

Precautionary Expertise for GM Crops (PEG)

National Workshop Report Spain

Quality of Life and Management of Living Resources
Key Action 111-13: socio-economic studies of life sciences
Project n° QLRT-2001-00034

J. David Tabara, Daniel Polo and Louis Lemkow
Institute of Environmental Sciences and Technology (IEST)
Autonomous University of Barcelona
Edifici Cn - Campus UAB
08193 BELLATERRA (Cerdanyola del Valles)
Barcelona
jdtabara@terra.es

August 2003

Contents

Summary	4
1 Introduction	5
2 Integrated assessment as the theoretical and methodological background	6
3 GM crops in Spain: a brief note	10
4 First meeting: Barcelona, 7 March 2003	10
5 Second meeting: Madrid, 26 June 2003	12
6 The scenarios	14
References	22
Appendix I: Questionnaire	23
1. Aspectos Políticos Y Sociales:	26
2. Aspectos Económicos Y Evolución De Los Mercados:	27
3. Evaluación Y Gestión De Riesgos. Aspectos Tecnológicos Y Ambientales	28
Appendix II: Transcriptions Of The Workshops (main extracts only)	30
1. Barcelona Workshop	30
2. Madrid Workshop	48

Summary

The following report summarises the procedure and results, in the form of scenarios, obtained from the two-stage workshop carried out in Barcelona and Madrid within the framework provided by the EU project, 'Precautionary Expertise for GMO Crops' (PEG). The theoretical and methodological background for the procedure chosen is based on *Integrated Assessment* in its participatory and dialogical forms. Three scenarios emerged mainly from two workshop meetings discussions, although other sources complemented their final design, such as a preparatory questionnaire sent to relevant stakeholders as well as the knowledge gained from qualitative individual interviews and documentary content analysis, carried out before the workshops. Thus the scenarios are the outcome of the larger PEG research *process*, not just one single research event.

1 Introduction

Policy scenario making, particularly in the form of participatory exercises, is now emerging as a widely accepted methodological approach in Integrated Assessment (Anastasi, 2003a; van Asselt *et al.*, 2001). Scenarios are now commonly used for mutual learning, for research analysis and to support policy decisions on complex issues such as those related to environmental and sustainability issues (EEA, 2001; Van Asselt *et al.*, 1998). To a large extent, the current appeal of scenario analysis lies in its versatility: scenarios can be applied both to large-scale contexts, such as Europe (Bertrand *et al.*, 1999), and to regional or local levels. Furthermore, scenarios can take many forms: some adopt the structure of purely quantitative numerical extrapolations of sets of past or present trends, while others mainly involve interpretative qualitative accounts based on rhetorical, literary or even satirical discourses¹. Scenario making is a large and diverse field with many variations and hybrids. In our case, we created a graphical representation of the knowledge gained during the discussions of a two-stage focus group, as well as from other interactions with relevant stakeholders in Spain on the debate about GM crops and their commercialisation in Spain and Europe. This presentation of PEG scenarios for Spain draws on the theoretical background and methodological advances made during the last decade within the field of Integrated Assessment.

Before going into the detail of the procedure and outcomes of the process, it is important to note that we understood scenarios not as tools to *predict* the future, but rather to *think about it* strategically and perhaps to act accordingly. (Thus some may argue that its underlying aim is not to depict the future but to invent it). Like all conceptual constructs, none of the scenarios are likely ever to occur in reality, and even less so in their fully described forms. Scenarios help to reflect on the dynamics in given processes and to explore possible on-going developments. Such outcomes and representations may not be easily put to the fore by other assessment or research procedures, although they may be crucial in the design of relevant policy options and measures. In our view, scenarios constitute one of the best available methodologies to question taken-for-granted assumptions and to broaden policy-analysis discussions, or simply to show that 'another world is possible'.

Therefore, in our view, and despite the diversity of approaches now available in scenario-making we understand that:

- Scenarios are not desired futures.
- Different scenarios may have many components in common, or that are not incompatible and that can thus be present in different scenarios.
- None of the different scenarios produced within a given research or assessment exercise are more likely to happen than the others. In fact, the most likely thing is that none of them will happen (in reality).
- A crucial aspect of scenario making is that the scenarios should clearly identify and represent the (qualitative) logic behind the different variables and components which link driving forces to plausible phenomena under consideration, e.g. as causes or consequences.

¹ Chris Anastasi underlines the importance of *fun* in the making of scenarios. An apparently less formal structure and procedure in scenario-making can improve creativity and unveil hidden realities which could not be grasped otherwise. Moreover, in relation to literary discourses, he points how Shell International employed a poet to write down the content and description of the different scenarios which the company used to learn about their own future strategy (Anastasi, 2003b).

- The logic, as well as the classification and structure of the different scenarios, must be credible and socially embedded. In order to achieve this – as well as, whenever possible, to avoid personal discretion and subjectivity in the researchers' analysis – stakeholder participation and peer evaluation is encouraged. The selection of such third-party participation can follow several criteria, according to the specific aim and topic of the research. At the same time, heterogeneity and maximum representation of the diversity of stakeholders is the approach usually adopted to compensate for subjectivity or to enhance mutual learning.

We see policy scenarios as tools to:

- Represent plausible trends and logics.
- Reveal the relevant actors' strategies involved in a given policy-issue development.
- Help to discover the stakeholders' rationalities, values, and even worldviews and expectations, behind given different contexts of action, as well as the forces and interests they respond to.
- Help to communicate the causes and consequences of different trends derived from different situations and policy options, and if necessary, to identify the key variables than can alter them.

Recently at IEST we have used the scenario-making methodology on three other occasions before the PEG project, both at local and regional levels: (a) to analyse the possible water consumption trends in the Metropolitan area of Barcelona region following the European project FIRMA (1999-2002; semi-quantitative), (b) to look at the possible use and sustainable use of local allotments in Terrassa, a city near Barcelona (2002; qualitative) and (c) to analyse the environmental and sustainability issues of Catalonia for 2010 (Tàbara, 2002; literary back-casting technique).

2 Integrated assessment as the theoretical and methodological background

Integrated Assessment (IA) aims to gather, structure, synthesise and present interdisciplinary knowledge in order to inform in a relevant manner policy decisions on complex issues. Integrated Assessment can be seen as the culmination of the confluence and evolution of several disciplines that have dealt with the perception, assessment, and management of risks and uncertainty over the last three decades (Jäger, 1998; Toth and Hizsnyik, 1998). As a dynamic and fast evolving field of applied interdisciplinary research, or science, as some like to put it, IA is informed by a diversity of theoretical positions and methodological strands. On the one hand, quantitative and modelling approaches to IA have been dominant in certain fields within IA. Partly, the popularity and appeal of these approaches may be explained by the indisputable capacity to assemble and process large amounts of information provided by computer models, tasks which could not be performed otherwise. It is also the case that the persuasive power of a relatively small number of figures or graphs to represent complex issues – regardless of their underlying possibly too reductionist assumptions – might have also played a role in their success. On the other hand, qualitative participatory IA approaches (also referred to as PIA), despite being still underdeveloped, are receiving growing recognition, in particular by practitioners of Integrated Environmental Assessment (IEA). The dichotomy or even antagonisms between the two positions are now being overcome, mainly by the design of hybrid approaches and procedures aimed to take advantage of both.

