive regime on the production and consumption of the GMOs in Turkey are of the impression that promoting organic production was one of the motives behind the making of the regime.[312] Vehbi Eser, the key bureaucrat behind the regulatory approach argued that being liberal on GMOs would contradict the promotion of organic products.[313] In the

[310] Aysu (2009).

[311] “Aysu ‘GDO’ların Adı Katır Tohumudur’,” *Karasaban*, June 17, 2009. http://www.karasaban.net/aysu-gdolarin-adi-katir-tohumudur/

[312] Author’s interviews with Hamit Esin, Rint Akyüz.

[313] Athor’s interview with Vehbi Eser.

Parliamentary debate on the Biosafety Law, members of the Parliament argued that GMOs should be banned in order to promote Turkey's brand value as an organic production site.[314]

However, the organic producers themselves are hardly responsible for the anti-GMO discourse. The sector's chief interest organization ORGÜDER's chairman Şerif Sümerli notes that while public demand for organic products has increased together with the GMO scare, "GMOs are the tip of the iceberg… Not that I am an advocate of the GMOs but there are greater threats to food safety [from pesticides etc.] than the GMO threat".[315] ORGÜDER has tenuous connections with the No-To-GMO Platform, not enlisting as a member and joining hands with them only for events that have commercial promotional value such as organic agriculture fairs. Also, even if the organic producers had put their full weight on the debate, their economic significance would be far from ensuring their efficacy. Organic agriculture (officially recognized as such) is practiced on only 0.5 percent of Turkey's agricultural land.[316] Organic food represents less than 1 percent of all gross sales in food.[317] In other words, if the promotion of organic products is one motive behind Turkey's ban on GM farming, this hardly came by as a result of lobbying by interest groups invested in such production, because their current economic significance is small and evidence of lobbying is not clear. The motivation was instead created by a political vision, espoused by the policy makers, that organic production should attain greater significance in Turkey's future and the idea that GM seeds would not have a place in that vision.

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[314] See remarks by the MPs Mehmet Serdaroğlu, Ramazan Kerim Özkan, Zeki Ertugay, Eşref Karaibrahim during the Parliamentary debate on the Biosafety Law, 17-18 March 2010, described in detail below.

[315] Interview with Şerif Ayhan Sümerli, "Orgüder Başkanı: GDO Buzdağının Görünen Kısmı," http://www.organikturkiye.com.tr/2014/03/orguder-baskani-gdo-buzdaginin-gorunen-kismi/

[316] Official figures for 2008, Karakoç and Baykan (2009).

[317] Figure provided by ORGÜDER chairman Sümerli, see the interview cited above.

## **The Lawmaker Decides**

The Turkish Parliament discussed the National Biosecurity Law on 17-18 March 2010, to decide on a regulatory regime for the cultivation and import of GM agricultural products. With regards to the import of GM products, it established a National Biosafety Council to grant approvals for use in food and feed. The Council would rely for its decisions on both a scientific assessment of public health and environmental risks, and a socioeconomic analysis of possible impacts on farmers and biological diversity; and grant approvals after determining "no risk" on these scores.[318] This is a rather extreme formulation of the Precautionary Principle. With regards to the cultivation of GM crops it established a total ban, the breach of which would be punishable by a jail sentence of twelve years. This is clearly a radical statement, compared to policies in other countries. The official justification for the law delivered to the Parliament noted that with genetic engineering "plant varieties turn into products of technology and [therefore] become more expensive, and for some the need for renewing their seeds every year become a reality; leading to socioeconomic risks like increased possibility of harm to producers and consumers, threat to the survival of local [plant] species and varieties, and increased foreign dependency in agricultural production." Asserting that Turkey is one of the world's most important countries in terms of biodiversity, it puts forward the preservation of biodiversity a chief motivation for making the law. The justification cites the Cartagena Protocol and harmonization with the EU law as major considerations.[319]

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[318] The language of "no risk" is found in the Section 1 of the Article 3 of the Law. Since this makes as little sense in Turkish as it does in English—because arguably there is never no risk—the readers may refer to the more detailed Article 5 to better understand what the risk assessment is expected to demonstrate. In any case the expectations are demanding—not least because the approval is not confined to the scientific risk assessment and requires an evaluation of socioeconomic risks and benefits. See Law no 5977, published in the Official Gazette no 27533 on March 26, 2010.

[319] This text, as well as the other quotes and paraphrases from the Parliamentary discussion in this section rely on the minutes of the 74th and 75th General Assembly sessions of the 23rd Parliament, accessed at the official website, and translated by the author. See

Turkish parliamentary debates typically feature partisan brinkmanship in which the government and the opposition parties are locked into categorically opposing whatever argument that may come from the other side. On the GMO debate, however, the lines were much closer. As Vahap Seçer from the opposition Republican People's Party (RPP), an agronomist by profession, put it on the floor, "It's kind of funny that this draft is in part to our liking too, since it prohibits the production of GMOs." In their support for the ban opposition MPs also drew on ideas associated with biodiversity preservation and paid even greater attention to IPR issues. Seçer explained that "the supply of GM seeds is under the monopoly of a handful of TNCs… Therefore, if we had liberalized the production of GMOs in our territory we would have been left at the mercy of this monopoly, and economic dependency would ensue". Hüseyin Yıldız from RPP informed that "compared to conventional seeds, GM seeds are 25-100 percent more expensive and because they need to be renewed on a yearly basis small farmers will be affected negatively. That most innovations in modern biotechnology are protected by patents causes countries which do not produce but only utilize the technology to pay great sums."

The idea that GM seeds have to be renewed on a yearly basis, repeated again and again by the activists, was also a popular one in the parliamentary debate. In fact, in a narrow technical sense GM seeds are not different from other seeds in whether they have to be renewed on a yearly basis, as discussed earlier in this work. Hybrid seeds have to be purchased yearly, but they can be GM or non-GM. GM seeds of the GURT (pejoratively, "terminator") type are unable to germinate and would have to be repurchased yearly but they are not in offer anywhere in the

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http://www.tbmm.gov.tr/develop/owa/tutanak_g_sd.birlesim_baslangic?P4=20603&P5=B&PAGE1=1&PAGE2=76 for the 74th session and http://www.tbmm.gov.tr/develop/owa/tutanak_g_sd.birlesim_baslangic?P4=20605&P5=B&PAGE1=1&PAGE2=60 for the 75th. Print copies are found at *Türkiye Büyük Millet Meclisi Tutanak Dergisi* volume 64.

world. It is true that IPR can be exercised more strictly over GM seeds to prevent replanting, but this is to an important extent up to what the state institutions will legislate and execute.

Turkish MPs, however, seemed to hold the erroneous belief that the need for repurchasing GM seeds yearly is a strict biological necessity. Gürol Ergin from RPP (PhD in agricultural engineering) opined that "[b]ecause of the terminator genes they carry, GM seeds have to be purchased from the supplying firm every year and they are 25 percent more expensive compared to non-GM seeds… Farmers will be harmed."

The erroneous belief caused confusion over how to fine-tune the law. A major point of dispute during the debate was whether it made sense to allow the transit passage of GM seed cargo through Turkish territory while keeping a ban on the cultivation of such seeds. Several MPs feared that GM seeds could be (accidentally) released to the environment during the passage and then germinate, contaminating conventional farms or wild plant populations. The fear, of course, would require the assumption that GM seeds are able to germinate, contrary to what many MPs believed; and several among the latter were the same ones who articulated the fear of contamination. Trying to add up these various concerns in an attack against the GMOs, Ramazan Kerim Özkan from RPP (veterinary physician) realized on the spot that he was contradicting himself and virtually started to mumble, ending his speech in unintelligible manner.[320]

In short, GMO-skepticism was the hegemonic attitude at the Parliament, shared by MPs from all convictions, although the attitude was built on highly imperfect knowledge over the matter. There was, nevertheless, also support for the idea that Turkey should not "miss the train" in this area of technological progress. The somewhat self-contradictory aspiration that had

[320] See p. 97 in *Türkiye Büyük Millet Meclisi Tutanak Dergisi* volume 64, session 74, March 17, 2010.

marked the State Planning Organization's expert panel a decade ago surfaced at the Parliament too, then: Adopting a precautionary stance towards the GMOs and preventing the biotech TNCs to establish control over seed production; while developing national capabilities in this area in the meanwhile in order to become commercially competitive in time and better oversee the risks.

Yet, it was not clear what kind of legislation could enable such a strategy and the discussed draft would not do it. While the law would ban the cultivation of GM crops in Turkey; imports of GMOs would be legal, if under a demanding approval regime. Several MPs were aware that this opened doors to foreign commodities that Turkish farmers themselves would not be allowed to produce. Opposition MPs proposed an amendment that would also ban the import and consumption of GMOs but this was rejected. It was clear to the government that such a move would not only be opposed by the agrifood industry seeking cheaper ingredients but also put Turkey at the risk of facing retaliation from the USA and possible sanctions at the WTO.[321] Squeezed between the Scylla of GMO-skeptic ideas and a public excessively influenced by them, and the Charybdis of international constraints on the other, the government had found itself in a corner that was in clear contradiction with the protectionist ideal—with which many within its own agricultural bureaucracy sympathized. We have seen above that influential corn and cotton farmers have expressed similar complaints.

Furthermore, given the high penalties for any accidental release to the environment, incentives for research in agricultural biotechnology were clearly being reduced. Mehmet Akif Paksoy (agronomist) from the Nationalist Action Party (NAP) described the outcome evocatively: "After passing this law, maybe it will be possible to protect our biological resources

[321] Earlier, the US State Department had communicated to the Turkish government concerns about the potential of the draft biosafety law to hinder trade and violate Turkey's WTO commitments, see US Ankara Embassy cable (ref: 05Ankara 862) to Washington DC, dated February 5, 2005, last accessed at http://wikileaks.org/cable/2005/02/05ANKARA862.html in July 2014. Supportive information comes from the author's interviews within the Ministry of Agriculture.

but it will be more difficult to develop new varieties using modern biotechnology. It will be more difficult for our universities and research institutes to bring in research material from abroad. The current draft neither creates additional funds for such institutes nor does it lay out regulations for organizing them in a new way."

## Conclusion: Assessing Epistemic Coalition Input

Turkey's prohibition of GM farming (and its rather restrictive regime of approvals for GMOs at large) was the outcome of an ideational battle over what the GM crops are good for, and why they may (not) be needed. A concern for preserving biodiversity, coupled with the expectation that GM seeds would open the country's plant genetic resources to biopiracy by the TNCs and make Turkish farmers dependent on these TNCs for seed supply made statesmen and domestic scientists skeptic towards the potential gains from the GM crops. These concerns were later joined by popular fears over the food safety risks from GM food, exploited masterfully by an epistemic coalition of activists that constructed a comprehensive anti-GMO narrative that tapped on social norms, ideology and selective scientific evidence. The narrative became a causal factor in the making of policy in part because the statesmen were convinced by its truth, and in part because the narrative held an important sway among the public, pushing the statesmen to send a clear message by taking extreme measures.

Protest from economic stakeholders modified the outcome only to a certain extent, and instead of being the architects of policy they had to be the ones to readjust their position. Big, commercially-oriented farmers and the agrifood industry, having lost the ideational battle, have tried to turn Turkey's "GM-free" identity into an advantage, although making clear that this would not be their first choice. The majority of the farm sector, consisting of small producers that are weak and dependent on state for their organization, never articulated a clear view over the GM crops, even if they became the protagonists of narratives told by other, mainly urban-based groups. The domestic seed industry is imagined by some to be the future beneficiary of the infant industry protection provided by the ban on GM seeds, but to some extent the industry had to be convinced by state bureaucrats that the vision made sense for them.

As Douglass North notes, "social scientists have incorporated the costliness of information in their models, but have not come to grips with the subjective mental constructs by which individuals process information and arrive at conclusions that shape their choices" (1990: 111). In Turkey, available mental constructs by which the actors processed information and understood their interests were delimited by the fact that the argument against the GM crops arrived earlier than the argument for it and had more passionate advocates. Information about GMOs within the bureaucracy was initially concentrated at a unit highly influenced by the Cartagena Protocol's biodiversity-oriented framing of the issue—providing the GM crops an unwelcoming policy environment. Field trials showing productivity gains were never publicized. The non-cooperative attitude of the bureaucracy made it difficult for the TNCs to communicate their vision and form an alliance with the farmers, empowering the ideas held by skeptics.

The Turkish bureaucracy's mistrust towards the few TNCs owning the IPR to the GM seed technology was not unfounded or unique—as seen in the previous chapters; but their reaction was of a special kind. Turkish decision makers thought that expensive GM seeds were inappropriate for the resource-poor, small-farmer dominated Turkish countryside; but the same seeds have been permitted and used by even poorer, smaller farmers in the structurally similar Indian case. Access to seeds in India were established in ways that defied the corporate vision of proper IPR protection. The Indian government refused to back the TNCs' IPR claims, at times actively resisting them, animated by ideas of rural development that had a different focus than the kind of biosafety concerns that characterized the influential epistemic coalition in Turkey. The next chapter examines this reaction.

# CHAPTER VII

# THE CASE OF INDIA

## Introduction

India is a case where a fragmented rural producer sector with limited political power struggled to exert influence on the government, yet the policy process unfolded in a different way than the "most similar" Turkish case: the government allowed GM seeds for the hugely important cotton, while regulating relevant IPR in heterodox ways. This, I argue, has been because of a different kind of policy engagement observed for the GMO-skeptic epistemic coalition, which stayed focused on the needs of the farmers and the countryside rather than prioritizing consumer fears as in Turkey. In this chapter I will narrate India's policy experience with GM seeds to highlight these variables, namely; the structure of the rural producer sector, the formation and engagement strategies of the oppositional epistemic coalition, and the governmental response, based mostly on secondary literature.

To a limited extent, then, this chapter also serves as a test of the propositions developed on the basis of original fieldwork in Argentina, Brazil and Turkey on a separate case, via evidence produced by other authors. We should be observing not only a match between the above-described variables, but the following specific propositions about the policy process that were listed earlier, and which I will repeat here in summary form (see Chapter III for details):

1. That lobbying for permissive policies has an economic logic.
2. That opposition to the technology is mainly coming from outside the producer sector.
3. That there is an IPR conflict introduced by the technology, and this qualifies producer sector positions.

4. That public decision-makers care about pleasing the producer sector, among other things.
5. That decision-makers make use of ideas in the form of scientific, economic, legal truth statements (not necessarily corresponding to true descriptions of the world, as far as we can objectively tell) to inform their decisions.

## The Material Context: Cotton Agriculture and Rural Sector Politics

Literature on post-independence Indian political economy concurs that the Indian countryside was the victim of an urban bias in government policies during the Nehru period, and enjoyed little political power. Starting from the late 1960s, the urban bias was somewhat reversed with policies associated with the "Green Revolution," more as a result of preemptive, paternalistic statecraft—supported by the United States government, American foundations, and institutions like the World Bank—than owing to organized political pressure exerted by rural actors themselves (Rubinoff 1997).

Only in the 1980s did rural populism—embodied in rural organizations such as Mahendra Singh Tikait-led BKU—became a significant, formative force in institutionalized politics. Observers disagree to what extent this force was representing a broad sectoral coalition (Varshney 1997) as opposed to being a vehicle of the rural upper classes (Rao 1996). In any event, the increase in the salience of rural demands was on top of a very low base to begin with, and what it achieved in terms of policy concessions seems to have been the prevention of deterioration in farm economic returns in a context of technological slowdown, rather than net improvements (Varshney 1993). And the political influence of rural populism ultimately waned in the 1990s. India specialists explain this with the greater salience of competing identity cleavages for the political orientation of the rural population (Basu and Kohli 1997, Ray and

Katzenstein 2005). In a critical instance, "when, in the campaign for the 1991 general elections, three different constructions of India's basic conflicts were presented to the electorate as competing choices for the future map of Indian politics—the urban-rural divide led by Devi Lal, the upper versus lower caste construction led by V. P. Singh, and a Hindu versus Muslim construction by L. K. Advani—the latter two literally consumed the first" (Varshney 1997: 1739).

Consequently, "[s]ince the implementation of reservations under the Mandal Report in 1990 … and the subsequent Ayodhya agitation, agricultural issues have been pushed to the background. Even though regional parties dominated by farmers came to power in Delhi in 1996, they were outpolled by entities that emphasized cultural issues" (Rubinoff 1997). By the turn of the century, "autonomous, grassroots farmers' movements of the sort Tikait led in the 1980s [had] practically ceased to exist" (Damodaran 2011). In short, when agricultural biotechnology emerged as a policy question in the 1990s, the rural producer sector was politically weak, defensive, and highly fragmented—both in terms of landholding patterns and such, and along lines of regional, ethno-religious, caste differences. "By the 1990s small-marginal farmers, with 80 per cent of the holdings and about 40 per cent of the cultivated land, came to numerically dominate Indian agriculture but yet ended up in a precarious position because of technological as much as policy changes over which they had no control due to lack of adequate political power" (Reddy and Mishra 2009: 13-14).