In this way, IA processes overlap with policy development processes. Until the mid-1990s, the label IA was often used to refer to tasks carried out mainly by using Integrated Assessment Models. Nowadays it is widely recognised that IAM is not a

complete IA methodology, but is better understood as a set of quantitative and analytical tools used in a broader participatory assessment and communication process. However, it is possible to observe two methodological standpoints among IA practitioners, based on distinct assumptions about the relationships between the researcher and the researched and the role given to the social context and conditions in affecting the assessments and the knowledge and strategic decisions of IA processes. On the one hand, those who mainly prefer to aggregate interdisciplinary information via the specification of causal relations in a quantitative way, e.g. by the use of computer models, may look at discursive approaches with distrust. And on the other, those IA practitioners – mainly with a social science background – more inclined to use dialogic and qualitative procedures of integration and representation of interests, knowledge and values may look at models as very incomplete and basic representations of reality. Although those evaluating environmental problems have been using discursive methods for over 25 years (Jäger, 1998), now it is possible to develop new IA participatory methodologies that benefit both from innovations in quantitative computer science and qualitative social science developments in a fruitful and complementary way (see also van Asselt *et al.*, 2001).

IA can also be understood as those interactive interdisciplinary and social processes occurring at the intersection between the three domains of public communication and debate, political decision making, and evaluation. Within IA, these three domains are intimately interrelated, as appropriate communication is essential for adequate decision-making and assessment and, in turn, all these dimensions can only be integrated via enhanced public participation and multilateral learning. The present situation of greater acknowledgement of the uncertainties and complexities existing in all human-environmental systems has led to the emergence of Sustainability Assessment (SA). In particular, one of the main methodological challenges of SA is to develop procedures that are capable of integrating different domains of knowledge of policy relevance (qualitative and quantitative, expert and non-expert, local and 'universal', as well as those from the social and the natural sciences) and doing so in an extended frame of action and reflection.

One of the advantages of discursive methods is that they can bring new ways of framing problems, as well as new context-based knowledge and values which are rarely incorporated or made explicit in quantitative simulation models. Moreover, quantitative models often have a rigid structure than can be difficult to understand for lay people or that may be of little interest to end-users. Within the discursive approach to IA, several different qualitative methodologies have already been used, depending on the actors, the issues at stake, or the general research design and where participation needed to be located. For instance, policy panels and exercises have been used when the participants are policy-makers and opinion leaders, while mutual learning methods have been used with experts and lay public or other stakeholders. In mutual learning methods, in particular, it is assumed that researchers can learn from the general public and that the public have a decisive role in the co-production of relevant knowledge (Rotmans, 1998); these methods therefore constitute a crucial move toward the democratisation of science practices and applications. The Integrated Assessment focus groups developed during the DGXII EU project ULYSSES were one of the first examples of a new kind of 'hybrid' and more participatory IA approaches, where computer models yielding numerical results were placed in dialogical settings of heterogeneous groups of non-expert citizens (Kasemir *et al.*, 2003). These IA focus groups were based on an assumption that group discussions produce different kind of results – richer, more reflective and collective, and potentially more policy-relevant – than those obtained simply through the aggregation of individual preferences, such as is the case with quantitative opinion polls.

In sum, participatory IA processes serve different purposes and functions, and often most of them are carried out at the same time (Tàbara, 2003). Specifically they help to:

- a) Frame and define in more relevant ways the problems at stake, their possible causes and effects, and plausible courses of action, on the basis of the stakeholders' views. By doing this, there is less likelihood of inadequate formulation of problems and of adopting false assumptions, which can only lead to inadequate answers.
- b) Improve the available information, communication and participation channels, both for the production of knowledge and for the policy-making process, including preferences and views which would rarely be taken into account otherwise; and therefore to increase the potential to yield more effective and equitable assessments and decisions on complex issues, especially when large numbers of uncertainties are present.
- c) Enhance the integration of diverse knowledges and value domains, both from experts and non-experts, as well as from different scientific disciplines. In this way, participatory IA procedures can improve the diversity and representativeness of the knowledge used in making decisions, aspects which are fundamental in the newly emerging techniques of Sustainability Assessment.
- d) Optimise the existing processes of social and institutional learning, by raising awareness of the complexity of a situation, its uncertainties and the limits or gaps in the knowledge and the capacities to deal with it. In doing so, IA processes can become central in all mutual learning processes occurring between policy makers, experts and the general public or other relevant stakeholders.

Needless to say, there are other 'functions' which the IA process can serve, such as increasing the legitimacy of a given policy making process, set of actors, or the *status quo* in difficult decisions. But these are not specific to IA procedures but rather are intrinsic to most participatory processes based on dialogical or hybrid methodologies. Table 1 compares the approach adopted within the PEG project by comparison with other projects with which we have been involved recently. There is no single universal methodological recipe that can be applied to all contexts – flexibility and adaptability to the policy and social circumstances of the issues at stake are the norm.

PROJECT	ULYSSES (Barcelona)	ARENYS DE MAR	EL BAGES	DIAFANIS	FIRMA (Barcelona)	LA MUGA RIVER	PEG
Issues	Climate change and urban sustainability. Exploratory analysis	Urban planning	Forest fire risk assessment and prevention	Territorial planning, around a National Park	Water demand and supply	Water cycle and management	Precaution, GMO crops and commercialisation
Main spatial scale	Regional and global	Local	Local	Local and regional	Metropolitan	Local	National (Spain)
Type and number of stakeholders consulted	Mainly non-experts (38); but also targeted expert and policy-relevant stakeholders (7)	Non experts (75) and interest group representatives (38)	Interest group representatives (35)	Experts and interest group representatives (29); non-experts (9); plus interviews with adults (53) and children (84)	Experts and interest group representatives (9)	Experts and interest group representatives (22)	In a group, experts and interest group representatives (9), plus a questionnaire and personal interviews
Duration of the project	3.5 years (1996-1999)	1 year (1999)	14 months (1998-1999)	1 year (2000)	3 years (2000-2002)	2 years (2002-2003)	2.5 years (2001-2004)
Type of expert information provided to participants	Computer models; contextual local information and statistical data	Project planning dossiers (over 600) and meeting with the planners	GIS mapping and local contextual information	Local contextual information with multicriteria modelling support	Contextual information and scenarios on water demand and supply with agent-based computer model simulation	Local contextual information and statistical data	National contextual and legal information
Number of meetings	26	16	14	6	3	3	2 (in progress)
Number of sessions, hours and meetings per participant	Each participant attended one group of 5 sessions of approx. 2.5 hours, a total of 12.5 hours per participant	Each representative attended 3 sessions of approx. 2 hours; general public 1 meeting of approx. 5 hours	Each participant, with some variation, attended up to 10 meetings of 3 hours each	Each person from the general public attended 1 meeting of around 2 hours; representatives 1 meeting of about 4 hours	Each participant attended, with some variation, 3 meetings (and was also consulted via questionnaire)	Each participant attends one meeting of about 2.25 hours (in progress)	Each participant attended one meeting of about 3-4 hours

Table 1. Comparison of seven policy-oriented projects inspired by IA. All of these projects except the first two have been or are being carried out by IEST-UAB.

In some cases (Ulysses, Firma and PEG), the meetings shown here were or are part of larger European projects.

3 GM crops in Spain: a brief note

Spain is the EU country with the largest area cultivated with GM crops. However, the only GM crop cultivated commercially in Spain so far is Bt maize. Two varieties were approved by the EU in 1998 for commercial production, 950243 JORDI CB and COMPA CB, both marketed by Novartis, although only the latter is being grown. According to the latest data available in 2003, the total area of this crop in Spain is 32000 hectares. GM soyabeans resistant to glyphosate can be used commercially for feed and food uses but not for cultivation.

Agriculture policy in Spain is highly decentralised (as is the case for many other issues). The Autonomous Communities (17 in total) have the competence to regulate agriculture and to impose penalties on producers. This will have an important effect on the understanding and application of the precautionary principle (PP) in Spain. Although private companies work at the international and state level, the capacity for control is set at the regional level. Autonomous Communities have many other competencies in relation to food regulation and eco-labelling. For the contained use of GMOs and their intentional release into the environment for field trials, authorisation is required only from the competent body of the Autonomous Community, although it can also be requested through the Central Administration from the Spanish Ministry of the Environment. Thus, in this two cases, control and responsibility is in the hands of the Autonomous Communities. For commercialisation, however, the only competent body for authorisation is the Central Administration.

For reasons of proximity to GMO research centres as well as to the relevant Central Government ministries, the PEG workshop meetings were held in Barcelona and Madrid.

4 First meeting: Barcelona, 7 March 2003

In order to ensure the anonymity of the sources used during this workshop part of the research, the real names of the participants have been changed and the specific name of their organisations also remains anonymous.

Participants

- **Antonio González**, an executive responsible for regulatory and public issues of a large agrobiotech company operating in Spain.
- **José Garcia**, an active anti-GMO campaigner of an environmental organization and a university researcher on enzyme immobilization.
- **Gloria Puig**, a representative of a Catalan consumer organization, working also in its department of environment and responsible consumption.
- **Luis Fernández**, a researcher of the Higher Council of Scientific Research (CSIC) working on agricultural GMOs .
- **Mercedes López**, a researcher of the Higher Council of Scientific Research (CSIC) working on agricultural GMOs.
- **Sandra Suárez**, an active anti-GMO campaigner working for an environmental organization in Spain.

Development and results

The meeting took place at the *Residència d'Investigadors de la Generalitat de Catalunya-CSIC*, Barcelona. It started at 16:00 and carried on without interruption until

19:15. Some people were also present until 19:30 and two of them stayed for a drink until around 20:20. Three participants came for lunch at 14:00, so a previous warm-up discussion started then. The meeting was moderated by J. David Tàbara, supported by Daniel Polo as a note taker.

All of the participants in Barcelona had previously answered a questionnaire related to the construction of plausible GMO policy scenarios. The information gathered via the questionnaires allowed us to create the first three baseline scenarios, to be specified and adjusted – or if necessary rejected – during the workshop discussion. The questionnaires were aimed at devising the scenarios in the participants' own terms. At the workshop they were asked to recollect their responses and to explore further their consistency, adequacy and relevance – as well as to find new variables, constraints or consequences from different policy developments. The baseline scenarios were presented to the meeting in a confidential way, that is, without citing who had said what about the future. The three scenarios were: 'full liberalisation', 'restricted liberalisation' and 'indefinite moratorium'. Before the workshop, the participants had received a seven page document with an introduction to the project, on the meanings of precaution, and on the most recent events relating to GM crops and their commercialisation in Spain and the EU. This document also included the three baseline scenarios obtained via the questionnaire. All the discussion was recorded by audiotape².

As can be seen from the composition of the group, the participants were quite distinct in the type of perceptions and interests represented. Despite the difficulties of bringing together such a heterogeneous group, the discussions were generally carried out in a relaxed atmosphere, except for a moment of tension between one environmentalist and one of the scientists - around half an hour after the start of the meeting - when a scientist said that he refused to speak with someone (the environmentalist) who labelled trans-pollination as "pollution". This incident underlined the crucial role of wording - and its implications for science and policy - which can represent huge differences in the worldviews of participants. Once that situation was under control, the workshop developed smoothly and dynamically. The scenarios were substantially polished and everyone agreed that they had a good learning experience. (At the end of the workshop the scientists even invited the environmentalists to visit their labs.)

The discussion followed a three-stage series of questions aimed at finding out the participants' views on current developments concerning GM crops in Spain, the meanings and implications of precaution and, finally, on future scenarios (see Appendix II for extracts from the transcripts). The information gathered during more than three hours of conversations allowed us to identify further the main relevant variables and the logical structures which would eventually help us to build the three final scenarios shown in Section 6 of this report.

The three scenarios produced three very different explanations of their causes, logics and consequences. To a large extent such differences were dependent on the type of stakeholder consulted. Our intention was not that the participants should reach agreement or consensus, but rather that they should provide us with a diversity of explanations, variables and links, which would allow us to revise the scenarios and to depict them in detail in a policy-relevant manner. For instance, the indefinite moratorium scenario could result in two very different consequences: 'disastrous' for research and

² Apart from the input from the participants at the meeting, these scenarios were partly based on other information gathered from the previous interviews, the analysis of secondary documentary sources, and also from attendance at Biospain, the largest meeting of Biotech companies in Spain, in Madrid. A follow-up protocol was included in the document provided for participants to add the views they expressed during the workshop.

agriculture and so on, according to the representative of the Biotech company, or 'good and enhancing' for alternative biodiversity research and organic agriculture, according to the environmentalists (Figure 3b).

Thus, for the participants gathered in Barcelona, Spanish GM crop policy development was very much linked to two main driving forces and constraints. One was the **European regulatory policy context** within the field of transgenic crops and precaution; the other was the future development of **corporate global strategies and alliances** of the biotech companies. As shown in the scenario on an indefinite moratorium, it seems that European companies might move from Spain and Europe, e.g. to some Third World countries and/or countries with weaker democratic regimes, in order to develop GM production on a global scale there, making the European regulatory context less relevant on a global scale; consequently, Europe would eventually have few options but to go ahead with (almost full) liberalisation (Figure 3b). Probably biotech companies find Spain an attractive context in which to operate within Europe not just because of weak public participation, but because it offers the combined advantages of a relatively well-trained body of scientists and possibilities for opening up markets within Latin-American countries and beyond.

5 Second meeting: Madrid, 26 June 2003

Participants

The real names have also been changed to ensure anonymity.

- **Concepción Martínez**, a senior executive in the Ministry of Health.
- **Juan Peña**, an executive from the Ministry of Agriculture.
- **Elisabet Rodríguez**, an environmental lawyer and a member of a Spanish environmental organisation.

Development and results

The meeting took place at the *Casa Veracruz*, in the centre of Madrid, and lasted for three hours, without interruption, from 16:00 to 19:00. Juan Peña and Elisabet Rodríguez also came for lunch at 14:00 and provided some key points for the discussion in the afternoon. The meeting was moderated by J. David Tàbara and supported by Daniel Polo as a note taker. Beforehand the participants received a similar document to the one provided in Barcelona, with information about the project, precaution and the current situation on GMOs in Spain.

The results obtained in Madrid add to those obtained from the analysis of the information from the Barcelona meeting. They have been synthesised and classified under the following topic headings:

- a) On the current situation on GM crops and GMO risk assessment and monitoring in Spain:
 - Bt maize Compa CB is the only commercialised GMO crop in Spain. According to the latest data available, and Juan Lopez de Haro, the total amount of this GM crop now planted in Spain is 32000 hectares (2003).
 - The public authorities have not carried out any monitoring for health effects during the commercialisation stage of GM crops in Spain, so it is not possible to know or guarantee whether or not these crops have entered the human food chain.

- As a result, according to our respondents, it is not possible to establish liability with regard to wrong-doing at the commercialisation stage, as this depends on the 'goodwill of the trader'. Until the traceability legislation is enforced, liability cannot be established. There has not been any public action from the Spanish Administration to pursue these issues.
- Monitoring has been limited to the cropping stage for Bt maize Compa CB. The monitoring plan was developed by Biotech company. The lab tests were developed by scientists from two institutes of the CSIC (Catalan IRTA and CIB) and also from the Universitat de Girona and the Universitat de Lleida, all in Catalonia. The first report containing the results of all the monitoring studies so far, five in total, was published in June 2003. It related to the following issues:

Efficacy of Bt maize to target insects.

Development of new resistances to the Bt toxin by the corn borer.

Effects on soil micro-organisms and non-target entomofauna.

Effects on soil micro-organisms, e.g. spread of ampicillin resistance.

Effects on digestive bacterial flora with regard to ampicillin resistance, based on chicken trials.