The picture is not much different in the particular case of cotton, which is of greatest interest to our discussion. Indian cotton production is huge, whetting the appetite of biotechnology firms interested in entering in large seed markets, and the production structure and political representation of cotton producers is fragmented. In the mid-2000s, the value of the commercial seed market was estimated around $ 1 billion, cotton seed comprising a fourth of the total market (Murugkar et al 2006). Typically between a fifth and fourth of all the world's cotton is produced in India. A majority of the product is consumed domestically, as raw material for the textile industry, and the rest is exported mostly to other Asian countries. "[C]otton plays a major role in sustaining the livelihood of an estimated 5.8 million cotton farmers and about 40-50 million people engaged in related activities, such as cotton processing and trade".[322] The commodity is particularly important in the states of Gujarat, Maharashtra and Andhra Pradesh from where three thirds of national cotton output regularly comes.

Most of the production is done in small farms by tenant farmers (Lalitha et al 2009). Farmer representative associations tend to be regional, with limited political influence. Through the cotton production chain, agricultural producers tend to be subordinated to better-organized interests downstream, such as ginners, trade agents and textile manufacturers (Harriss-White 1984, World Bank 1999, Kondo 1997).

## Enter Biotechnology: Emerging Epistemic Coalitions

### Bureaucratic Reception of TNC Offers

From the very beginning, conflicts over IPR marred the biotechnology firms' entry to Indian agriculture. Indian agricultural science and policy community debated the promise of genetic engineering starting from around the same time as in the USA. In 1983 a National Biotechnology Board was formed to identify priority areas and develop strategy; in 1986 the Board became the Department of Biotechnology (DBT) within the Ministry of Science and Technology. It was to the DBT that Monsanto first approached to offer a partnership for

[322] Cotton Market and Sustainability in India, WWF Report 2012, available at http://awsassets.wwfindia.org/downloads/cotton_market_and_sustainability_in_india.pdf.

developing and commercializing GM cotton in India. Because insect pests are a major problem in Indian cotton production, GM seeds embodying the insect-resistant Bt genes could be an option. In 1990 Monsanto offered DBT a partnership for technology transfer that would involve back-crossing a genetically modified American cotton variety (*Bt Bollgard*) to a local variety, creating Bt cotton adapted for India.

However, the idea fell through in 1993 due to the Indian side's concerns over exploitation of public resources by a transnational corporation. DBT's evaluation committee concluded that the technology fee demanded was "ridiculously high".[323] Monsanto's initial offer asked Rs 60 crore (60 times ten million Indian rupees) to be paid from Indian public monies for inserting its genetic event into Indian cotton hybrids and training Indian personnel. When pressed for negotiation, the company cut the figure to a bit over Rs 30 crore, suggestive of the high mark-up margin of the initial offer. Pushpa Bhargava, a scientist involved with the evaluation, notes, "many of us [at the DBT] were upset about this … when we could have developed this technology for less than Rs 3 crore, be it in the public sector or the private sector" (2003: 3541). Monsanto's push seemed exploitative to Bhargava, who drew parallels with Western corporations using third world countries as cheap toxic waste disposal sites, and even with colonial ventures of earlier epochs: "[It is as if] [w]e must … open the business of producing and marketing seeds that are a product of new technologies such as genetic engineering to the [multinational corporations] without any reservations and without asking any questions for they know it all better than us—just as the British stated during their rule in India that they know better than us what was good for us" (2003: 3541). In any event Monsanto's offer was rejected. At the time R&D to produce Bt cotton was underway in the public Central Institute of Cotton

[323] The evaluation of V. L. Chopra—agricultural scientist leading the committee, reported by Bharathan (2000: 1068).

Research, and it was seen to be deserving greater support than technology transfer from a foreign company (Bharathan 2000, Indira et al 2005, Ramanna 2006).

A few years after rejecting Monsanto's offer, the public commission DBT gave permission for Mahyco, a private Indian seed company, to do basically what Monsanto had offered earlier: import 100 gr of Bollgard seeds from the USA and back cross it to local varieties, and then perform field trials for their environmental release. This meant that Monsanto was not going to charge a technology fee—not to be paid out of public monies, anyways—for the gene transfer (Bharathan 2000). In 1998, nonetheless, Monsanto again made itself part of the game by acquiring a share of Mahyco and later forming with it a joint venture called Mahyco-Monsanto Biotech (MMB) in order to market seeds in India.

So, price and transnational control issues related to the IPR dimension of the technology defined the policy debate within bureaucratic circles from the beginning. An initial rejection led Monsanto to re-adjust its market entry strategy to a policy terrain defined by Indian developmental priorities, to some extent.

**No to Corporate Biotechnology: Arguments and Strategies of Civil Society Activists**

While field trials for Mayhco's (later MMB) Bt cotton were underway, India witnessed the emergence of influential civil society activism concerned with the adverse impacts of GMOs. The main GMO-skeptic activist groups in India are listed below.

Table 26: GMO-skeptic activist groups in India

| Organization | Leader/main spokesperson |
|---|---|
| KRRS (Karnataka Rajya Raitha Sangha) | Prof. Mahantha D. Nanjundaswamy |
| Research Foundation for Science Technology and Ecology | Dr. Vandana Shiva |
| Navdanya | Dr. Vandana Shiva |
| Gene Campaign | Dr. Suman Sahai |
| Forum for Biotechnology and Food Security | Devinder Sharma |
| ASHA (Alliance for Sustainable & Holistic Agriculture) | Aruna Rodriguez |

Source: Bharathan (2000), Indira et al (2005), Ramanna 2006, Herring (2007), Scoones (2008), Stones (2012)

Three things characterize civil society mobilization in India, explaining the particular contribution it made to Indian policy debates. First, from the onset, mobilization was dominated by fears relating to the corporate control of the technology, as captured in the "terminator seeds" image. Secondly, all major opposition NGOs put the countryside at the center of their discourse, trying to engage with the policy debate from the vantage point of how rural communities and small farmers would be affected by the introduction of this technology. This is manifestly different from the largely urban opposition observed in Turkey or Brazil, which have been focused on biosafety concerns in relative isolation from its relationship to rural welfare. Third, activists have displayed heterogeneity in regards to policy positions: while some organizations such as Dr. Vandana Shiva's Navdanya have translated their misgivings to a wholesale oppositional stance, others such as Dr. Suman Sahai's Gene Campaign have been careful to differentiate *corporate* biotechnology from biotechnology itself, providing a discursive space where heterodox policy approaches for the appropriation of the technology could be justified. Again, this is not observed in comparable cases. The Gene Campaign has simply no counterpart in Turkey or, arguably, in Brazil.[324] Conversely, while organizations concerned with food safety (such as the Europe-inspired Slow Food or the Halal-focused Food Safety Movement in Turkey and IDEC in Brazil) came to dominate the GMO debate in those countries, they were conspicuous by their absence from Indian debates.

I will now explain these three features of Indian civil society mobilization, starting from the "terminator seeds" controversy. Prior to the full-scale outbreak of the GMO debate, India had already had social movements questioning the virtues of modern seed varieties introduced with the Green Revolution and wider issues arising from corporate ownership of natural assets. In such a context, the image of terminator seeds would become an ingredient linking these concerns to new developments in biotechnology, and to the ongoing interest of the transnational Monsanto to penetrate India.

The term "terminator" was coined by RAFI, a Canadian NGO, referring to a new genetic use restriction technology (GURT) developed in the USA. This genetic engineering technique would inhibit germination of harvested seed, thus preventing farmers from sowing that seed for a second crop. Shortly after RAFI publicized the news about GURT in March 1998, widespread alarm emerged in India regarding the socio-economic implications of GM seeds, which were then being tested in field trials. In Indian public discourse, terminator seeds, other GM seeds, and Monsanto became conflated and merged into one threat. The conflation generated the erroneous belief that all GM seeds embody this trait, and fueled self-contradictory fears about the gene for sterility escaping to the environment and through pollination making other plants sterile too. Nonetheless, despite assertions by some pro-GMO writers, GURT (or the so-called "terminator")

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[324] A focus on rural sector interests and heterodox policy approaches for the adoption of GM seeds were largely missing in the early phases of mobilization in Brazil, which was rejecting the technology on biosafety grounds. However, as GM seeds become more and more a reality to reckon with in Brazil, a new kind of opposition might be emerging. Activities of recent organizations such as ABRANGE may be signs of such a shift. More time needs to pass to fully evaluate the extent of such a change. See the chapter on Brazil for details.

does exist, and it was developed with the explicit aim of solving the IPR enforcement problem in developing countries' seed markets for American proprietary interests.[325] Indeed, the US Department of Agriculture, which had co-developed the technology with the private seed company Delta & Pine Land —now owned by Monsanto—filed a patent plea for this technology in India late in December 1998.[326] Indian government took the step of issuing a memo banning the entry of terminator, and questions on the technology were raised in both houses of Parliament.[327]

The civil society opposition also linked the image of "terminator seeds" to the long-existing problem of farmer suicides in India, coining the neighboring phrase "seeds of suicide." Most conspicuous in this regard has been the work of Navdanya founder Vandana Shiva, who has been publishing since 1997 reports on farmer suicides. The number of farmer suicides in India is in the order of tens of thousands every year. In Navdanya discourse, "[t]he consequences of giving seed companies a free hand through privatisation and deregulation has been increasing the costs of seeds and agrichemicals for farmers, increasing farm debts and increasing crop failure. Farmers suicides are the extreme result of these policies of market freedom".[328] When Bt cotton in India became public knowledge, Shiva started to associate farmer suicides with Bt cotton (even before the seeds were available to Indian farmers outside trials sites), and also make use of terminator vocabulary: "They are in an ecological sense terminator, which terminates biodiversity and the possibilities of ecological and sustainable agriculture" (Shiva et al 1999).

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325 See Chapter II.

326 Bharathan (2000).

327 Ramanna (2006: 10).

328 Shiva and Jalees (2006).

When the sites of Bt-cotton field trials became public knowledge in November 1998, having been alarmed to the possibilities of the entry of terminator into India, activists destroyed trial fields in Andhra Pradesh and Karnataka. The attacks were organized by the Karnataka's farmer movement KRRS (*Karnataka Rajya Ryota Sangha*), led by the influential Professor Mahantha Devaru Nanjundaswamy, under slogans such as 'Stop Genetic Engineering', 'No Patents on Life', 'Cremate Monsanto' and 'Bury the WTO.' "He gave notice that all trial sites in the southern Indian state of Karnataka would be burned, with the media in attendance. The US embassy, in turn, requested police protection for US companies in Bangalore, and the High Court of Karnataka ruled to protect sites and the property of the Mayhco seed firm [in which Monsanto was now a shareholder]" (Scoones 2008: 319). Furthermore, opposition activists operated not only by challenging extant law with attacks on property, but also through it. The Research Foundation for Science, Technology and Ecology, another NGO led by Vandana Shiva, started a public interest litigation against DBT, Monsanto and Mahyco on the grounds that, starting from the import of lab material from the USA through the field trials, bio-safety regulations were flouted and the Genetic Engineering Approval Committee (GEAC) governed by the Ministry of Environment and Forests (MoEF) was left out by institutions without proper authority.[329] KRRS also threatened to launch a criminal case against Monsanto on the basis that the trials were illegal.[330] Demonstrations against Monsanto by Indian activists in Europe followed: the Inter-Continental Caravan of protest toured against the World Trade Organization headquarters in Geneva, the European Commission in Brussels and the OECD in Paris, during summer of 1999.[331] These demonstrations popularized the terminator image, making this Canada-origined

[329] Bharathan (2000: 1073). See Shiva et al (1999) for details.

[330] Scoones (2008).

[331] Bharathan (2000).

meme effectively a re-export of India.

The "terminator" and "seeds of suicide" narratives defined the orientation of the Indian GMO-skepticism. Concerns with the technology have centered on the prospect that it would take the control of essential means of agricultural production away from farmers and give it to transnational companies, putting the farmers in a cycle of indebtedness and dependency.

This brings us to the second point. Despite their differences, and the decisively urban and upper class/caste origins of some among their number, all major opposition leaders put the countryside at the center of their discourse, trying to engage with the policy debate from the vantage point of how rural communities and small farmers would be affected by the introduction of this technology. According to Ramanna, influential opposition activist Vandana Shiva's criticism of GM crops rested on four arguments: "biotechnology would enable corporate control and monopoly of seed … firms are profit driven and through advertising they would trap the farmer and also enslave him through contracts … monocultures further increase the vulnerability to pest attacks," and "the claims of Bt cotton to produce high yields and fight pests are unfounded" (Ramanna 2006: 9).[332] As for KRRS, which had led the opposition until the death of its founder Prof. Nanjundaswamy in 2004, Herring describes it as "a farmer organisation specifically dedicated to protecting Indian farmers—and India—from globalisation, personified by Monsanto" (Herring 2007: 137; also see Omvedt 2005). Activist literature is populated by competing claims over the economic performance of GM crops, as opposed to the food safety and environmental preservation concerns that dominate Turkish and Brazilian activist discourse. Field incinerations, rather than urban rallies, are the center of opposition activism. "No one gives

[332] Also see Shiva et al (1999) for an impression. This piece, which appeared in the influential Indian periodical *Economic and Political Weekly*, warns that "a few varieties will dominate the seed market" (Shiva et al 1999: 601) and that "[genetically engineered] seeds … will lead to complete erosion of the agricultural biodiversity and adversely affect the socio-economic status of the farmers" (1999: 605).

a damn for farmers," the title of an article by the leader of the anti-GMO organization Forum for Biotechnology and Food Security Devinder Sharma, is a rallying call for activists in India, while it could pass as an almost fair description of the GMO debate in Turkey.[333]

It is also important that most of the NGOs vocal in the Indian GMO debate had already existed prior to it, and they made this particular issue part of their broader contention against the exposure of the Indian countryside to capitalist globalization. When a national public debate began in 1998, M. D. Nanjundaswamy had been well known in India for decades as a rural activist and politician[334] and Vandana Shiva had international fame as an author, activist, and occasional contributor to FAO.[335] In comparison, the GMO debate saw the emergence from scratch of new NGOs in Turkey, such as Fikir Sahibi Damaklar (also known as Slow Food Turkey) or Gıda Güvenliği Hareketi ("Movement for Food Safety"), and new epistemic brokers such as Professor Kenan Demirkol who rose to public eminence through their contributions to the debate from the food safety perspective.

Thirdly, maintaining a broader discourse going beyond GMOs and food safety allowed Indian activists to display heterogeneity in policy positions. "Many campaign-focused NGOs [began] to see the anti-GM campaign as inherently limiting, and were keen to provide the other side of the story, developing a narrative about possible alternatives" (Scoones 2008: 320). Gene Campaign, led by Suman Sahai, is an influential organization that questions the corporate vision of agricultural production in a way that challenges the for/against dichotomy. Gene Campaign describes itself as an organization that "has been responsible for raising the national debate on

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[333] Devinder Sharma, "No one gives a damn for farmers," *Ground Reality*, 29 December 2015, http://devinder-sharma.blogspot.com.tr/2015/12/no-one-gives-damn-for-farmers.html

[334] See the obituary by John Vidal, "MD Nanjundaswamy," *The Guardian*, 6 February 2004, http://www.theguardian.com/news/2004/feb/06/guardianobituaries.globalisation.

[335] Vandana Shiva, "Most Farmers in India are Women", FAO, 1991.

the dangers of seed patents and its threat to food sovereignty." Accordingly, "Gene Campaign has not taken a 'for' or 'against' position in the highly polarized debate on GM crops. It demands stringent biosafety transparency and democratic decision making in this crucial field that has significant implications for food, livelihoods and environmental security. It seeks accountability and greater competence in the regulatory systems".[336] A major point of contention put forward by Gene Campaign early in the biosafety debate, for example, was that the base (non-GM) cotton used to create the Bt varieties that Monsanto planned to market in India was of low quality, thus likely to under-perform and fail farmers economically.[337] Such an approach allows for imagining legitimate ways in which genetic engineering technology can be delivered to Indian markets. These qualities of the Indian civil society opposition affected the ways in which both Monsanto developed its strategies and the way Indian government elites reacted to the policy debate.

In response to civil society activism questioning the virtues of GMOs and associated corporate property rights, Monsanto and other biotech industry players tried to offer an alternative discourse centering on agrarian development and drawing parallels with India's success in information technologies, captured in the slogan "biotechnology for the poor." The discourse was not only disseminated through publications, but starting from the turn of the century was also grounded in collaborative projects with TERI (The Energy Research Institute) and Indian Institute of Science towards the development of high-vitamin A "golden mustard" and other public interest-oriented biotechnology research. As Ramanna notes, "[t]hese alliances were significant and strategic in influencing the policy process … [O]rganizations like TERI organized 'stakeholder dialogues' inviting participants from NGOs, industry and farmers to

[336] "About Us," Gene Campaign, http://genecampaign.org/about-us/, last accessed December 2015.

[337] See writings of Suman Sahai at http://timesofindia.indiatimes.com/edit-page/Seeds-of-discontent/articleshow/1705854.cms and Sahai and Rahman (2003).

debate biotechnology. Although these forums spoke to those who perhaps were already convinced about biotechnology, they did provide some substance to the position that policy was being initiated with 'wide consultations'" (2006: 7).

## Government Response

### Government Response to the Biosafety Challenge

The partial resolution of the polarized debate over GMOs in India was facilitated as much by events in informal markets as debates at official institutions. In November 2001, while the authorization for Mahyco's field trials were being challenged in courts by opposition activists, a cotton variety marketed by a local company called Nevbharat was observed to withstand the powerful bollworm attack in Gujarat. Due to the already existing debates over the technology, the seeds were tested and found to contain the same kind of Bt event (expressing the Cry1Ac gene) that Mahyco-Monsanto was intending to legally introduce (although incorporated into a different cotton variety than the one they were testing). Since then, Nevbharat has been both celebrated as the Robin Hood of agricultural biotechnology—beating Monsanto to the market and delivering the technology to small farmers with lower prices (Tripp 2009d); and suspected to have acted as the biotech giant's Trojan horse in releasing the technology in India with a fait accompli (Bhargava 2003). The company itself claimed ignorance of the genetically engineered nature of the seeds. In any event, they were prosecuted for violating biosafety laws and forced to stop selling their illegal Bt variety, upon a complaint by Mahyco-Monsanto.[338]

In response to the discovery of Bt cotton in Gujarat, the Genetic Engineering Approval Committee (GEAC) in Delhi ordered not only burning of the crop and collection of the lint for

[338] Pray et al (2005).

testing, but also mandated retrieval and destruction of seeds from farmers' houses and ginning mills, and measures to sanitize the fields. Expectedly, farmers protested.[339] At this point, as Herring notes, "regulation encountered the light-switch problem: a switch is thrown but it is not connected to anything. Gujarat state had not set up a biosafety committee, as all states were mandated to do; the GEAC itself has no police powers" (2007: 133). Hence, the orders were not carried out. It may be tempting to see this outcome as being *caused* by India's federal structure, but that would be misleading. The GEAC was overridden by political orchestration at the union's capital: "The central government provided little political support for the hard line originally adopted by the GEAC … Appropriately enough, Gujarat's decision to do nothing to enforce the order was announced in Delhi by the Union [i.e. Federal] Minister for Textiles, Kashiram Rana immediately after a meeting with the Chief Minister of Gujarat, Narendra Modi. Delhi has a deep national interest in cotton production. Textile Minister Rana could see nothing wrong with the controversial seeds; he reasoned that since the Bt seeds reduced pesticide use and were favoured by farmers, opposition must be coming from the pesticide lobby … The consensus, across state and national governments, and eventually the GEAC itself, articulated by Secretary of the Department of Biotechnology Manju Sharma, was that the 'interests of farmers' would not be harmed" (Herring 2007: 133).

These events turned the terms of the debate against the GMO-skeptics. "GM as the farmers' choice" became a powerful story line on which the biotech industry quickly capitalized (Ramanna 2006: 11). Their case was strengthened by mobilization of certain farm sector leaders. Among them was Sharad Joshi, influential within the nation's chief agricultural organization Kisan [agriculturalist] Coordination Committee (KCC). Joshi was arguably the foremost,

[339] See farmer leader Sharad Joshi's (2001) account.

although controversial, farmer leader in India at the time, known for several decades for his classic liberal views against government intervention to agriculture.[340] On the question of patented biotechnology applications, Joshi thought "I prefer to pay royalty for good quality seeds than pick up bad subsidised ones",[341] and "[i]f the farmers can have immediate access to frontier technologies on payment for a period of twenty years and free of cost after that, we ought to be grateful to the developed world for that".[342] Such views by Sharad Joshi on intellectual property were probably not shared by many fellow-farmers, but his enthusiasm for access to new technology was. On 25 March 2002, farmer representatives led by Joshi threatened to launch a civil-disobedience movement (by cultivating transgenic varieties regardless of official approval) if Bt cotton were not approved by Delhi, and KCC representatives from cotton-growing states across India—Gujarat, Maharashtra, Punjab and Andhra Pradesh—rallied in support. Not all cotton farmers were equally interested in the GM seed debate. As Damodaran (2011) notes "Farmer leaders of recent years … have tended to espouse causes—either extreme aversion or uncritical support for GM and other new technologies—far removed from the farmers' day-to-day concerns of erratic [electricity] power, timely availability of fertiliser and credit, and marketability of produce." However, action by the KCC must have persuaded government

[340] On Joshi's importance in Indian rural politics see obituaries on *The Hindu* (http://www.thehindu.com/news/national/shetkari-sanghatana-founder-sharad-joshi-passes-awayshetkari-sanghatana-founder-sharad-joshi-passes-away/article7981677.ece#comments) and *The Hindu Business Line* http://www.thehindubusinessline.com/news/farmers-leader-sharad-joshi-passes-away/article7980287.ece) following his recent death in December 2015. The GMO-skeptic *Lobby Watch* concedes Joshi's importance, but notes his isolation even in his own organization Shetkari Sanghatna for his enthusiastic support for GMOs and IPRs, see "Kisan Coordination Committee (KCC)" article at http://www.lobbywatch.org/profile1.asp?PrId=70. Perhaps it is best to understand Joshi as a relatively major figure in the context of dwindling rural political mobilization in India, as noted earlier, see Damodaran (2011).

[341] Lekha Rattanani, "Knowing His Onions, " *India Today*, 15 January 1994, http://indiatoday.intoday.in/story/shetkari-sanghatana-leader-sharad-joshi-for-converting-peasants-into-entrepreneurs/1/292630.html, last accessed December 2015.

[342] Sharad Joshi, "Visionaries of a New 'Bharat'," http://www.sharadjoshi.in/sites/default/files/Visionaries%20of%20Bharat-PDF%20File.pdf, last accessed December 2015.

authorities of the existence of significant interests in the countryside strongly in favor of permission. The following day and no later the GEAC announced the approval of three varieties of the Mahyco–Monsanto Bt cotton.[343] The formal decision came ten days later as a conditional clearance valid for three years, subject to the evaluation of annual reports on insect resistance and tests for cross pollination. Opposition activists thought that the trials were far from complete. As Vandana Shiva puts it, "In effect, the commercialisation was an experiment" (Shiva et al 2006: 85).

Consequently, the formal release of Bt cotton provoked more protests. "Attempts at crop burning during 2002 had mixed results, with some farmers accepting compensation from KRRS protestors for the public destruction of their crop, while others firmly refused such advances and called in the police (Scoones 2008: 320). Soon, an epistemic struggle to control the narrative about the "truth" about the GM seeds emerged: "In 2003 and 2004 protests continued, but many activists had their eye on the three-year review of the Bt cotton results in 2005. Much was invested in providing alternative evidence based on surveys in the cotton areas, which would demonstrate the limits of the technology" (Scoones 2008: 320).

The impact of the technology thus became subject to high-profile debate involving scientists, social scientists, and activists. Epistemic coalitions confronted each other over rival narratives. As Stone describes, "The 'triumph narrative' flows mainly from economists and the biotech industry (and its academic allies), including more peer-reviewed writing … It claims Bt seed to be a 'remarkable success' … and a revolution that has raised yields by 70% … The counter- narrative comes largely from non-governmental organisations (NGOs) along with some journalists and academics, usually in non-peer-reviewed writing; it depicts Bt cotton as a failure,

[343] Herring (2007).

a farce, and a cause of farmer suicides" (Stone 2012: 62-63).

The debate was waged not only through normative arguments or abstract claims, but also via disputes over the methodology of the field and farm surveys. Early studies found very high yield increases from Bt cotton based on trial data provided by the biotech company itself; contributing to the marketing buzz for the seeds; however, the validity of the results have been disputed because most studies came from few scholars, examining few genetic events or seed varieties, and utilizing methods featuring similar biases (Stone 2012, see Herring 2014 for the counter perspective). It may be interesting to note that Bt cotton was not even designed to increase yields at the first place: it aimed at cost reduction via fewer pesticide applications. However, in the Indian context yield increase through better pest management seems to be a reality, because pesticide use by the smallholding cotton farmers had been inadequately low or ineffective to begin with. Indeed, even relatively conservative estimates documented significant yield increase impact, at least in the short term, although finding high variation across regions (for an overview see Smale et al 2009). A detailed meta-analysis by the International Food Policy Research Institute (IFPRI) concludes that "on average Bt cotton has had a significant positive effect on cotton productivity in India, raising farmers' income via an increase in yields and a reduction in pesticide use, despite increasing overall production costs" (Gruère et al 2008: 42), and "[t]he loss observed in some studies is largely due to the lack of adequate Bt varieties, … the lower quality of cotton with some of these varieties, the high price of seeds compensating for the reduction in pesticide costs, and the improper use of the technology associated with the limited knowledge of the technology among cotton growers (for example, use of the wrong variety, improper pesticide use, and the perception of Bt as a 'silver bullet')" (Gruère et al 2008: 17). The study also states that Bt cotton is neither sufficient nor necessary cause for farmer suicides, which stems from the broader problem of indebtedness.

With input from studies like those reviewed in the IFPRI report, the GEAC evaluated the three-year experience of Bt cotton in India in March 2005. It decided to renew the Mayhco-Monsanto license for selling these seeds in Central and Northern states, but withheld it in Andhra Pradesh (AP), where there was greater crop failure. “The decision not to allow the three [Bt varieties] in AP was taken on receiving adverse [scientific and other] reports from the State Government as well as some 20 farmers’ organizations in the State” (Ramanna 2006: 13). The Government of Andhra Pradesh signed a memorandum of understanding with seed companies, asking Monsanto to pay compensation to the farmers for losses. Andhra Pradesh would later allow GM cotton again but also become the first state to introduce price caps for the expensive seeds. The price caps are part of the broader contestation over the proper value added by this technology and the question of who has the right to appropriate it, which I am taking up in the section below.

## Government Response to the IPR Challenge

In India, the biotech TNC has encountered significant problems of IPR enforcement and failed to shape policies after its own design. This is despite that the genetically modified Bt cotton varieties sold in India use hybrid seeds as their base. [344] In hybrid varieties, the harvested $F_2$ (second generation) seed lacks vigor, so farmers are supposed to procure seeds externally on an annual basis. Given such a context, the biotech TNC could have been expected to face no problems in enforcing IPR and collecting high technology rents. However, three things have limited their ability to do so. All involve political and institutional barriers that test the power of

[344] The use of hybrid cotton was already common among Indian farmers prior to the entry of GM varieties, though the latter facilitated it further. Shiva and Jalees (2006: 11) reports hybrid use as 23% in 1997.

the TNC in a developing country—barriers that arise from a selective use of state capacity, and lack thereof, by Indian political elites answering to domestic stakeholders.

First, because of high official prices for Bt seeds, farmers find it expedient to plant even the under-performing second generation Bt seeds rather than buying them anew on the market.[345] To prevent this, Monsanto would need a law to prohibit replanting of commercially licensed seeds (like they tried to enact in Argentina), establish a point of delivery royalty payment system (like they did in Brazil), or introduce "terminator" GURT seeds that would be completely sterile in the second generation. Given an Indian agrarian context marked by poor smallholding farmers, Monsanto's claims to push "biotechnology for the poor," widespread dissent against the idea of terminator seeds, and perhaps the limited commercial impact of the problem, such solutions would be politically unappealing, and they do not seem to have been discussed as concrete projects.

Secondly, the market for Bt cotton seed is flooded by varieties produced by pirate seed companies operating without a license from Mahyco-Monsanto and therefore pass no royalty fees to it for each bag of seeds sold. These companies either multiply the officially approved seeds and sell them at below-official market prices, or they follow the example of Nevbharat in crossing official seeds with other varieties to develop new, illegal varieties of GM cotton. The resulting seeds may possibly address a greater variety of agricultural needs but also release unregulated risks to the environment, making biosafety regulations meaningless. Sold under banners that covertly hint at GM traits (such as "BesT seeds"),[346] they come with no liability and expose farmers to the economic risk of spurious seeds. Nonetheless, surveys in Gujarat found that illegal Bt seeds yield similarly to legal ones and bring down overall production costs in

[345] Lalitha et al (2008).

[346] Herring (2007).

comparison[347] (and they are preferred especially by farmers operating smaller and less well-irrigated farms).[348] In any case, from the vantage point of the biotech TNC they represent a leakage in the IPR enforcement chain, and an important one at that.[349]

To what extent is the existence of this "cottage-industry" of GM seeds, as Herring (2007) calls it, a political outcome? In a study made for the Indian Statistical Institute, Lalitha et al (2008) conclude that "The underground seed economy does not seem anarchic or devoid of organization… The government possesses the information and means to enforce the law … Our analysis of government institutions and the nature of hybrid seed production suggests that regulations could have been enforced" but they have not been enforced. Neither the states nor the national government deployed their institutional capacity to enact what would be an unpopular measure among farmers in order to protect the intellectual property of a transnational company.

Third, the official seed market itself is regulated with publically mandated price caps. When the first approved GM seeds (Bt Bollgard) were brought to the market by Mahyco-Monsanto, their price was set at four times the price of conventional hybrids.[350] The price was first contested in late 2005 by the South India Cotton Association and then other farmer

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[347] Reported in Lalitha et al (2008).

[348] Lalitha et al (2009).

[349] The importance of this leakage is multiplied by the status of Indian IPR law. To enforce its monopoly over the technology during the Bt event's introduction phase, Monsanto-Maycho (MMB) was not able to assert IPR per se. The Plant Varieties and Farmers Rights Act, although enacted in 2001, was not implemented with regulations until 2006. And it was not clear whether the recently changed Indian Patent Law would allow the patenting of genes. Therefore, to collect rents while licensing the use of the gene to other seed companies, MMB had to rely on its exclusive ownership of biosafety data for the transgenic event, which would be required for the regulatory approval of any seed variety containing the gene. When biosafety regulations are short-circuited through the illegal market, this proxy property protection instrument fails. See Lalitha et al (2008). An official patent became more significant later when royalty fees became a point of dispute as state governments instituted price caps for GM seeds and MMB protested: By 2010 a journalist was writing "MMB is bolstering its argument with a new weapon—a patent that it holds in India for its Bt technology. The patent, granted in 2008, will run till 2019. Will this have any bearing on the case?" (Latha Jishnu "Bt cotton: Monsanto is back in courts over royalty," *Rediff Business*, 1 April 2010, http://www.rediff.com/money/column/guest-bt-cotton-monsanto-is-back-in-courts-over-royalty/20100401.htm, last accessed December 2015).

[350] Lalitha et al (2009).

organizations, which encouraged the state government of Andhra Pradesh to approach the Monopolies and Restrictive Trade Practices Commission (MRTPC), claiming that the price charged by Mahyco-Monsanto was “exorbitant” and “unscientific”.[351] The Union’s (Federal) Ministry of Agriculture backed the claim, and the MRTPC ordered the seed price to be halved.

Expectedly, Mahyco-Monsanto appealed the Monopolies Commission’s (MRTPC) decision. As Gene Campaign leader Suman Sahai explains, “Mahyco-Monsanto has challenged the locus standi of the MRTPC, saying that it can only deal in trade in goods and that it has no jurisdiction to adjudicate on intellectual property rights (IPR) issues, in the present case, the cost of proprietary Bt technology. By introducing IPRs into trade via the Trade Related Intellectual Property Rights (TRIPS) of the WTO, the WTO has, in fact, made IPRs tradable goods, so Mahyco-Monsanto's position is untenable”.[352] Following the same reasoning, the Indian Supreme Court upheld the legality of the Andhra Pradesh price cap, and other state governments including Gujarat and Maharashtra followed with similar measures, bringing down seed prices. An impact study by Sadashivappa and Qaim (2009) finds that the price caps have increased the profits farmers derived from adopting Bt seeds, and they probably also contributed to a decline in the share of illegal Bt seeds in the market.

Price caps can be seen as an institutional solution devised to combat monopoly power over determining the price of a technology whose impacts are much disputed. They also manifest a distributional conflict between not only farmers and Monsanto, but also the upstream biotech giant and its Indian subcontractors. The high original price of the seed was driven by the transgenic trait royalty fee, which comprised two thirds of the seed price and which went to

[351] Sadashivappa and Qaim (2009: 174).