According to the report, none of these surveys has shown any significant negative effects from this variety of Bt maize on the researched issues, and this crop is still effective in combating the pest.

b) On precaution:

- The interpretation of precaution was no different from prevention. There were few references to 'precaution' (prevention) during the discussion.
- Thus, no significant role was given to precaution as a driving force which could move a particular outcome or scenario in one direction or another.

c) On public participation, information and institutional developments:

- Participants made it clear to us that there has been an explicit and conscious policy decision not to open up GMO risk assessment and management procedures to the public. The main stated reason was a fear of conflict. For instance, no information was provided to the public about where the crops were located 'to avoid fields being burnt'.
- A new institutional development proposal to deal with GMOs and 'biocontrol' has been written but has still not been approved by the Ministry of Agriculture. It is expected to allow some kind of broader public participation. The new National Commission of Biovigilance (CNBV) is intended to become a consultative body for monitoring plans developed for authorised GM products after the EU moratorium ends. The membership of this Commission will be similar to the Biosafety one, but less dominated by scientific experts. At present the CNB (biosecurity) assesses requests for approval. The CNBV will look at the cultivation-stage monitoring plans and their results.

d) On scenarios, the future and co-existence:

- All three participants saw as completely unrealistic any scenario other than 'restricted liberalisation'.
- There was some discussion about whether 'restricted liberalisation' was only a prior stage to 'full liberalisation'. They appeared to see the restricted liberalisation scenario as the one where the Public Administration could play a major role.

- On the future, they stated that 'the EU moratorium will not work unless the USA do the same, and they won't do so'. This implies, in their opinion, that Spain will have to join the agri-biotechnology race.
- Both participants from the Administration strongly argued that co-existence is 'possible and desirable'.

Thus, the public officials reinforced some of our previous underlying results (and suspicions) about whether or not Spain has a distinctive policy aim of its own with regard to GMO crops and their commercialisation. Despite the usual rhetoric that Spain tends to 'follow suit' and do whatever the EU says, our respondents agreed to our statement that Spanish GM crop policy is based on two main *leit motifs*:

1. To allow, and to provide strong support for, technological development and innovation.
2. To avoid conflict, particularly with consumer and environmental organisations.

Needless to say, there are other important (corporate) interests at stake, as we saw at the Biospain Congress in Madrid.

There is no monitoring of of Bt maize Compa CB, except during the cropping stage, as the product is intended for animal feed only. This means there is no way of ensuring that its use is restricted to animal feed and does not find its way into products for human consumption.

Finally, there is no regulation for liability issues related to environmental harm due to GM crops, though there has already been a case of genetic contamination in the Autonomous Community of Navarra, which has affected organic farmers (2003). According to our respondents, responsibility can be determined through civil legislation only when economic harm can be properly traced and proven. Future developments of environmental liability regulation in Europe may adopt the subsidiarity principle.

6 The scenarios

The scenarios produced for the PEG Spanish case study are the result of a number of interlinked research tasks and not the product of one activity alone. Thus they can be seen more as a research-action *process* rather than a single event result (Jager and Farrell, 2003; Löfstedt, 2003). In particular these scenarios emerge from the following:

1. The two PEG Spanish workshops held in Barcelona and in Madrid.
2. Content analysis of secondary documentary sources, including scientific and mass media and internet sources.
3. One-to-one interviews with relevant stakeholders.
4. A questionnaire, focusing first generally on GMO crops and commercialisation in Spain and the EU, as well as on precaution, and then more specifically on developing the scenarios.
5. Observer participation and speech analysis of attendees at the BioSpain 2002 congress of Spanish biotech companies.

With regard to the scenarios the main purpose of carrying out these activities was in the first place to identify the maximum number of relevant **variables**, and then to identify and represent the **logics** and strategic use made of them by different relevant stakeholders. For this, the procedure we followed was to:

1. Compile a full list of the variables identified for Spain. A draft list of these variables was presented at the workshops and used to support the discussion among participants.

2. Select the most relevant ones for each scenario, and classify them as either causes or consequences. This helped us to sharpen the definition of each variable, its role, and its relevance.
3. Discuss at length how the different stakeholders saw the links (the logical and plausible developments) between those causes and consequences, and represent the links by hand.
4. Present the results, many of which we did not expect at all at the beginning of the process, using PowerPoint software.

Three main scenarios emerged from the discussions as well as from the analysis of previous interviews and other secondary sources. These were: full liberalisation, restricted liberalisation and an indefinite moratorium. Each scenario is illustrated in the figures that follow both in terms of identified variables and relations with regard to the *causes* (Figures 1a, 2a and 3a) which could lead to a particular situation/scenario as well as in terms of the *consequences* (Figures 1b, 2b and 3b) of that situation.