[352] Suman Sahai, “Seeds of Discontent,” *The Times of India*, 5 July 2006, http://timesofindia.indiatimes.com/edit-page/Seeds-of-discontent/articleshow/1705854.cms, last accessed December 2015.

Mahyco-Monsanto mostly. The price reduction would now be realized by cutting specifically the royalty fee portion.[353] The expected effect would be an increase in the quantity of seed sold and therefore revenues to the companies crossing the Mahyco-Monsanto variety (legally, with a paid license) with their own germplasm, and seed distributors further down the line. Indian press claimed it "an open secret" that, in addition to farmer lobbying, "Indian partners of Monsanto companies were behind the campaign to get trait [royalty] fees reduced because it was reducing their margins".[354]

In short, farmer-saved seed, illegally sold seed, and mandated price caps on intellectual property remuneration, all arising out of political omission or commission, limit the biotech TNC's ability to collect technology rents in India, generating negotiated, rather than unilaterally imposed, terms of access to GM seeds.

In addition to these explicit and stealth ways of challenging monopoly power, the Indian government has been interested in changing the monopolistic market structure, by providing for competition in transgenic trait supply. Whereas Bt cotton first spread in India through varieties sold by Mahyco-Monsanto or their licensee firms, transgenic constructs developed and patented by the public Indian Institute of Technology were also soon commercialized.[355] Because of ongoing debates over price and IPR, public research then focused particularly on developing Bt

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[353] "Andhra wins case against Monsanto," *Business Standard*, 11 May 2006, http://www.business-standard.com/article/economy-policy/andhra-wins-case-against-monsanto-106051100028_1.html, last accessed December 2015.

[354] Latha Jishnu, "Bt cotton: Monsanto is back in courts over royalty," *Rediff Business*, 1 April 2010, http://www.rediff.com/money/column/guest-bt-cotton-monsanto-is-back-in-courts-over-royalty/20100401.htm. As of 2015, eight of these licensee companies were in open dispute with Mahyco-Monsanto, because while the latter demanded trait royalty fees to be paid as per the original contracts, the companies argued that with the government mandated price caps, the contracts ceased to be private business, threatening legal action if Mahyco-Monsanto did not go along. "Monsanto, cotton seeds firms at war," *Business Standard*, 20 October 2015, http://www.business-standard.com/article/companies/monsanto-cotton-seeds-firms-at-war-115101901068_1.html, last accessed December 2015.

[355] Tripp (2009c).

non-hybrid cotton, which could be saved and replanted by farmers without loss of vigor. By 2011, such varieties had been officially approved and were in circulation.[356]

### Disputed Technology Performance and Continued Epistemic Debates

Lately, the performance of Bt cotton in India has been subject to renewed debate. When Bt cotton was first spreading in India, national aggregates showed remarkable increases in cotton yields and decreases in pesticide use. However, as Bt seed adoption approached universal levels in the late 2000s, yields plateaued and the insect problem was coming back. In some regions, the pink bollworms targeted by the insecticidal trait seemed to develop resistance to it, in others, new insects started to fill the niche left over by the disappearing pink bollworm. Social and natural ecology conspire to generate such results; and all policy stakeholders function as the agents of conspiracy through their short-sighted actions: the disregard of the publicly mandated refuge requirements by the farmers, low insecticidal protein expressed in illegal spurious seeds—which function like vaccine for the insects and accelerate resistance buildup, lack of good stewardship by the technology provider, and the absence of adequate public extension service to compensate for that.[357] The worsening record must also be, to some extent, arising from the eventual spread of innovation to the most laggard sections of the rural sector, who work with marginal land and poor resources, and for whom the technology may not be appropriate.[358] (Note that the same selection bias makes the early impressive results less representative, too, see Stone 2012).

[356] Linton and Torsekar (2011).

[357] See Herring (2007), Tripp (2009a), Stone (2012), Gutierrez et al (2015) for these points.

[358] Indeed, a critical article (Gutierrez et al 2015) finds that Bt cotton may be economic in irrigated cotton (indicative of better resources), whereas costs of Bt seed increase the risk of farmer bankruptcy in low-yield rainfed cotton.

For our purposes, of interest are the political dimensions entangled with the uses and the construction of scientific "stylized facts" in this debate. If technology performance is found to be disappointing this becomes ammunition for the technology-users in negotiations against the monopolistic technology provider over the price and terms of access. It also gives courage to those who object to the use of this technology and argue for a ban. And the construction of science too incorporates political elements. Validity of data is contested, and researchers draw different conclusions from the same data, in ways that do not seem to be independent from the political narratives they espouse. The data reported below, for example, are taken from an influential article published in *European Environmental Sciences*, which declares that pesticide use in India have recently risen back to the levels observed in the pre-Bt cotton period, failing to mention that cotton cultivation has increased even more. In another way of looking at the same data, insecticide use on land cultivated with cotton shows a remarkable decline from 130 to 60 kilograms per hectare between 2003 and 2012, while Bt share jumped from 1 to 94 percent of all cotton cultivation, and yields also improved. (This particular article includes the verdict about pesticide use in the abstract and the open-source main text, but relegates the relevant data to a less accessible appendix).

Table 27: Performance of Bt cotton in India, national averages

| | (A) Bt share in cotton area (%) | (B) Yield (kg/ha) | (C) Total cotton cultivation area (ha) | (D) Total insecticides on cotton (tonnes) | (D)/(C) ratio |
|---|---|---|---|---|---|
| 2000 | . | . | . | 10988 | . |
| 2001 | . | . | . | 13176 | . |
| 2002 | 0.38 | 331 | 78000 | 6863 | 0.09 |
| 2003 | 1.2 | 387 | 77850 | 10045 | 0.13 |
| 2004 | 5.59 | 463 | 89200 | 9367 | 0.11 |
| 2005 | 11.51 | 468 | 88170 | 5914 | 0.07 |
| 2006 | 37.73 | 519 | 91730 | 4623 | 0.05 |
| 2007 | 67.1 | 567 | 94390 | 5543 | 0.06 |
| 2008 | 80.8 | 524 | 94060 | 5057 | 0.05 |
| 2009 | 81.76 | 486 | 101520 | 6726 | 0.07 |
| 2010 | 91.54 | 495 | 111410 | 7885 | 0.07 |
| 2011 | 91.87 | 496 | 121910 | 6828 | 0.06 |
| 2012 | 94.23 | 552 | 115530 | 7234 | 0.06 |
| 2013 | 95.66 | 567 | 119780 | 11598 | 0.10 |

Source: Columns A to D is reproduced from Gutierrez et al (2015) additional file Table 1; the last column is author's elaboration

Such disagreements over the interpretation of data have directly distributional implications and, if politics is about "who gets what, when, and how" (Lasswell 1936), they thus become political arguments. Monsanto calculates transgenic trait royalty fees charged for the seeds on the basis of cost savings the seeds generate (by substituting for pesticides), and the public price caps are justified with alternative calculations of the same. "The … problem," as a journalist comments, "is that estimates of the cost of inputs vary widely as a series of studies made by agriculture universities, research institutes and government have shown. So whose figures of cost savings are to be accepted?".[359] Each new release of technology renews these debates as they typically come with claims of superior performance and attempts at increasing

[359] Latha Jishnu, "An Odd Royalty Calculus," *Business Standard*, 24 June 2010, http://www.gmwatch.org/index.php/news/archive/2010/12317-monsantos-odd-royalty-calculus.

the price. In 2007 Mahyco-Monsanto wanted to introduce Bollgard II at three times the conventional hybrid price, even though the biosafety regulations now required two pockets of non-GM refuge (as opposed to one as mandated earlier) for each packet of GM seed being sold due to insect resistance against the Bt trait developing in time—therefore, the new technology had to be *much* more effective than the old one to justify the higher price. The state governments intervened again and brought the price to the same level as Bollgard I.[360] The price caps were contested by the company in courts, sometimes with adverse consequences. In August 2012 the Maharashtra government declared all trade activities of Mayhco-Monsanto in that state illegal. The state government justified the decision by stating, “We have given fair chance to the company and all charges of unfair trade practices have been proved. Hence, under the existing cotton seed act we have taken action.” The state was also commissioning a scientific study of the impacts of Bt cotton in the state to consider banning GM seeds sold by any and all firms.[361]

Recently, the debate over the worsening record of Bt cotton combined with ongoing IPR disputes have strengthened GMO-skeptic circles and caused a renewed hesitation among public decision-makers. By Fall 2009, the country had come close to permitting its first GM food crop: a Bt eggplant was evaluated and recommended for approval by the regulatory body GEAC. However, the Ministry of Environment and Forestry (where GEAC is housed) announced a moratorium on this decision, based on a series of nationwide public meetings organized by the

[360] Latha Jishnu, “Battle royal over Bt cotton royalty,” *Business Standard*, 28 May 2010, http://www.business-standard.com/article/economy-policy/battle-royal-over-bt-cotton-royalty-110052800037_1.html, last accessed December 2015. Also see Tripp (2009c: 147).

[361] “Maharashtra State Revokes Monsanto’s Cotton Seed License,” *Environment News Service*, 9 August 2012, http://ens-newswire.com/2012/08/09/maharashtra-state-revokes-monsantos-cotton-seed-license/, last accessed December 2015.

Centre for Environment Education, an environmental NGO.[362] Because the Bt eggplant was developed by inserting Mahyco-Monsanto's patented transgenes into local varieties of eggplant, whose global center of diversity is India, it was feared that the spread of patented genetic material across the eggplant population could open way to "illegal proprietary claim" on "India's biological resources".[363] In July 2011, GEAC itself took a step towards tightening the biosafety regime when it introduced new procedures for authorizing field trials, requiring applicants to obtain a 'no objection certificate' from the relevant state government, upon which several states declared themselves GM-free.[364]

By early 2012 an internal advisory report of the Union's Ministry of Agriculture leaked to the press was stating "Cotton farmers are in a deep crisis since shifting to Bt cotton. The spate of farmer suicides in 2011-12 has been particularly severe among Bt cotton farmers".[365] Although denounced by the Minister himself, the report was interpreted as sign of discord within policy bureaucracy. In August 2012, a publicly commissioned scientific investigation discovered serious errors in Bt cotton biosafety evaluations. Certain queries in the investigation generated doubts about how well regulatory scientists knew what they were doing. An example:

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[362] The 'Jairam Ramesh Report' of February 2010. See http://www.scidev.net/global/gm/editorials/indian-government-still-flip-flopping-on-gm-trials.html and http://www.nature.com/nbt/journal/v33/n9/full/nbt.3331.html?referral=true .

[363] The quotation is from a criminal court petition submitted to Karnataka High Court. See Priyanka Rastogi and Anshul Bansal, "India: Patenting Of Genetically Modified Crops In India Vis-À-Vis International Decisions," *Mondaq*, 17 March, http://www.mondaq.com/india/x/300270/Patent/Patenting+Of+Genetically+Modified+Crops+In+India+VisVis+International+Decisions.

[364] See USDA FAS GAIN report #IN4059 "India Agricultural Biotechnology Annual 2014," dated 7/11/2014, available at http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Agricultural%20Biotechnology%20Annual_New%20Delhi_India_7-11-2014.pdf, last accessed December 2015, for these developments.

[365] Internal communiqué SJ/FA-2/1a/i dated January 9, 2012, reported in Yogesh Pawar, "Has Bt Cotton Helped Farmers? Sharad Pawar Says Yes, His Ministry No," DNA, 22 March 2012, http://www.dnaindia.com/india/report-has-bt-cotton-helped-farmers-sharad-pawar-says-yes-his-ministry-no-1665671, last accessed December 2015.

Question by investigator: *"Was there a reason for choosing an STR instead of single copy gene [i.e. particular methods for sampling biological material] for this analysis?"* Answer by regulatory scientist: *"Sir, we were not sure about the method to be followed at that time. This method was decided by the firm".*[366]

The same month the Parliamentary Standing Committee recommended a ban on all GM crops. Around the same time the Supreme Court of India decided to consider a 2005 petition by anti-GMO activists and appointed a Technical Expert Committee to review and recommend biosafety risk assessment studies for GM crops. The Expert Committee recommended a moratorium on field trials, a ban on the environmental release of any GMO where India is the center of origin or diversity, and an overhaul of the biosafety system. According to US sources both the government and "industry stakeholders" objected to the report in hearings.[367] According to the press the Minister for Environment and Forests Jayanthi Natarajan was opposing Agriculture Minister's views in favor of GMOs, which was dictating the government's arguments in the case. Natarajan thought, "The scientific community is, in fact, split vertically down the centre in its views on these issues, and robust, proven failsafe scientific protocols to prevent damage from GM crops are yet to be developed in our country".[368] (As of Summer 2015, more hearings were expected and the Court's decision was pending).

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[366] See p. 51 of the so-called Sopory Report: "The report," Committee To Examine Scientific Claims Made With Regard To The Bnla106 Event (Genetic Transformation Of An Elite Indian Genotype Of Cotton, Gossypium Hirsutum L.) For Insect Resistance, August 2012. The report can be accessed at the Indian Council of Agricultural Research website http://www.icar.org.in/files/BN-Bt-cotton-report.pdf. Note that this investigation was about biosafety tests for publicly developed Bt cotton, and not Mahco-Monsanto's.

[367] We know that the government said the report was scientifically flawed and did not address the terms of reference and merits outright rejection since it has exceeded its mandate. Later, the apex court appointed Dr. Rajendra Singh Paroda as a member who submitted a separate dissenting report when the five other TEC members submitted theirs in July 2013. http://www.thehindu.com/opinion/op-ed/battle-lines-sharpen-over-gm/article6268776.ece

[368] Nithin Seti, "Jayanthi Natarajan opposes Pawar's views on GM crops, wants field trials put on hold," *The Hindu*, 3 August 2013,

Just as Indian regulatory system seemed to be taking a more precautionary direction, the voting into office of Narendra Modi's BJP government in May 2014 changed things, and precipitated a counter-attack by the pro-GMO epistemic coalition. On 3 June 2014, the Intelligence Bureau (IB), India's national spy agency, got involved with the GMO debate. In an inflammatory report leaked to press, the IB was accusing "concerted efforts by select foreign funded NGOs" for undermining Indian development projects, with an alleged negative impact on GDP growth at the order of 2-3 % per annum. According to the report, in the area of agricultural biotechnology, "NGOs were active facilitators of news articles, liaison with other activists and social media activism, which contributed to the … moratorium on Bt brinjal [eggplant] and the ban/moratorium regimes recommended by the Parliamentary Standing Committee … and the Technical Expert Committee (TEC) appointed by the Supreme Court …"[369] Much of their work, it said, was funded by the US-based Centre for Media and Democracy.

In response, the anti-GMO groups returned the accusation of foreign manipulation: "The strategy of the global GMO seed industry with their patents & IPRs (Intellectual Property Rights) is to bend regulation and influence governments and regulators to approve GMOs … It is difficult to avoid the conclusion that the IB report has been influenced by those who have most to gain by undermining our seed and food sovereignty ie. the foreign corporations".[370] According to the activists, "the leaking of the IB report [was] timely. The new Modi administration seeks to

http://www.thehindu.com/news/national/jayanthi-natarajan-opposes-pawars-views-on-gm-crops-wants-field-trials-put-on-hold/article4982776.ece?ref=relatedNews

[369] Quotation from the report taken from the note by ASHA (Alliance for Sustainable & Holistic Agriculture), one of the NGOs singled out in the report. http://www.kisanswaraj.in/2014/06/15/ashas-statement-on-the-ib-report-indias-gmo-free-movement/

[370] Statement signed by activist leaders Vandana Shiva, Aruna Rodrigues, Kavitha Kuruganti, http://seedfreedom.in/foreign-hand-in-the-ib-report-joint-statement-from-vandana-shiva-aruna-rodrigues-kavitha-kuruganti/

speed up projects".[371] Two weeks after the report surfaced the Indian government banned direct foreign funding of local campaign groups.[372] In the meantime the new Minister of Environment revived the GEAC, which gave approval for field trials for several crops that had been previously suspended because of the still ongoing case at the Supreme Court.[373] The government attitude receives criticism even from close quarters. Rashtriya Swayamsevak Sangh, a nationalist civil society organization that is regarded as the parent body of the ruling BJP, termed the decision of the government as "betrayal of people's trust … People of India who have elected BJP to power are feeling deceived".[374] "And in any case, why should we hand over our agriculture to some foreign companies?"[375] BJP had promised in its election manifesto that GM food would not be allowed without an evaluation of its long-term effects. Nonetheless, so long as BJP blocks GM seeds for food crops, it may find it easy to justify the resumption of biotechnology applications in cotton. India still does not allow the importation of any genetically modified food except in the form of soy oil, either.[376]

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[371] "Criminalising Dissent In India Against GMOs And Monsanto, 20 June 2014, "http://www.colintodhunter.com/2014/06/gmos-ngos-and-activism-criminalising.html

[372] Dean Nelson, "India targets Prince Charles' aide in war on Greenpeace," *The Telegraph*, 22 June 2014, http://www.telegraph.co.uk/news/worldnews/asia/india/10917731/India-targets-Prince-Charles-aide-in-war-on-Greenpeace.html

[373] USDA FAS GAIN report #IN4059 "India Agricultural Biotechnology Annual 2014," dated 7/11/2014, available at http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Agricultural%20Biotechnology%20Annual_New%20Delhi_India_7-11-2014.pdf, last accessed December 2015

[374] "Modi govt condemned for allowing GMO field trials," 23 July 2014, *GMWatch*, http://www.gmwatch.org/news/archive/2014/15544-modi-govt-condemned-for-allowing-gmo-field-trials

[375] "Modi bets on GM crops for India's second green revolution," *Reuters*, 23 February 2015, http://www.reuters.com/article/us-india-gmo-insight-idUSKBN0LQ00Z20150223

[376] USDA FAS GAIN report #IN4059 "India Agricultural Biotechnology Annual 2014," dated 7/11/2014.