Figure 1a Scenario 1 Full liberalisation - causes

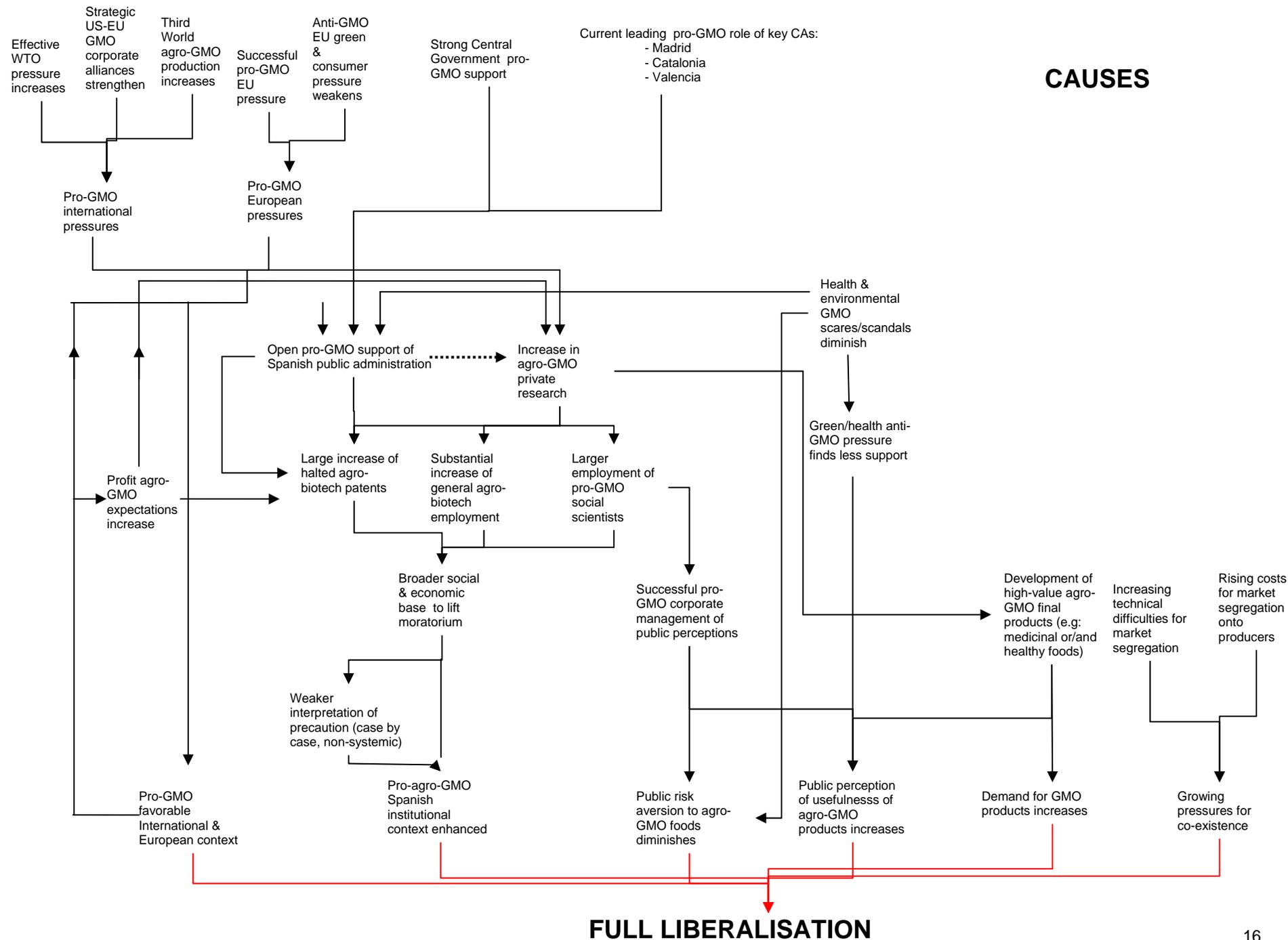


Figure 1b Scenario 1 Full liberalisation - consequences

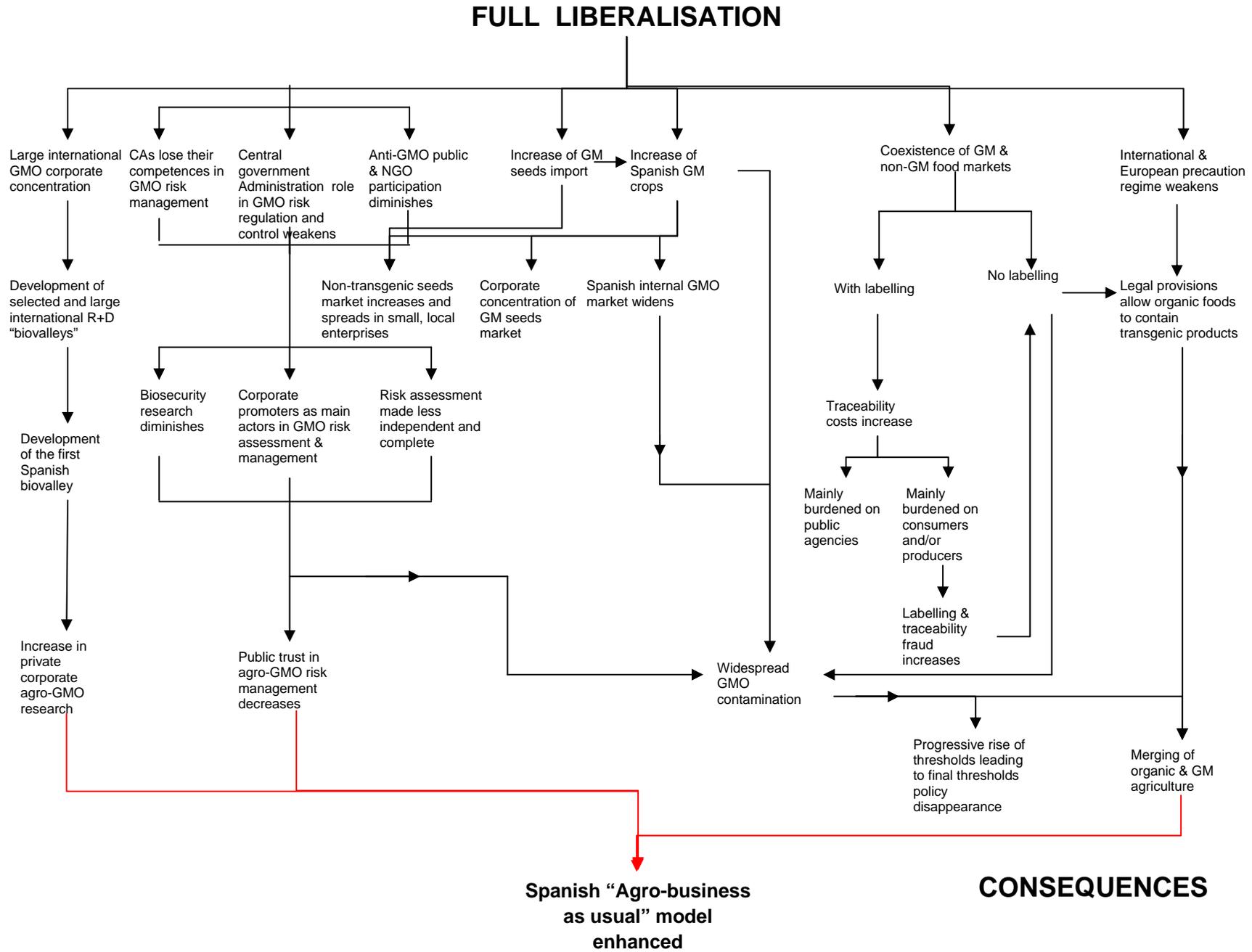


Figure 2a Scenario 2 Restricted liberalisation - causes

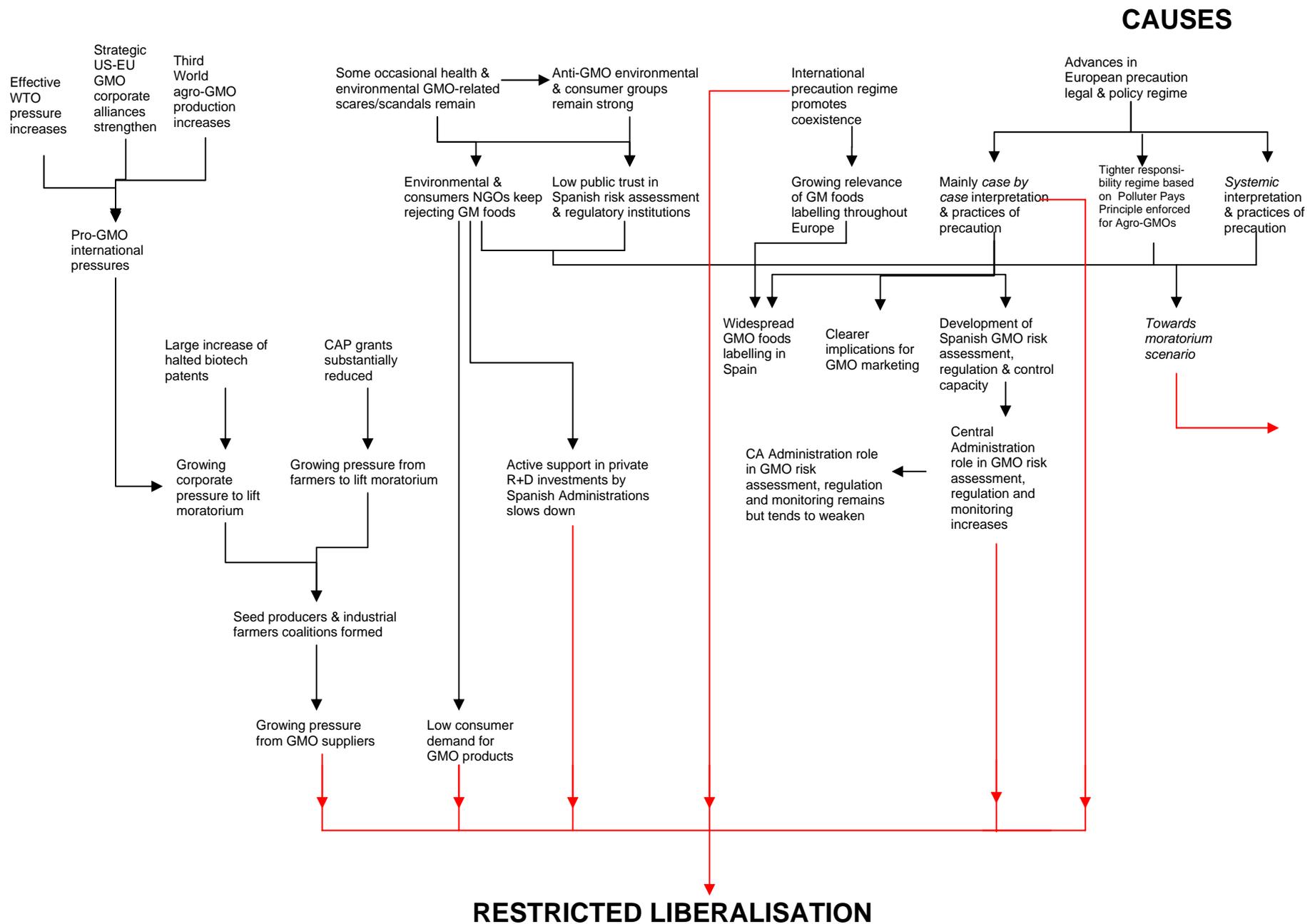


Figure 2b Restricted liberalisation - consequences

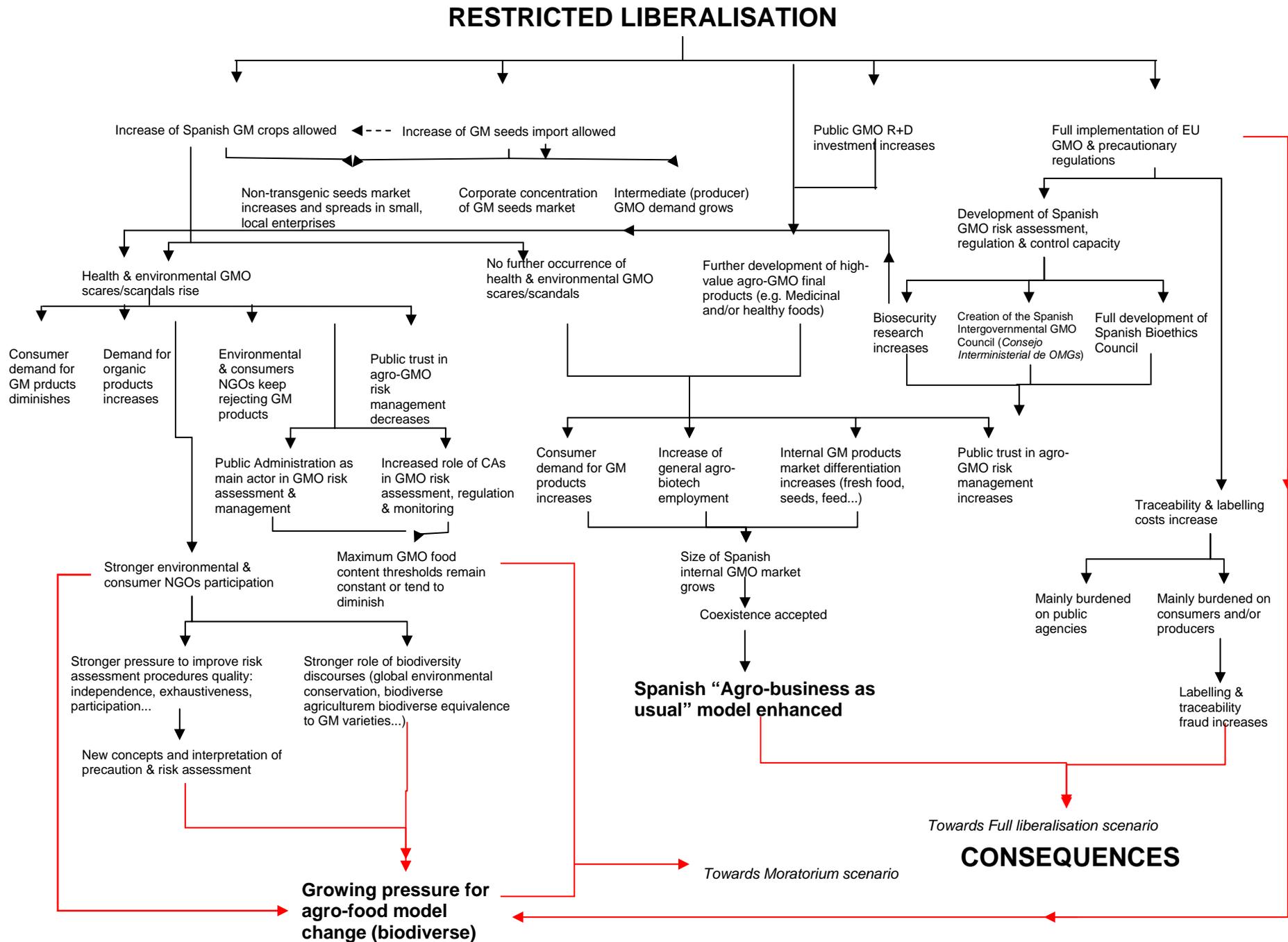


Figure 3a Indefinite moratorium - causes

CAUSES

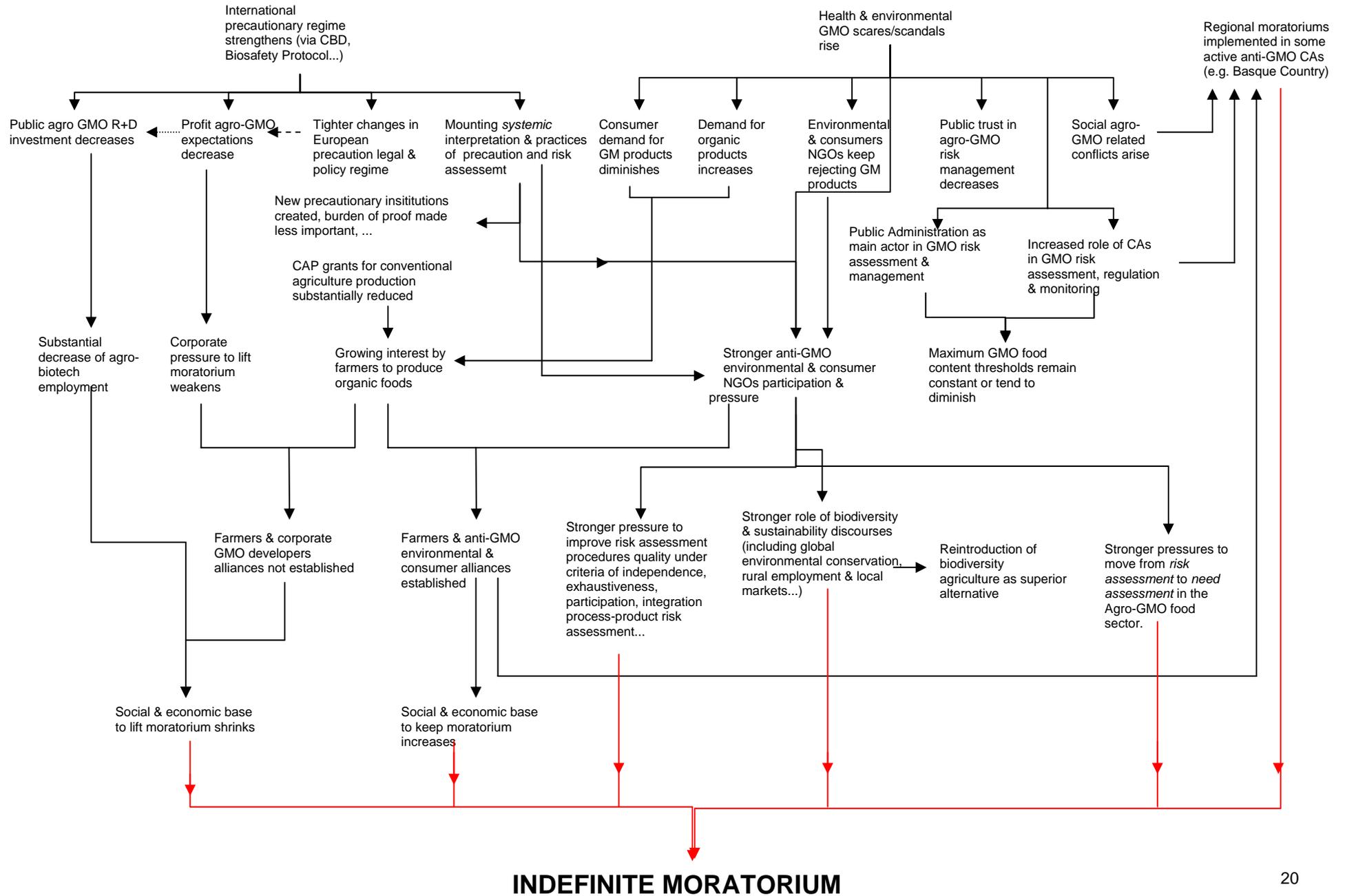
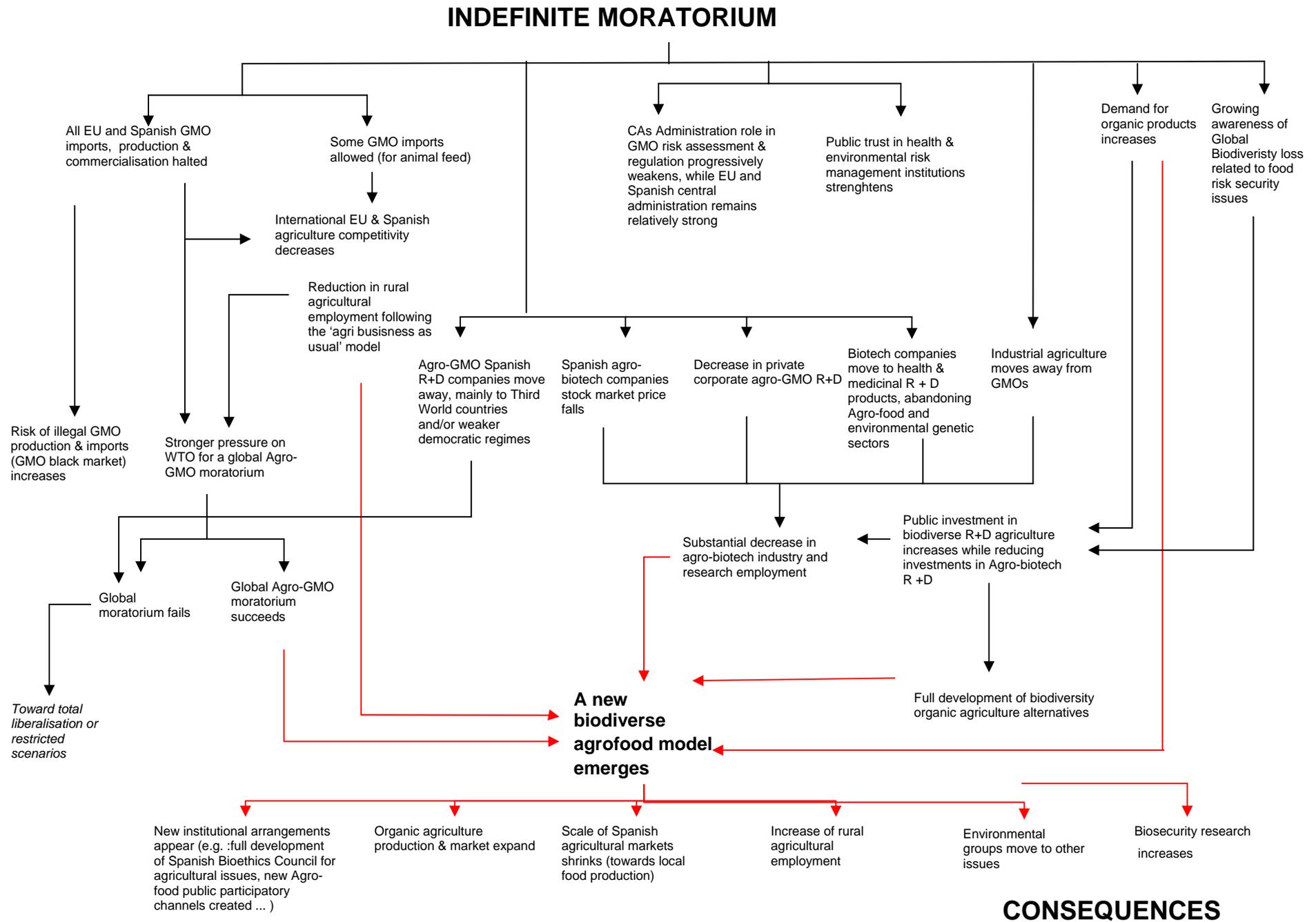


Figure 3b Indefinite moratorium - consequences



References

- Anastasi, C. 2003a. 'On the art of scenario development', in in Kasemir, B.; Jäger, J. Jaeger, C. Gardner, M.T. (Eds). *Public Participation in Sustainability Science. A handbook*. Cambridge: Cambridge University Press, pp. 201-212.
- Anastasi, C. 2003b. 'Participative scenario making'. Lecture given at the ICIS summer course on Integrated Assessment. Maastrich: University of Maastrich-International Centre for Integrative Studies.
- Asselt van, M.; Rotmans, J.; Greeuw, S. C. H. 2001. *Puzzle-Solving for Policy. A provisional Handbook for Integrated Assessment*. Maastrich: ICIS.