## Conclusion: Assessing Epistemic Coalition Input

In short, the Indian biosafety regime remains contested. Many varieties of GM cotton have been approved for cultivation, but no approvals have been given for other plants. For cotton, several kinds of IPR enforcement problems are in place, most notably mandatory price caps limiting the royalty fees companies can charge on seeds. In other words, the biotech TNC has made some inroad into this important market, but has not been able to shape either the biosafety or the IPR regime to its liking.

How is this outcome to be explained? India's great size, and especially the great amount of cotton being produced in the country, despite low levels of average income, signifies huge market opportunities for biotech companies. Monsanto in particular have been very interested in penetrating this market and starting from early 1990s lobbied Indian public institutions for marketing GM cotton varieties adapted for India. This company's efforts, together with other transnational and local biotechnology companies (together represented by All India Biotech Association), have provided for the strongest source of the push towards a permissive regime for GMOs in India. The other potential source of pro-GMO lobbying, the agricultural producers themselves, have been less enthusiastic, and their activity seems to have been in the form of local defensive reactions against attempts at restricting access to seeds after they have already spread. Organized pressure on the government by peak agricultural organizations in the way observed in Argentina or Brazil seems absent, comparatively speaking. This, I argue, has to do with the already low level of organizational capacity and cohesion of Indian agriculturalists, especially cotton producers, who are mostly smallholding, resource-poor tenant farmers. The same qualities also make farmers more vulnerable to price volatility risks and such, increasing the salience of IPR claims that raise input prices. Therefore due to greater uncertainty of interests, and lesser capability to pursue them, farm sector positioning on GM crop debate has been less determinate. This makes India different from the New World cases.

What makes India different from Turkey, another country with indeterminate farmer stance on GM crops? An exhaustive explanation of this difference has to incorporate several reasons. But one important thing India had and Turkey did not, was civil society mobilization oriented towards agrarian questions and the place of GMOs in them. Three things characterize civil society mobilization in India. First, from the onset, mobilization was dominated by fears relating to the corporate control of the technology, as captured in the "terminator seeds" image. Secondly, all major opposition NGOs put the countryside at the center of their discourse, trying to engage with the policy debate from the vantage point of how rural communities and small farmers would be affected by the introduction of this technology. Third, activists have displayed heterogeneity in regards to policy positions: while some have translated their misgivings to a wholesale oppositional stance, others have been careful to differentiate *corporate* biotechnology from biotechnology itself, providing a discursive space where heterodox policy approaches for the appropriation of the technology could be justified. The result was a GMO-skeptic opposition orientation that vilified the transnational companies more than the transgenes, and worried more over food security and sovereignty than over food safety. Not only for cotton, but for food crops too, this worry applied: IPR over food crops could endanger access to food, as it was argued most concretely in debates over GM eggplant. This particularly IPR-sensitive and pro-farmer attitude of the epistemic coalition aligns with (and I argue, causally contributes to) the subsequent government policy for allowing widespread use of Bt cotton seeds in a weak IPR enforcement environment, even at the risk of greater biosafety threats (arising from government-tolerated illegal seeds and farmer managed seed).

The India case is a good illustration of the strength of the epistemic coalition concept. In India various arguments for and against allowing for GM cotton, and appropriate forms of IPR for it, find their justification in scientific stylized facts about how much these seeds contribute to cost savings. The debate had obvious distributional consequences, however, arguments going into it are made in the form of truth statements about how nature and markets work. Various sides accuse their detractors for not *knowing* enough, or at best feigning ignorance of truth.

Existing literature on the relationship between science and politics is structured around the question of whether or when power listens to truth. “Epistemic communities” approach argues that power listens to truth often, and investigates the ways in which this could be facilitated further (Haas 2015). Its detractors argue that power listens to truth only where its interests are already aligned with it—interests that are determined by coercive imperatives or material incentives (Toke 1999, Krebs 2001). On GMOs, the latter approach is aligned with the claim that there is a global epistemic community consensus over the merits of the GMOs, which the policy-makers disregard with their less-than-enthusiastic approach, as claimed by Drezner (2008), and Paarlberg (2009). Unlike these authors I find it untenable to speak of a global scientific consensus over GM crops’ appropriateness, especially at the level of regulatory detail—the case of India particularly provides striking instances of the absence of such consensus. And it is also not true that policy-makers disregard scientific truth. What happens is that policy-makers holding power listen to *various* claims of truth, each with certain scientific stylized facts in their support. The epistemic coalition concept allows for the possibility of such contending epistemic claims to scientific authority, and a broader set of participants in the making of those claims. In a certain sense, an epistemic coalition is a “bastardized” form of an epistemic community, which is best imagined as a group of scientists isolated from material conflicts of interest and political motivations. In the conclusion chapter I will discuss broader implications of this distinction, between epistemic (bastardized) coalitions versus (pure) communities.

# CHAPTER VIII

# CONCLUSION

Below I will first summarize the findings of the study and address possible limitations, as far as the current research questions are concerned. I will then comment on the theoretical and practical implications of the study for broader questions of international and comparative politics.

## What the Study Did and Why

### Summary

What has the study achieved so far? What have we learnt?

I have studied policies regulating GM crop cultivation in Argentina, Brazil, India, and Turkey. Most conservatively, this study can be read as an informative account of the political reactions provoked, and some of the social-economical outcomes generated, by a controversial agricultural technology in major agricultural producer countries of the global South—in other words, a historiographical study of an instance of what Joseph Schumpeter (1942) called as "creative destruction". I have traced the trials and tribulations of Northern biotech companies as they ventured to introduce GM seeds into countries with differing social and natural ecosystems and claim royalty fees for their use. Throughout, we have witnessed reactions to this technology among export- versus domestic-market oriented producer groups, large farmers and small, growing crops with biological characteristics that pose a variety of biosafety and intellectual property rights (IPR) enforcement problems to be addressed. This can be seen as a contribution for development policy; science, technology and society studies; and future economic history.

At a further level, the study pursues analytical questions that this historical episode generates for political science. There is an emergent international regime complex regulating various aspects of GM agricultural production, but elements of the complex are in contradiction with each other, and they generate regulatory gaps (Raustiala and Victor 2004). Scientists also debate the merits of this technology, and even if a view broadly in favor of the safety of GMOs has been arguably gaining greater acceptance, there was disagreement regarding the design of appropriate regulatory measures during the earlier phase of the debate (Jasanoff 2011). How have policy-makers made use of a fragmented international regime complex while adopting national policies to regulate GM agriculture, and in the absence of clearly defined global legal and scientific imperatives what other reasons have driven individual countries' policy choices, are the questions of interest at this level.

In pursuing these questions my theoretical motivation has been to contribute to debates in political science about the place of ideas, cognitive frames and social learning in comparative public policy or international cooperation (Skocpol and Weir 1985, Hall 1989, March and Olsen 1989, Sikkink 1991, Katzenstein et al 1998, Wendt 1999, Berman 2001, Blyth 2002 and 2006, Parsons 2003, Schmidt 2008, Woll 2008, Abdelal et al 2010, Nelson and Katzenstein 2014). Social constructivism suggests that public decision-makers react to the same challenge in varying ways because of how they perceive it, and they perceive it differently because of different ideas they hold. This is a simple and reasonable premise with a powerful implication: With different ideas, different policies are possible, and so long as ideas do not simply follow from hardwired economic interests or practically immutable features of institutional architecture we could generate better policy outcomes by spreading better ideas among the actors that matter—be them lobbying groups or autonomous state managers. In this study I aimed at demonstrating the strength of this premise. However, the plausibility of the premise is challenged by alternative possibilities: that ideas rationalize and justify policy choices rather than causing them, that they are ineffective when their implications run against powerful material interests, or that it is the material context that selects for the ideas that gain traction at the first place. Conceded that these points hold true quite often, the challenge is to delimit when and how it is that ideas, and idea-generating or idea-propagating agents, can become effective as autonomous forces. In any case, nonetheless, where one claims that ideational factors are animating public decisions, they face the null hypothesis that it is actually material interests all the way down. Hard and crucial tests, and systematic comparative inquiry would be required to show that this hypothesis is not confirmed, i.e. that ideas are making a difference in ways that self-evident material factors are not accounting for.

These criticisms can be applied in specific ways to particular research programs studying the causal influence of ideas, such as the epistemic communities program, which is of special interest for policy questions that have to do with science, technology, and the environment (Ruggie 1975, Adler and Haas 1992, Haas 1992). The program rests on the premise that in areas such as environmental policy-making and cooperation, causal ideas and associated norms propagated by "epistemic communities" of scientific experts may contribute to better policy outcomes by changing the way political power holders view an issue, where the experts are perceived as impartial. Although the strength of the concept has been widely recognized, critiques have pointed to a number of limitations, centered on what Dunlop identifies as "the approach's failure to engage with the real world of politics and interest-group bargaining" and "a lack of critical empirical testing" (2000: 142). Sebenius argues that the actual influence of epistemic communities is ultimately exercised through bargaining, and yet there is no theory of bargaining elaborated in the approach (1992: 326). Liftin argues that epistemic communities approaches downplay the ways in which scientific information may simply rationalize or reinforce existing political conflicts (1994: 12). Krebs argues that members of epistemic communities may just be after their own personal or professional self-interest (2001: 225-6). Toke argues that the influence of epistemic communities has been probably overstated (1999: 97-102).

To address such criticisms, a convincing empirical study of ideas has to build on a good sub-theory informing the choice of comparative counterfactuals. In studying ideas Parsons (2002) urges us to ask, "What was the range of possibilities without these ideas?" Equipped so, the study could then address the crucial question: Do different ideas follow from similar material settings, and do they generate different policies—policies that matter materially?

To pursue this question, I have studied the engagement of civil society actors, scientific experts and the public decision-makers they try to influence, with a debate on agricultural technology; and I have done this in different agricultural contexts, in order to avoid generalizations based on what may be exceptional experience, and provide limited empirical tests for some of the critical questions above. To do it in a concrete manner, I have generated two research questions that capture the foremost dimensions of GMO policy as it applies to developing countries: 1) Why have some countries banned GM crop cultivation in their territory, while others encouraged it? 2) Why have they built varying IPR enforcement systems? The overall hypothesis was that ideational engagement preceding these policy decisions would have traceable marks on the decision-making process, with material outcomes. The contribution of scientific experts to ideational engagement between the policy stakeholders and policy-makers was expected to be significant, and it was an open question whether this would take the precise forms predicated in the epistemic community concept.

Here is how the analysis proceeded. I have focused on the experience of those countries where (because of their agricultural production profile) the biotech TNCs marketing the technology have significant interest in lobbying for policy change towards 1) permissive biosafety policies that would facilitate GM crop cultivation, and 2) IPR policies that would allow the extraction of technology fees from cultivators. The US Foreign Service lends diplomatic support to this lobbying effort. In these settings, the most important obstacle the TNCs face is the fact that the greater public perceives significant risks from the spread of GM crops and little if any gain, and there are activists campaigning against them by pointing to those risks. This makes permissive policies a hard sell for national policy makers. The TNCs face a potential ally in domestic agricultural producers, who may be interested in accessing a potentially productivity-enhancing technology. A TNC-domestic producer alliance is therefore necessary to effectively push for policies permissive of GM crop cultivation. However, the TNCs and the domestic producers have conflicting interests in IPR enforcement defining the terms of access to the technology: TNCs want stronger IPR enforcement (which pays for them) than the producers (who pay for it) do. In the absence of an ally, the domestic producers are likely to lose out in this conflict, because the TNCs, supported by US diplomatic pressure, are strong, A domestic producer-activists alliance is therefore necessary to apply pressure on and convince policy-makers to adopt policies that prevent the terms of access from turning against the producers. These were the postulates of my sub-theory.

What brings out a TNC-domestic producer alliance? I theorized that where most of the domestic agricultural production is being done in big farms by capitalist farmers, this alliance would be more likely and efficacious. Where smallholding peasantry dominates, the domestic producers would be less interested, and less able, to politically defend such an alliance position, because their potential gains from technology permission is uncertain (which follows from agricultural microeconomics) and at best small compared to the costs of political mobilization (which follows from collective action theory). A more consolidated, capitalist producer sector, therefore, is expected to be more strongly in favor of permissive biosafety policies. This was the prediction of my sub-theory.

I then comparatively pursued my study in two pairs of countries, one pair where such producers are found, and one where they are not. Significant differences in policy experience were indeed observed between the pairs, which attest to the importance of the material context in defining the strength of the producer sector: A formidable TNC-farmer alliance pushed for and eventually obtained permission for GM crop cultivation quite easily in Argentina, and after some contestation but quite decisively in Brazil too. In the small farmer-context of Turkey and India, farmer associations were relatively missing from the debate, or took defensive positions that did not translate into a clear alliance with the biotech TNC. The result has been precautious, limited permission as in India or a complete ban as in Turkey. The implication of this between-pair comparison is that a frontal campaign against the GMOs (spearheaded whether by civil society activists or their allies in official circles) is likely to be doomed to irrelevance where the domestic producers are strong because the stars are then aligned for permissive policies as two favorable stakeholders meet. Indeed, such a campaign succeeded in Turkey, yet failed in Brazil.

What brings out a domestic producer-activist alliance? It comes about when GMO-skeptic activists *decide* to ally with the producers and frame the GMO threat in terms of property claims rather than purely consumer risks. Such a frame, and campaign strategies aligned with it, help change perceptions among the producer groups, and the state officials they talk to, about which demands concerning IPR claims are legitimate, and what can be achieved against the TNCs. Campaigns with such a focus were effective in Argentina and India, to such an extent that the TNCs have expressed great dissatisfaction about IPR enforcement in these places. The case studies demonstrate that the effect of epistemic coalition activism was particularly pronounced in India where the agricultural sector interests are less well-articulated organizationally, while in Argentina a very strong agricultural sector acted more independently to defend its perceived interests with less need for an ally. Without such campaigns producers lost access to technology in Turkey, or found themselves alone vis-à-vis the TNCs in their contention over intellectual property claims in Brazil. The implication of the within-pair comparison is that activists can help the domestic producers to obtain more favorable terms of access to the technology if they recognize such access as a legitimate demand. Orthogonal to the material agrarian context, then, the ideational orientation of the oppositional activists is a variable that affects the policy contestation. The differences in policy experience observed within pairs (between countries that are similar on agrarian structure characteristics) attest to this.

In other words, if you are campaigning against the GMOs altogether, you may hope to win in a context where well-organized farm interests are lacking. Where they are not lacking, a campaign orientation against corporate property claims over technology, rather than a categorical rejection of the technology itself, may be a safer bet for success in policy influence. These claims about the outcomes of opposition orientation are causal claims, which stand confirmed by the current sample; however, because of limitations with the sample and the data it is safer to conceive them as probabilistic, rather than deterministic relationships.[377] This conclusion is

[377] Because of certain claims about particular forms of QCA analysis (Ragin 2014), sometimes scholars associate all qualitative social science with the analysis of deterministic relationships. Obviously, there is no theoretical reason

illustrated in Figure 12, which reproduces Figure 1, this time adding the social-economic results of the policy decisions.

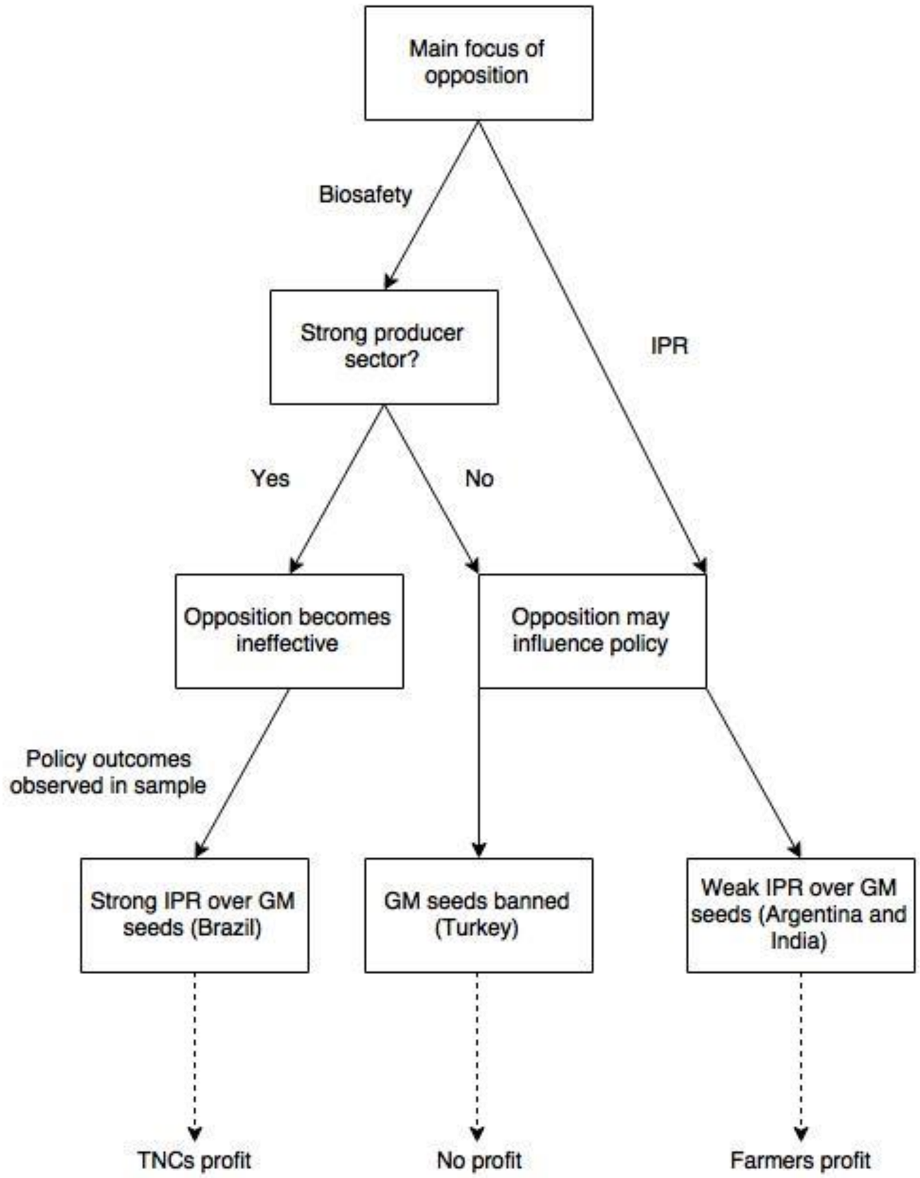


Figure 12: Causal pathways to policy decisions and their economic outcomes

From secondary literature reviewed in the case studies above we can observe that different policies are associated with different social-economic outcomes: Under strong IPR,

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for this (since "qualitative" is not a theoretical category but a mode of academic practice). What qualitative researchers lack is not the common sense notion that things may happen with a probabilistic chance, but precise ways of estimating and reporting the probabilistic strength and the uncertainty of the inferences made. To do so, we have to fall back on ordinary language, employing phrases like "to the extent that" and "probably."

impact studies can barely document any extra profit gain from adopting GM seeds for farmers, as in Brazil (da Silveira and de Carvalho Borges 2007). With weak IPR, those gains look more substantial, at least in static terms,[378] as in Argentina (Qaim and de Janvry 2003, Trigo and Cap 2003, Sztulwark 2012) and India (Lalitha 2008, Sadashivappa and Qaim 2009). With a categorical ban there are opportunity costs of non-adoption (Brookes 2012, Aydin et al 2013), but also preemption of relevant biosafety risks, as in Turkey.

What determines the orientation of the opposition then? Why did Indian activists focus their discourse and their campaign strategies on considerations of rural welfare and farmer vulnerability vis-a-vis IPR demands, while Turkish or Brazilian activists remained more interested in biosafety threats? In response to this question, historically contingent, ex post facto descriptions can be provided, drawing on the biographies of the activists and such, and they are found in the chapters above. Generalizing from these descriptions with an effort towards a causal explanation of activist orientation would result in an explanation as rich (therefore as explanatory as, and not more than) the descriptions themselves. Stopping short of infinite regress, my causal analysis ends where activists develop different orientations. In other words, ideas can be taken as dependent variables in other studies, the point in this one is that the ideational orientation of the activists is an independent variable that affects policy contestation.

## Conceptual Innovation: Epistemic Coalitions

My contribution with regards to making sense of how the activists orient themselves is rather a conceptual one. I have proposed the concept of "epistemic coalition" as a container term

[378] For a more dynamic evaluation, one would need to take into account the effects of weak IPR over incentives for innovation in plant biotechnology in the longer term. TNCs constantly threaten to quit weak IPR environments, but given the large market size in these places, those threats may prove to be bluffs. As for the rate of innovation, there is surprisingly little scholarly evidence for the commonplace expectation of more innovation from stronger IPR. See Hudson and Minea (2013) for a review.

for describing the relationship between activists, the scientific knowledge sources they utilize on the one hand, and the public decision-makers they try to influence on the other. The coalition brings together scientists, civil society activists, and pro-active bureaucrats. They strategically mix selective scientific evidence with ideological narratives and social norms to produce truth statements over the nature of the policy challenge in question, under conditions of incomplete scientific consensus. These statements are made in the form of claims on how nature and markets work, providing descriptions about "how GM seeds reproduce themselves," "how much they actually contribute to costs savings" and the like. Competition between rival epistemic coalitions occurs through a contestation over such truth claims. Instead of simply appealing to interests, epistemic coalitions accuse their detractors for not knowing enough, or at best feigning ignorance of truth. This is what is *epistemic* about those coalitions.

Investment in claims of knowledge makes it necessary for the epistemic coalition to enlist the input of scientific experts. Experts can participate in epistemic coalitions and influence policy in four ways. First, experts communicate with and give ideas to civil society actors, such as activists organized in NGOs, who may then affect policy. Secondly, experts in the capacity of consultants communicate with and give ideas to public policy-makers. Third, experts are employed or appointed in public committees in the capacity of regulatory scientists, and put their ideas directly to work. Fourth, many civil society actors and government bureaucrats or even elected politicians active in this area themselves are experts, with advanced degrees in life sciences, medicine, or agricultural engineering. To the extent that they fall back on their expert knowledge in forming their opinions, they represent expert influence over policy. The relationships between scientific experts and the other actors they communicate with are causally complex and multidirectional, in ways that go beyond the oft-used metaphor of "speaking truth to power." A governmental or non-governmental organization may be following the advice of certain scientific experts in their conduct, but they might have chosen to consult that particular group of experts on the basis of the latter's expected congruence with the organization's conduct. Also, ideas developed by experts themselves rest on kinds of knowledge other than purely scientific expertise. Their conduct is underpinned by a sense of responsibility of the wider economic and political implications of their views, gleaned through their conversations with non-scientist participants in the debate. This is why they are not "epistemic communities" (Adler and Haas 1992) and instead given the looser name *coalition* in an effort at concept differentiation.

To understand what this term is intended to convey, remember the following episode on the decision to approve, for the first time, the cultivation of a genetically modified crop in Argentina. Because it is never possible to establish with hundred percent certainty the absence of harm from a product, the scientists involved with this decision reportedly did not feel that they have exhausted all the possible test questions. One close observer remembers, "when the decision to liberate the [genetically modified] soybeans came up there were still doubts and worries. The CONABIA [biosafety committee] experts went and talked to the [Secretary of Agriculture] Felipe Solá, and said 'It looks good to us, though maybe we should also do this and that [test], etc. Solá [himself an agricultural engineer and a university professor] said to them 'I am willing to sign this, but you are the experts, you have to take a decision and tell me whether this is good or bad'… It was the CONABIA people who took the responsibility to go forward, Vicién [scientist chairing the committee] being a chief figure." Dr. Vicién sees herself as among a larger coalition who approached the issue with a foremost concern for agricultural productivity and contextualizes her input with reference to opinions in that circle: "There was a group of people at the National Institute for Agricultural Technology, the Secretariat of Agriculture, and the private sector, who thought that this technology could be useful for the country".[379]

Two things can be inferred from this episode. First is that the input from the regulatory scientist, in the capacity of an expert, indeed mattered. Yet, secondly, her input was not derived exclusively from science, and instead was grounded on her understanding of Argentina's national economic interests. These lessons negate two alternative ways of making sense of this historical episode. First is a story of merely political struggle, where expert opinion receives lip service, and serves to justify already existing preferences driven by interest group politics or ironclad ideological views (as much of the mainstream political science would imply). Second one is a story of social learning where expert opinion speaks the scientific truth to power and leads it to rule on that basis (various cognitive evolution and social learning approaches). The first story presumes that political actors already know well what they want and how to get it, with little use for additional policy knowledge. The second story is set in a crisis situation where this presumption does not hold, and argues instead that scientific input can bring cognitive order into an otherwise uncertain world, thanks to the consensual nature of the validity tests it relies on. Epistemic coalitions operate in a third universe, some kind of purgatory, where uncertainty is indeed significant, but so are struggle and negotiation, due to a lack of consensus over the precise implications of expert knowledge. The concept therefore invites attention to the strategic interaction of competitive coalitions, each with their own attempt at recruiting some expert knowledge in support of their policy agenda.

Recast in these terms, what I have done is a study of the struggle between epistemic coalitions that put forward rival kinds of policy knowledge towards policy influence. The

[379] See Chapter IV for references.

struggle is between those who accept the biotech TNCs' narrative that there is little reason to worry about the spread of GM crops and the proprietary claims associated with them, and those who oppose this vision for various reasons, the latter coming in various forms on the basis of particular reasons they emphasize. I document the participation of scientific experts in these coalitions, but I am skeptical that it is the experts that are chiefly responsible for ideas dominant in each coalition. What I do argue is that 1) the ideas of epistemic coalitions are not simple functions of their material settings, they are not derived from economic interest groups, and instead they represent an autonomous social force, and 2) they are causally influential on policy-making, in a manner orthogonal to variables associated with the relevant economic structure. I empirically demonstrate the plausibility of this argument by tracing the policy processes. To add validity to the findings, I do it through structured comparisons across countries where the material setting and the relevant economic interest groups vary in theoretically meaningful ways. The policy outcomes observed imply that the policy process has been in a wide sense a process of learning and cognitive evolution, but not necessarily towards better outcomes; because in formulating a narrative of policy knowledge, epistemic coalitions mix scientific and non-scientific ideas, good ideas and bad, and governments act on this knowledge inconsistently.

Before discussing the implications of my findings at greater length, I will first address possible empirical limitations of the study. If the explanations and the concepts I am offering are not suitable matches to the present research questions, there would be all the reason to doubt their implications for more remote contexts.

### Validity, Adequacy, and Alternative Explanations

Is it possible that I am missing simpler adequate explanations of the choices each country made regarding GM crop cultivation? Am I omitting some fundamental difference that drives the variation among cases, which would challenge the validity of my account?

What about state autonomy (Evans et al 1985), for example? In this analysis I have deliberately treated state autonomy as residual; taking the pressure from civil society actors as the primary explanatory factors. This is not because state autonomy does not matter, but without a theory of the autonomous interests of the state managers in a given field, *any* result can be expected from autonomy; it would be affecting policy-making processes in contingent, ad hoc fashion. It is true that greater state autonomy vis-à-vis transnational pressures would result in policies defiant of TNC interests more often, but I have explained that such policies could be realized in a variety of ways, such as banning GM crop technology or adopting heterodox IPR policies for its appropriation. Which way, is to be decided. In other words, rather than being explanatory, state autonomy stands here as something to be explained with regard to its direction. Epistemic coalition is the interface through which activists infuse ideas into public decision-makers in a way that help determine that direction, influencing the adoption of particular policies.

Similarly, the primarily society-based explanatory mode employed here may be criticized as lacking enough state-institutional component. Institutional causes are in essence historical causes crystallized and reproduced in current practices through the continuous application of established rules regardless of the change in human cohorts and the issues they face. Historical (Thelen 1999) and sociological institutionalism (DiMaggio and Powell 1983, March and Olsen 1989) therefore stress that institutional behavior is influenced to a greater extent by historically inherited preferences and styles than by present external factors.[380] In this study, we face a different image; institutions bewildered by novelty, and established practices upset by new international-legal and scientific predicates. Consequently, here political institutions are rather treated as part of the terrain that interest and opinion groups traverse as they try to formulate and articulate their interests to decision-makers. Although in the close-up ideographic view institutions appear to be connecting actions to reactions and to outcomes, they are not causal variables that systematically tilt the outcome to one particular direction.

This is not to say that we are dispensing with official state institutions while explaining a question of policy. Indeed, plenty of empirical material in the chapters above report on inter-institutional interaction in order to document the inner workings of the state machinery; a glance at figure 10 above would give an idea about the degree of detail with which this has been done. In all countries examined, farm groups focused their lobbying activity at the Ministry of Agriculture, biotech companies did so too but also courted Ministries of Foreign Affairs, Treasury, and if there is one, Science and Technology, and NGO activity was focused more on the Ministries of Health and Environment. At a further level of detail, for example, when the TAGEM unit of the Turkish Ministry of Agriculture proved to be uncooperative to agrifood industry, the industry encouraged the unit called Directorate-General of Protection and Control—to whom they always had more regular contact—to develop expertise and acclaim a greater role over the policy decision. Such institutional choices made by the actors may have affected the outcomes in specific ways in particular contexts. But if this is so, the cause lies in the choice, and the strength of the actors making the choice, not the institutional channel chosen. For example,

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[380] "Rational choice institutionalism" as it is called by political scientists, or "new institutional economics" as called by economists, on the other hand, is more interested in how purposeful actors design institutions to achieve certain ends, and once institutions are established how individual behavior is adjusted in rational anticipation of institutional constraints.

perhaps it has made a difference that the Indian biosafety regulatory body GEAC remains under the Ministry of Environment, which enjoys veto power for biosafety approval decisions. An independent GEAC could be expected to be more permissive. However, such an argument generates the question why GEAC has remained under the said Ministry. The time period I have studied is long enough for institutional re-adjustment for political aims, so I believe that the answer would lie in the wider societal context. In a country where the pro-GMO lobbying groups were more cohesive and stronger, institutional change could have been engineered to make the regulatory agency independent or otherwise more compatible with permissive policies. Indeed this has been the case in Brazil, where the lobby was stronger, but not in India.

Readers from different traditions may find the above *theoretical* point more, or less, compelling. The *methodological* point that we may have to agree on is the following: A study interested in demonstrating the effect of particular political institutions on policy would follow a different research design; selecting cases purposefully on the basis of varying institutional characteristics—and not agrarian characteristics. On the contrary, in order to bracket the influence of polity and institutional characteristics, I have excluded such substantially interesting countries as China, and limited my sample to countries with a roughly similar polity profile: relatively democratic, open to Western influence, with a history of state-led capitalist development and corporatist consultation between the state and interest groups. For the present research design it is enough to demonstrate that my explanatory variables (producer sector strength, and epistemic coalition orientation) are not unidirectionally generated by the state institutions they encounter (i.e. that there is no omitted variable bias).[381] In the case of producer strength this is obvious enough: all of these troubled democracies have witnessed major

[381] For omitted variable bias to occur, the omitted variable need to be strongly associated not only with the dependent (outcome, "left-hand side") variable, but also with an independent (explanatory, "right-hand side") variable.

restructuring of their polity several times over the last decades only, during which agrarian structure and farmer organizations have evolved more slowly. (There is even reason to think that the inverse relationship would be significant: consider the kind of agrarian structure that would generate a Ministry of Agriculture that is consistently stronger than the Ministry of Health). That epistemic coalitions emerged in the way they did and took the discursive and mobilizational routes they took primarily because of particular state institutions they faced, appears to me as a farfetched assumption, and the evidence I encounter does not seem to vindicate that. In short, polity institutions may have had some causal influence, but they have not been overwhelming. Instead of trying to detail their influence, I paid enough attention to them to make sure that my explanation is not biased by their omission from the story.