- Asselt van, M.; Storms, C.A.M.H.; Rijkens-Klomp, N.; Rotmans, J. 1998. *Towards Visions for a Sustainable Europe. An Overview and Assessment of the Last Decade of European Scenario Studies*. ICIS: Working Paper 198-E001.
- Bertrand, G.; Michalski, A.; Pench, L. R. 1999. *Scenarios Europe 2010*. Brussels: European Commission: Forward Studies Unit.
- European Environmental Agency 2001. *Scenarios as Tools for International Environmental Assessment-Environmental Issue Report, 24*. Copenhagen: EEA.
- Jäger, J. 1998. 'Current thinking on using scientific findings in environmental policy making'. *Environmental Modeling and Assessment* 3, 143-153.
- Jäger, J. & Farrell, 2003. 'The design of Environmental Assessments: what can we learn?'. Harvard Global Environmental Assessment Project. Internal report. In press.
- Kasemir, B., Jäger, J., Jaeger, C. and Gardner, M.T. (Eds) 2003. *Public Participation in Sustainability Science. A Handbook*. Cambridge: Cambridge University Press.
- Löfstedt, R. (ed.) 2003. 'RiskWorld'. *Journal of Risk Research*, 6:289-619. Special issue on the Riskworld project and scenario building.
- Rotmans J. 1998. 'Methods for IA: The Challenges and Opportunities Ahead'. *Environmental Modeling and Assessment* 3: 155-179.
- Toth, F.L. and Hizsnyik, E. 1998. Integrated environmental assessment methods: Evolution and applications. *Environmental Modeling and Assessment* 3, 193-207.
- Tàbara, D. 2003. 'Participación cualitativa y evaluación Integrada del Medio Ambiente. Aspectos metodológicos en cuatro estudios de caso' [Qualitative participation and Integrate Environmental Assessment. Methodological issues in four case studies]. *Documents d'Anàlisi Geogràfica*. 42
- Tàbara, D. 2002. 'Escenaris sobre el medi ambient i la sostenibilitat a la Catalunya del 2010. (Scenarios on Environmental and sustainability issues for Catalonia 2010). In *L'Europa del 2010 i Catalunya*. Barcelona: Fundació Bofill. pp. 265-308.

Appendix I: Questionnaire

The following questionnaire was sent and used to facilitate further discussions with relevant stakeholders and participants for the Barcelona workshop. It was also sent to other relevant persons within the GMO debate in Spain but who did not attend neither the Barcelona or the Madrid meetings.