A partial exception to this could be institutions of federalism. In a federal structure it is more difficult to enforce a sweeping policy of the more radical kind, as local governments may try and deviate from it. It would therefore be more difficult to find federal countries as extreme cases on a policy question. Indeed, my extreme cases on biosafety policy are the staunchly unitary Turkey, and Argentina, a country where federalism is not taken as seriously as in either Brazil or India. Federal versus state government contestation comprises part of the reason why Brazil and India are classified as “contested policy” cases. In all countries though, most of the governmental contestation has been horizontal—between different ministries of the federal government—anyways. As explained before, the propositions and evidence I am considering are much about the contestation process and not strictly about cross-country differences in outcomes. Furthermore, the implications of federalism may be less predictable than it first appears: scholars have compared federal systems with each other to find how GMO biosafety policy is affected by the design of federalism, and not the degree of federalism per se (Bernauer 2003, Sheingate 2009).

What about partisan divides? Perhaps on this policy question the party in office is reproducing its overall approach to agriculture and economic policy: the left-wing goes left, while the right-wing goes right, and so on. While this must be part of the story it does not yield clear predictions, as it is not clear how one would derive policy positions on a complex question such as the regulation of GMOs from broad ideological commitments. Besides, the time period I cover allows for variation in government orientation, and process-tracing yields counter-intuitive evidence. In both Argentina and Brazil, GM crop cultivation enjoyed expansion under the government of urban-based left populist parties that historically had an uneasy relationship with farmers, yet the latter still made its influence felt. In Brazil in particular, the Worker's Party (PT) came to office with explicit promises of fighting transgenic agriculture, contrary to the previous Cardoso government's position. Yet, as narrated in Chapter V in detail, the PT government was forced to change its position after being pressured by the agricultural producers and persuaded of the legitimacy of their demands by epistemic brokers.

Is it that some broad-brush cultural differences underlie differences in the public reception of GMOs, which then drive the variation in policy? Maybe "Western" societies are more permissive towards products of modern biotechnology, whereas in places like Turkey or India religious or philosophical objections carry greater weight, it could be argued. But, as explained in each respective chapter, in *all* of these countries opinion surveys documented that the majority of the public preferred non-GM to GM food and even favored a total ban, including in Brazil and Argentina. The question is why the opposition of the general public is overridden by the demands of particular stakeholders in only some cases. Also, while it is true that opposition groups make use of various religious and cultural motifs to construct their narratives; the same motifs can be used, and are used, to support different kinds of narratives too. Some Islamists in secular Turkey justify their opposition to GMOs on religious grounds, while the Islamic Republic of Iran promotes ambitious R&D programs for GM crop development. Particular cultural motifs may serve as language to articulate views, but they are probably not determinants of them.

Apart from these political and social factors, certain technical reasons could be evoked as alternative explanations. Is it that countries have chosen their regulatory regimes through an automatic alignment with the approach dominating in their export markets? European skepticism towards GMOs must surely have affected those who export to Europe, it could be conjectured. But EU regulations do not ban GMOs, it only discriminates against them. Besides, all these countries export to Europe, with Brazil and Argentina leading the pack—why the counterintuitive variation in policies? Turkey chose to ban GM crop cultivation completely, instead of allowing (like Argentina and Brazil did) those varieties approved in major export markets. Besides, even at the doorstep of Europe, Turkey does not really export crops to Europe, or much anywhere else for that matter—it is an exporter of horticulture, for which GM varieties are irrelevant; and some cotton, whose major producers lobbied *for* GM seeds. For India the main agricultural market of interest is India. No, export markets do not explain the story. And it is not that some of these countries needed GM seeds obviously more than the others for agronomic reasons. As explained in the empirical chapters, each one of these countries were approached by the TNCs for the commercial release of GM seeds adopted to their ecosystems. In some of these countries the chief technical problem in the farm is crop blight due to insects, in others it is undesirable weeds and the costly or cumbersome tasks required for removing them.

But GM applications for each of these problems exist in the form of insect-resistant Bt (*Bacillus thuringiensis*) or HT (herbicide-tolerant) crops. It is also not the case that these issues were being decided by technocrats in boring meetings behind closed doors, with no public interest. In all these countries, the regulation of GMOs was a high-stakes issue that taxed the attention of activists and politicians alike, in addition to scientists. In the capital, Prime ministers and Presidents had to get involved with the issue first-hand. In the countryside, murders and suicides were allegedly associated with the debate. When Argentinian and US Presidents met to discuss how to restructure Argentina's fabled external debt, IPR over GMOs were among the top items they put on the negotiation table. While complex and technical, the regulation of GMOs was not a technocratically resolved issue—it was deeply politicized.

Lastly, due to the importance of certain critical junctures in defining the policy trajectory in path-dependent fashion in each case, one could argue that policies were driven by random historical happenstance, and not by the sort of factors analyzed here. The fait accompli of illegal spread of GM seeds in Brazil and India for example, changed the tone of the policy conversation in these places. That is true, but instances of illegal entry of GM seeds have been detected in Turkey too. In these cases, the government bureaucracy responded harshly with police measures, made sure that the response was well-publicized, and made it clear that it would not *allow* the policy to be defined by such events.[382] An ocean of uncertainty and randomness surrounds the actors at all times but they also enjoy some degree of purposeful action that lends itself to comparative analysis.

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[382] Fearful of the unauthorized release of GM varieties, Ministry of Environment issued a communiqué in June 1999 asking governors to inspect the production and sale of unregistered seeds. Since then, incidents of security forces interceptıng unauthorized importation of GM food or seeds have been publicized several times. For an instance, see "6 bin 600 ton GDO'lu mısır Türkiye'ye girerken yakalandı," *Hürriyet,* 5 July 2011, http://www.hurriyet.com.tr/6-bin-600-ton-gdolu-misir-turkiyeye-girerken-yakalandi-18175626. Crucially, despite ongoing rumors about the illegal cultivation of GM crops in certain areas, this has not fuelled pressure for policy change presumably because the stakeholders do not expect the government to respond to such pressure favorably.

In short, policies regulating GM crop cultivation were not determined by technocratic fiat in a way that is isolated from societal input. They did not come about through an automatic alignment with policies in export markets. They do not seem to follow simply from partisan orientation of the government in power, or the institutional design of the state machinery they run. They are not explained by "national culture" or religion either. Instead, policies were made as a result of social contestation, through the interplay of biotech TNCs (with a *certain* interest in permissive biosafety and strong IPR policy), local agricultural producers (with a *potential* interest in permissive biosafety and weak IPR policy), and the epistemic coalitions trying to articulate the public interest (towards broadly strict biosafety policies). With TNC lobbying a constant; public decisions materialized as a resultant of the political strength of the agricultural producers, and the particular orientation of the influential epistemic coalition. Both of these factors—structural and voluntaristic; matter. Economic structure determines the strength of the local producer sector to an important extent, but determines its interests to a lesser extent. If GMO-skeptic epistemic coalitions can attach themselves to producer sector discourse, they may help define those interests. If they do not do so, and if the producer sector happens to be strong, the GMO-skeptics become irrelevant, and the TNC vision becomes likely to win over policy.

## **Does it Matter? Theoretical and Practical Implications**

### Epistemic Coalitions, Communities, and Policy Knowledge

The first implication would be suggested conceptual improvements in regards to the literature on social learning and public policy. With the epistemic coalition concept I have built on the epistemic community (Haas 1992, 2001, 2015) by focusing on agents utilizing expert knowledge to change causal beliefs in order to influence policy, but relaxed some of the assumptions about what defines such agents and included a broader set of participants; drawing on other concepts such as the "advocacy coalition" (Sabatier 1988), the "discourse coalition" (Hajer's 1995), and the "transnational advocacy network" (Keck and Sikkink's 1998). The coalition is wider than the community.

Social scientists are advised to keep a "conservative bias with regards to concept formation" (Snyder 1998: 227) since "the proliferation of new terms and concepts" is likely to result in "conceptual confusion" (Collier and Levitsky 1997: 451). However, conceptual stretching—inappropriately trying to fit new phenomenon in existing concepts—is at least as important a peril, and new concepts should be coined where it is necessary to avoid it. The pressure groups investigated in this study are too much invested in claims of scientific truth to count as simple political advocacy coalitions. Yet they are too much involved with ideological narratives, and too selective and partial in their use of scientific knowledge, to be recognized as veritable epistemic communities. "Epistemic coalition" would be a term to contain these qualities that would not seem to fit with existing concepts.

With conceptual innovation I aim to overcome certain criticisms of the epistemic community research program explained earlier. Reviewing the criticisms, Cross puts forward constructive suggestions for improving the viability of the research program. Accordingly, future research in this area "should account for a number of things, including domestic politics (why some epistemic communities' ideas gain traction over others); competition among epistemic communities or with other actors; the context within which epistemic communities operate, especially the major political interests of a given time period; the varying degrees of power that epistemic communities might have; and the relationship between scientific knowledge and political preferences" (2013: 146). With a similar aim, Dunlop recommends "[a]ssuming greater elasticity in the structure of an epistemic community and borrowing ideas from the advocacy coalition framework" (2000: 142).

These improvements would make sense, but if simply added on top of the existing definitions of the "epistemic community" term, they may end up making it unrecognizable. The attractiveness of the original concept was in its simplicity and the theoretical leverage that came with it; and contaminating the concept with auxiliary ingredients implies a loss of leverage. In order to further the research program without such contamination or stretching of the concept, we may need to recognize distinct variants or mutants observed in the neighborhood around it. Epistemic coalition would be a variant. Where an epistemic community is unable to form a consensus view and become influential over policy, the struggle over the scientific truth narrative may take the form of a contestation between rival epistemic coalitions. In the seminal article where Peter Haas described epistemic communities at length, he differentiated the term from its neighbors based on four characteristics. Below I reproduce the tabulation of this comparison, inserting the "epistemic coalitions" as the bottom row, which fills a discrete logical place there.

Table 28: "Variables discussed in the literature on policy coordination" in Haas (1992: 21); the bottom row added by the author

| Variable | Defining characteristics of variable | | | |
|---|---|---|---|---|
| | Principled beliefs | Causal beliefs | Validity tests | Policy enterprise |
| Epistemic communities | x | x | x | x |
| Ideas | x or | x | | |
| Belief systems, operational codes, and cognitive maps | x or | x | | |
| Consensual knowledge | | x | x | |
| Policy networks | | x | | x |
| Transnational and transgovernmental channels and politics | | | | x |
| Institutions and organizations | | | | x |
| Epistemic coalitions | x | x | | x |

In these terms, epistemic coalitions are groups who propagate causal ideas and principled beliefs in the service of a policy enterprise, yet whose standards of validity are contested by at least another coalition of the same kind.

Concepts come with associated empirical territories. Most epistemic *community* research has been devoted to analyzing policy influence at the level of international negotiations, trying to understand how experts may contribute to international coordination on transboundary problems (see Haas 2015, Cross 2013 for review). The empirical territory more appropriate for the concept of epistemic *coalition* could be analyses of how states translate common international obligations, norms and challenges at large into national policy (Chayes and Chayes 1993, Evans et al 1993, Downs et al 1996, Fearon 1998, Haas 1998; Borzel et al 2010). Epistemic communities help states to learn the same lessons, to the effect that they have similar policies or otherwise policy coordination. Epistemic coalitions may result in the learning of different lessons. The image that shines forth through the community concept is policy isomorphism, animated by consensual knowledge. For the coalition concept, it is policy differentiation, fueled by disagreements and contested knowledge.

## Globalization, National Policy and Development

The questions of isomorphism and differentiation are of substantial interest to debates in international development since observers disagree about whether common global standards or discrete policy approaches serve developing countries better, and the policy issue examined here has a substantively important place in these debates. When the World Trade Organization (WTO) was founded in 1995, it came with treaties like TRIPS, TRIMS, SCMs, and GATS making intellectual property protection, investment measures, and trade in services part of the broader package of global trade integration, which had been hitherto squarely focused on (and intellectually justified by theories of) trade in goods. Developmental scholars warned that by imposing a one-size-fits-all straitjacket, these treaties were ruling out industrial policy tools that Asian tigers such as Taiwan and South Korea had successfully used before. For the Korean economist Ha-Joon Chang (2002), this amounts to "kicking away the ladder" on behalf of the advanced industrialized countries, which had grown by using similar tools during their own development. Robert Wade argues that these treaties implied that "development space", i.e. the room for discrete policy-making for national developmental priorities, was shrinking. Birdsall, Rodrik and Subramanian declare, "An international community that presides over TRIPS and similar agreements forfeits any claim to being development-friendly" (2005: 144). Braithwaite and Drahos comment that for advanced industrial countries, it was clearly a "remarkable accomplishment to persuade a hundred countries who were net importers of intellectual property to sign an Agreement to dramatically increase the cost of intellectual property imports" (2000: 203-04). Studies of the relevant negotiations demonstrate that technology-importing country delegates were not much illusioned about the merits of the agreement and they resisted it (Adede 2003). Rather than being a negotiated outcome itself then, it is probably accurate to describe TRIPS as a sacrifice that the developing countries have made for the broader negotiation towards the formation of the WTO. Moreover, countries like the USA have been promoting "TRIPS-plus" IPR standards that go beyond the globally agreed minimum as a condition for concluding bilateral trade and investment treaties.

It should be therefore no great surprise that actors in developing countries have been interested in going around some of the formal commitments to IPR protection, either by using reservations in the TRIPS itself, references to other agreements, or through administrative measures with ambiguous connection to international law. This has been particularly conspicuous, and studied most, in regards to pharmaceuticals. In India, Brazil, Turkey and Thailand either the governments have broken patents and forced the TNCs to compulsory licensing in order to facilitate generic production of branded drugs, or the threat of such measures has led to negotiated drug price reductions (Attaran 2004, Krikorian 2009, Dorlach n.d.). Due to the moral strength of appeals to a human right to health, heterodox policies are recognized to be easier to pursue in the area of pharmaceuticals than in industrial upgrading at large (Shadlen 2009).

In this study I have investigated the room for maneuver in IPR enforcement with regards to plant genetic sources in agricultural inputs. Not unlike pharmaceuticals policy, arguments that appeal to a right to food, and a somewhat romantic view of rural cultivators as deserving protection from market forces, give debates in this area a moral quality that is otherwise lacking from discussions of industrial policy. Indeed, the countries I have studied have defied, to varying extents, the TNC demands for recognizing biotech patents applying to plant genetic transformations, or the particular commercial claims associated with them. In justifying these measures, public decision-makers have made use of a variety of arguments, some drawn from international agreements that may be interpreted to contradict TRIPS. The "farmer's privilege" clause of the older UPOV conventions—allowing for farmer-saved seed, for example, continue to provide reference for seed laws around the world. The mere existence of such clauses do not guarantee results; the soybean farmer associations in Southern Brazil, for example, refer to the same clause, enshrined in the Brazilian Seed and Seedlings Act, to argue against the legality of royalty fees collected by Monsanto, yet it is not clear if the Brazilian courts will ultimately vindicate their argument. However, while not sufficient, a fragmented international regime complex with such contradictory clauses may be a necessary condition for actors in developing countries to successfully challenge unwelcome IPR demands. By forum-shopping, i.e. seeking the international forum with the most desirable clauses for one's ends, actors may make the most of their existing strength in international and transnational interaction (Helfer 2009). In the evocative phrase of a Turkish bureaucrat referring to the differences between the WTO and the Cartagena regimes, "They [USA] want us to play football, yet we insist on soccer, because that's what we are good at".[383] The policy implication is that, if—as reputed development economists argue—discrete developmental space is a good thing; policy-makers in developing countries should then be making use of forum-shopping opportunities to retain that space.

Nonetheless, as conservative economists would hasten to emphasize, discrete developmental space need not be a blessing even for developing countries themselves, since it increases the room for deviation from "sound" policies. In any case, forum-shopping is after all a clever way of defecting from certain international commitments, and it undermines mutual gains that would arise from policy convergence. A more collectively desirable solution would be a coordinated one. The implication is that if treaties like TRIPS are encouraging developing countries to defect from formal commitments, fairer treaties could provide more realistic candidates for true coordination points. This should be kept in mind for the design of future treaties, such as the proposed Substantive Patent Law Treaty.

It should be also kept in mind that even for purposes of effective intellectual property protection; high-profile, strict IPR law may not be the most productive option. More than all property, intellectual property is relational in the sense that its effective reality ultimately rests on how negotiations between market actors unfold, and what governments choose to enforce. This

[383] Author's interview (August 2012, Ankara).

means that high-profile IPR treaties and laws can be counter-productive by provoking reactions from those concerned with exploitation of developing country resources through technology rents, and by driving technology transfer negotiations into undesirably conflictual terrain. As I have demonstrated in this study, it may also complicate issues of technology acceptance. Moreover, market practices such as branding, physical protection of trade secrets, or research prizes, are often more effective than formally mandated IPR rules (which are, after all, publicly granted monopolies) in protecting commercially valuable knowledge from unauthorized reproduction and incentivizing innovation (Gallini and Scotchmer 2002, Attaran 2004, Boldrin and Levine 2008, Hauns and Shadlen 2009). High-profile IPR law is not only politically explosive; it may be economically unnecessary.

## Prospects for Agricultural Biotechnology

Although passing a verdict on the appropriateness of GM crops as a technology is not the objective of this study, my findings point to the need for a more nuanced view of the policy challenges in this area than what is available in current policy advocacy writing. Both simplistic pro- and anti-GMO narratives are wrong in assuming that the technical characteristics of the technology will solely determine its impact. “Kranzberg’s first law of technology” seems pertinent to the debate: “Technology is neither good nor bad; nor is it neutral” (Kranzberg 1986: 546). Technology is not neutral because it surely has a fundamental impact on relations of production, exchange, and public health but the shape of this impact will depend on the social and institutional context in which it is incorporated into markets (Boyce 1987, 1988). While critical scholars may have exaggerated fears concerning corporate ownership of technology, they correctly identify a major fault line. In the four countries examined here the biosafety and IPR aspects of policymaking have been indeed closely linked, concerns over IPR abuse in a context of monopoly have complicated GM crop acceptance, and biosafety concerns in turn have become instrumental in challenging IPR claims. The resulting policies defy, to varying extents, the TNC vision of how the technology should be deployed in the market.

Perceptions about the safety of genetically modified agricultural crop varieties would have been probably much different if they had initially come, as with the Green Revolution of the 1960s and 1970s, from a consortium of public interest-oriented institutions, through public distribution and extension services; and if they had been part of a broader effort for sustainable agricultural development instead of being marketed as a singular silver bullet. In fact, the technology has become synonymous with the few TNCs marketing it, and this has greatly contributed to opposition. It is not that there are no reasonable biosafety concerns, but conflating such concerns with problems of market structure may hinder a proper scientific understanding of either area of concern.

Nonetheless, this may start to change soon. Currently the market for genetic engineering is under pressure of both "spread" and "backwash" effects; as economist Gunnar Myrdal (1957) called them. New companies, some from the global South, come up with patented genetic transformation events every year, but in response leading TNCs follow an aggressive merger and acquisition strategy to absorb newcomers and even established rivals—as can be seen in Monsanto's recent $47 billions-bid to take over the forerunner company in the field, Syngenta. It is difficult to judge which one of the countering trends will prevail in the next decades, but further spread of effective innovation capacity to the global South looks likely, especially among those countries with substantial financial and human resources such as those examined here. If and when that happens, based on this study we may expect to observe a change in the overall orientation of the policy debates, as the IPR fault line between the TNCs and certain domestic commercial interests will be blurred and therefore pressure for permissive biosafety policies will effectively increase.

For the time being, however, as Karl Marx remarked about the machine-breaking Luddites, it will take "both time and experience before the workpeople [learn] to distinguish between machinery and its employment by capital, and to direct their attacks, not against the material instruments of production, but against the mode in which they are used" (Marx 2011: 468). So far, many GMO-skeptics have translated their dislike of corporate control over the currently available genetic engineering applications to a Luddite-like rejection of this platform technology en masse. In the meanwhile, in pro-GMO accounts the appreciation of genetic engineering leads to a downplaying of the policy challenges associated with the corporate-institutional package in which the technology is deployed. Many writers simply do not notice that a historically unprecedented extension of formulaic IPR law to plant genetic sources, combined with the monopolistic market structure in transgenic technology supply, is problematic from a political and economic viewpoint.[384] Others, while recognizing the problem, point to "local anarcho-capitalistic" practices such as illegal seeds as indication that monopoly power is not fully realized in actually existing markets (Herring 2006, also see Paarlberg 2009). This is true; however, those practices have existed not thanks to but despite the biotechnology TNCs and the emergent global IPR regime; and their future survival depends on the extent to which

[384] Perhaps they would have thought differently had they read Adam Smith more often: "Country gentlemen and farmers are, to their great honour, of all people, the least subject to the wretched spirit of monopoly. They have no secrets such as those of the greater part of manufacturers, but are generally rather fond of communicating to their neighbours and of extending as far as possible any new practice which they have found to be advantageous … Country gentlemen and farmers, dispersed in different parts of the country, cannot so easily combine as merchants and manufacturers, who, being collected into towns, and accustomed to that exclusive corporation spirit which prevails in them, naturally endeavour to obtain against all their countrymen the same exclusive privilege which they generally possess against the inhabitants of their respective towns." See *The Wealth of the Nations*, Book IV, Chapter II.

political realities in each producer country dissipate corporate pressures towards extinguishing them. Besides, since such practices work around biosafety regulations they are far from the best way to counter monopoly power.

A more ideal and realistic way would be to increase the public sector's involvement with research, development, and extension as well as the regulation of agricultural biotechnology. Greater public involvement could direct research priorities for more public interest-oriented goals (drought-tolerance and biofortification instead of the commercially-oriented herbicide tolerance trait, improving crops other than cash crops, promoting integrated pest management, and so on), keep the technology inexpensive for the farmers, and possibly contribute to better oversight of biosafety risks. The state's capacity to fulfill these tasks efficiently, especially in developing countries, should not be exaggerated, so these are only potential, if plausible, improvements. Nonetheless, the same capacity limitation perhaps applies at least equally to the state's ability to properly regulate the private sector, as Chaudhry (1993) reminds: Heavy public presence in the economy, instead of being a sign of developmental hubris, may be a compensation for the state's incapacity in effectively overseeing private actors; which can be a more difficult job in a context of weak legal and administrative institutions. In any case, public agricultural extension services (i.e. services to carry technology, knowledge, and best practices to agriultural producers), emaciated in most of the developing world since the neoliberal turn, should be reinforced. This is necessary to enforce such seemingly mundane but fundamental biosafety measures as proper "refuge" management (planting non-GM variants near GM crop plantations to hinder the undesirable evolution of pest and weed populations), which are currently mostly ignored by farmers and private technology suppliers.

Such reorientation of public policy would need a social base for political support and for policy knowledge. In other words, an epistemic coalition needs to coalesce around this policy agenda. Such an epistemic coalition may have to engage with, instead of confronting or simply ignoring, "productivist" concerns and domestic economic interest groups because those groups, if they are strong, are likely to substantially influence public policy anyways, as shown in this study. Engagement may increase not only the chances of success for activists, but also the quality of public policies, for we need technology skeptics as much as we need technology enthusiasts and the markets generate many incentives for the cultivation of the latter and few for the former. Skeptic activists, if they are to build epistemic coalitions with desirable impact on public policies, have to consider—just as social scientists are advised to do—counterfactual comparisons: What is the status quo that we fall back on when we reject a certain proposal? What are the resources and the ideas that we need in order to change the status quo in alternative ways? What is the realistic utopia that we can pursue and what kind of constructive critical thinking do we need to get there? The findings of this study justify a call for critical realism: an urge to be more critical for those who see themselves as realists, and to be more realist for those who are critical. In evaluating such calls, Max Weber's (1949: 53) reminder may prove to be a useful guide: "Science can make [the individual] realize that all action and naturally, according to the circumstances, inaction imply in their consequences the espousal of certain values—and herewith—what is today so willingly overlooked—the rejection of certain others. The act of choice itself is his own responsibility."

## APPENDIX A

## INSTITUTIONS LIST FOR ARGENTINA

Exemplary institutions list for the Argentinian grain production chain, author's elaboration

| Abbreviation | Description |
|---|---|
| Public Institutions | |
| SAGPyA | Ministry of Agriculture |
| INTA | Agricultural research |
| INASE | Seed trade regulation |
| CONASE | Corporatist council for seed sector representation |
| CONABIA | Biosafety regulation |
| SENASA | Food safety regulation |
| INPI | General IPR regulation |
| Private Institutions | |
| Agricultural producers | |
| Sector-wide associations | |
| SRA | Mostly major producers of the Buenos Aires province |
| FAA | Mostly small and medium producers of the Santa Fe province |
| CRA | Mostly producers of the interior regions |
| CONINAGRO | Mostly small and medium producers |
| Particular associations or major firms | |
| AAPRESID | Promoters of no-tilling agriculture |
| AACREA | Agricultural technology extension |
| MNCI | Association of indigenous farming communities |
| FONAF | Association for family agriculture |
| Los Fortabat | Private firm |
| Grobocopatel | Private firm |
| Seed and biotechnology | |
| Sector-wide associations | |
| ASA | Seed industry |
| ARPOV | Plant-breeders |
| ArgenBio | Multinational biotechnology firms |
| Prosoja | Soy plant-breeders |
| CASEM | Local seed multipliers |
| Firms | |
| Monsanto | TNC |
| Syngenta | TNC |

| | |
|---|---|
| Dow Agro Science | TNC |
| DuPont | TNC |
| Bayer | TNC |
| BASF | TNC |
| Nidera | National seed, a leader in soy |
| Relmó | National seed, pioneers in soy |
| Buck | National seed, specialized in wheat |
| Klein | National seed, specialized in wheat |
| Don Mario | National seed, a leader in soy |
| Morgan | National seed, specialized in corn |
| BioGenesis | National biotech |
| BioSidus SA | National biotech |
| Bioceres | National biotech |
| Agrifood sector | |
| Sector-wide associations | |
| CIARA | Oilseed industry |
| COPAL | Food industry |
| ACSoja | Soy chain association |
| Firms | |
| Cargill | TNC |
| Bunge | TNC |
| Dreyfuss | TNC |
| ADM | TNC |

## APPENDIX B

## CONTACTS LIST FOR BRAZIL

Exemplary contacts list for Brazil, source: www.ctnbio.gov.br/upd_blob/0001/1095.doc, last accessed December 2015

| NAME | INSTITUTION |
|---|---|
| Adriana Cheavegatti Gianotto | Alellys S.A. |
| Alda Luiza Santos Lerayer | Conselho de Informações sobre Biotecnologia - CIB |
| Alessandra Bortoni Ninis | Universidade de Brasília |
| Aléssia Barroso Lima Brito Campos Chevitarese | Uniceub |
| Alvaro Miguel Rychuv | Casa Civil da Governadoria – Palácio das Araucárias |
| Ana Cristina Oliveira de Almeida | Federação dos Estudantes de Agronomia do Brasil |
| André Abreu | Bayer S.A. |
| André de Sousa e Silva | RiCon Consultoria e Assessoria |
| Andrea Lazzarini Salazar | Idec - Instituto Brasileiro de Defesa do Consumidor |
| Andressa de Sousa e Silva | RiCon Consultoria e Assessoria |
| Antonio Carlos Cunha Cavalcanti | COOPLANTIO - Cooperativa dos Agricultores de Plantio Direto |
| Antônio Celso Villari | Conselho de Informações sobre Biotecnologia |
| Ariano Martins de Magalhães Júnior | Embrapa Clima Temperado |
| Arno Cleri Reinstein Schoroder | Associação dos arrozeiros de São Sepé ( AASS) |
| Augusto Santos | Edelman |
| Bernhar Gobbi Rocha Coimbra | |
| Caio Cesar Silva Lopes | IF SERTÃO PERNAMBUCANO |
| Carine Torres Galindo | BASF S/A |
| Celso Brum de Moraes | Associação dos Arrozeiros de São Sepé ( AASS) |
| Cezar Marques Santiago Filho | Associação dos Arrozeiros de Santa Maria |
| Claudia David | Bayer CropScience |
| Claudio Martin Damboriarena Escosteguy | Produtor Rural, Assessor Técnico Privado |
| Cristhiane Abegg Bothona | Syngenta |
| Daniela Gazoto Contri | BASF S.A. |
| Dária Pimenta de Oliveira | Alellyx SA |
| Debora Bartcus Marques | Conselho de Informações sobre Biotecnologia |
| Débora Moreira Pescarini | BASF S.A. |
| Denis Ubeda de Lima | Bayer S/A |
| Denise Gallo Pizella | Centro de Recursos Hídricos e Ecologia Aplicada - EESC-USP |
| Eliane Suzuko Hiratsuka Kay | AGROBIO |

| | |
|---|---|
| Ellen Carolina da Silva | Luchesi Advogados (Bayer S/A) |
| Ernesto Donizete da Silva | ABCDA - Assoc. Brasil. Combate a Degradação Ambiental |
| Eron Cassol Argenta | Associação dos Arrozeiros de São Sepé |
| Fabiana Branda Santigo | Associção dos Arrozeiros de Santa Maria -RS (AASM) |
| Fabiana Pinho | Bayer CropScience |
| Fernanda Soares Ferment | |
| Fernando Ajudarte Neto | CIB - Conselho de Informações sobre Biotecnologia |
| Francisco Lineu Schardong | Câmara Setorial da Cadeia Produtiva do Arroz |
| Gabriel Bianconi Fernandes | as-pta |
| Gabriella Casimiro Guimarães | Universidade de Brasília - UNB |
| Geraldo U. Berger | Monsanto do Brasil Ltda. |
| Gesmar Rosa dos Santos | Universidade de Brasília |
| Gilles Ferment | NEAD/MDA |
| Giovane Corrêa Machado | Associação dos Arrozeiros de São Sepé |
| Gutemberg Delfino de Sousa | Du Pont do Brasil |
| Helvio Missau | RiceTec Sementes Ltda. |
| Ivan Dotto Ritter | Associação dos Arrozeiros de São Sepé |
| Ivo Lessa Silveira Filho | FARSUL - Federação da Agricultura doEstado do Rio Grande do Sul |
| Jesus Aparecido Ferro | Alellyx S.A. |
| João Alberto Reinstein | SchoroderAssociação dos Arrozeiros de São Sepé (AASS |
| João Batista Amadeo Volkmann | Fazenda Capão Alto das Criúvas |
| Jorge Henrique Cordeiro | Greenpeace |
| José Alberto Noldin | Epagri/Estação Experimental de Itajaí |
| José Antônio Pereira Lisboa | Sociedade de Agronomia de Santa Maria (SASM) |
| José Mário Tagliapietra | Cooperativa Agrícola Mista Nova Palma Ltda. |
| José Rogério Carvalho Tomaz Junior | Núcleo de Estudos Agrários e Desenvolvimento Rural (NEAD) |
| Juliana Ribeiro Alexandre | MAPA |
| Juliana Vansan | ArborGen Ltda |
| Leonardo Agostini Novo | Ministério da Agricultura, Pecuária e Abastecimento |
| Liliana A. Soares de Mello | Suzano Papel e Celulose S/A |
| Lisiani Gonçalves da Rosa | Movimento de Mulheres Camponesas |
| Lucia Helena Oliveira de Souza | ANBio - Associacao Nacional de Biosseguranca |
| Luciana Di Ciero | Amyris Crystalsev Biocombustíveis Ltda |
| Luciana Pimenta Ambrozevicius | Ministério da Agricultura Pecuária e Abastecimento |
| Luis Gustavo de Paoli | Bayer S.A. |

| | |
|---|---|
| Luiza Chomenko | Museu de Ciencias Naturais - Fundação Zoobotanica (MCN/FZB-RS) |
| Marcelo Giuliane | Associção dos Arrozeiros de Santa Maria |
| Marcelo Gravina de Moraes | Universidade Federal do Rio Grande do Sul |
| Marcio de Jesus Souza | |
| Maria das Graças Santos | ASSOCIAÇÃO DAS DONA DE CASA DO ESTADO DE GOIAS |
| Maria José da Costa | Asssociação Nacional de Pequenos Agricultores |
| Marina Cardoso Galvão | BASF S.A. |
| Mario Luis Silva | Sociedade Agronomia de Santa Maria ( SASM) |
| Markus Richard Ritter | RiceTec Sementes Ltda |
| Mel Mansur | Edelman |
| Mônica Cristina Altaf Julien de Sousa | CONAB |
| Nauro da Silveira Junior | |
| Rafael Georges da Cruz | Greenpeace |
| Reinaldo Montrazi Barata | CTC - Centro de Tecnologia Canavieira |
| Renato Caiaffo da Rocha | Federação das Associações de Arrozeiros do RS – FEDERARROZ |
| Roberta Marins de Sá | Ministério do Desenvolvimento Agrário, SDT |
| Robertinho Luis Meneghetti | Associação dos Arrozeiros de Santa Maria (AASM) |
| Robinson Cannaval Jr. | ArborGen Tecnologia Florestal Ltda |
| Romario Costa de Sousa | |
| Ronaldo Alfredo Schroter | Terra Consultoria |
| Rosangela Piovesani Cordeiro | Associação Nacional de Mulheres Camponesas |
| Rutneia de Paula Pessanha | Ministério da Saúde – SCTIE |
| Sarah Zanon Agapito Tenfen | Universidade Federal de Santa Catarina |
| Teresa Cristina Nascimento Mazzotini | AGROBIO |
| Valmir Gadke Menezes | Instituto Rio Grandense de Arroz |
| Verena Glass | Reporter Brasil |

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