El siguiente cuestionario consiste en un conjunto de 5 bloques de preguntas abiertas e interconectadas que le permiten aportar su opinión de manera cualitativa y extensa. De este modo, le agradeceremos que evite respuestas excesivamente escuetas. Puede responder a continuación de cada pregunta. Puede resultarle útil ojear primero el conjunto del cuestionario antes de empezar a responder. Es posible que encuentre alguna pregunta que no pueda contestar, lo que no invalida la decisiva importancia que responda a las demás. Una vez completado, por favor devuélvalo antes del 15 de diciembre a JoanModerator.Tabara@uab.es

I. CONCEPTO Y APLICACIÓN DEL PRINCIPIO DE PRECAUCIÓN EN LA AGRICULTURA ESPAÑOLA.

P1. ¿En su visión, cuál es el significado y la relevancia del principio de precaución a la hora de informar la evaluación y la gestión de los organismos modificados genéticamente (OMG) en la agricultura? Y según su criterio, ¿cuál

debería ser el significado y relevancia de este principio?.

P2. ¿Cómo cree que los diferentes actores sociales difieren en la concepción y en la utilización del principio de la precaución en este campo en España?.

P3. ¿En qué medida opina que se está aplicando el principio de la precaución en el cultivo y la comercialización de OMG agrícolas en España?. ¿De qué modo y en qué ámbitos?.

P4. ¿Cuáles cree que son las principales dificultades u obstáculos institucionales, económicos o sociales para su efectiva aplicación en España?.

II. EVALUACIÓN, REGULACIÓN Y GESTIÓN DE LOS RIESGOS RELACIONADOS CON LOS OMG EN ESPAÑA.

P5. En su opinión, ¿qué tipo de relaciones se mantienen en la práctica entre los innovadores o promotores, los institutos de investigación, y las agencias reguladoras del cultivo y la comercialización de OMG agrícolas en España?. ¿En qué medida cree que incorporan o consideran el principio de la precaución en sus relaciones? ¿Cómo se establecen las prioridades con relación a la evaluación y la gestión de OMGs agrícolas?..

P6. ¿Qué valoración le merecen las medidas existentes actualmente para la gestión y la monitorización de los riesgos asociados a los cultivos modificados genéticamente en España (mayoritariamente maíz y algodón)?. ¿Podría mencionar y comentar algunas en concreto?.

P7. ¿Cómo ve el papel que llevan a cabo en el presente las 17 Comunidades Autónomas al respecto?. Y en futuro, ¿cómo podría variar su intervención?

P8. ¿Cómo cree que conciben, tratan y/o gestionan las agencias reguladoras españolas la incertidumbre asociada a los riesgos de OMGs agrícolas?, ¿Y los

investigadores?, ¿Y en particular, con relación a la investigación en bioseguridad?

III. FUNCIONAMIENTO DE LA COMISIÓN NACIONAL DE BIOSEGURIDAD.

P9. En su opinión, ¿cómo evaluaría el papel realizado hasta ahora por la Comisión Nacional de Bioseguridad (CNB) en la evaluación de los riesgos asociados y en la autorización de OMG agrícolas en España?. ¿Cuáles han sido sus propias experiencias con la CNB hasta el momento?.

P10. ¿Cómo cree que la CNB establece o modifica los criterios de prueba de riesgo o de evidencia de seguridad a partir de los cuales se establecen las normas ambientales?. ¿Cómo se vinculan estos criterios respecto a preocupaciones sociales más amplias?..

P11. ¿Ha tenido acceso u oportunidad de consultar las actas de la Comisión Nacional de Bioseguridad? En caso afirmativo, le agradeceremos que nos diga en qué medida cree que en dichas actas se aplica o se incorpora el principio de precaución. ¿Opina que el acceso, el contenido y el formato de dichas actas son adecuados?.

IV. PAPEL DE LOS GRUPOS DE PRESIÓN Y DE LA OPINIÓN PÚBLICA

P12. ¿Cómo cree que los grupos de presión en España participan y/o influyen en los procedimientos y las medidas de evaluación y de regulación de los OMG?, ¿En qué medida cree que estos grupos se encuentran dentro o fuera de tales procedimientos?, ¿Cuáles son en su opinión los grupos más relevantes?, ¿Cómo difieren sus posiciones?.

P13. ¿En qué medida opina que los grupos de presión en España consiguen sus objetivos?. ¿Cree que las acciones de estos grupos responden a medidas de precaución o que responden a otros objetivos?.

P14. ¿Cómo y en qué medida estas asociaciones promueven modelos o consideraciones nuevas o alternativas sobre el modo de mostrar las evidencias de riesgos e incertidumbres? ¿Y en que medida aportan evidencias de la necesidad de precaución o de una agricultura no transgénica?..

V. DESARROLLO DE ESCENARIOS FUTUROS

P15. En su opinión, ¿cuáles van a ser los factores más decisivos que van a determinar en los próximos años el desarrollo y la evolución del cultivo y la comercialización de los OMGs en España? Cite, de mayor a menor orden de importancia, al menos tres. .

P16. Imagínese que se encuentra en España en el año 2020 y en aquel momento intenta relatar lo que ha sucedido en el país durante los últimos 20 años con relación al cultivo y la comercialización de OMG agrícolas. Evidentemente, lo que haya ocurrido durante este tiempo puede haber tomado muy diversos cursos de acción, de entre los cuales le pedimos que sólo seleccione tres, en la forma de escenarios. Le agradeceremos que:

- a) Imagine tres escenarios plausibles distintos, y les ponga un nombre distintivo.

- b) Vaya describiendo, a partir de los elementos y factores que se le aportan, de qué modo se distinguen o se asemejan cada uno de estos escenarios.

NOTA: Recuerde que algunos de los elementos característicos pueden ser iguales en dos o tres escenarios, por lo que no son incompatibles ni excluyentes entre ellos, ni tampoco unos escenarios son más probables que otros. Observará que hemos dejado filas vacías para que Vd mismo pueda añadir otros elementos o factores que crea conveniente considerar. Puede agregar tantas filas como quiera (o incluso columnas, si considera necesario añadir otro escenario).

1. ASPECTOS POLÍTICOS Y SOCIALES:

Fuerza de cambio, factor o elemento distintivo.	ESCENARIO A Nombre:	ESCENARIO B Nombre:	ESCENARIO C. Nombre:
Posición general de la política de la UE en materia de OMGs			
Interpretación, incidencia y aplicación del principio de la precaución en la evaluación y la regulación de OMG en España			
Papel y protagonismo de las Comunidades Autónomas			
Aceptación o rechazo de los OMGs por parte de los consumidores			
Incidencia de los grupos de presión ecologistas			
Evolución e incidencia del etiquetaje de OMG			
Otras medidas			
...			

2. ASPECTOS ECONÓMICOS Y EVOLUCIÓN DE LOS MERCADOS:

Fuerza de cambio, factor o elemento distintivo.	ESCENARIO A Nombre:	ESCENARIO B Nombre:	ESCENARIO C. Nombre:
Evolución general de la comercialización interna de OMG en España			
Evolución de los cultivos de OMG en España			
Coexistencia o segregación de OMG agrícolas en España (en caso de autorización).			
Distribución de los costes de etiquetaje, segregación y gestión de OMG agrícolas			
Evolución de los precios y la competitividad agrícolas.			
Evolución de la renta agraria			
Evolución del mercado de semillas. Concentración empresarial, importaciones y exportaciones.			
...			

3. EVALUACIÓN Y GESTIÓN DE RIESGOS. ASPECTOS TECNOLÓGICOS Y AMBIENTALES

Fuerza de cambio, factor o elemento distintivo.	ESCENARIO A Nombre:	ESCENARIO B Nombre:	ESCENARIO C. Nombre:
Evolución de la capacidad institucional de evaluación y control de riesgos asociados a los OMG			
Principales actores y responsables de la evaluación y control de OMG			
Evolución de los umbrales máximos permitidos de OMG.			
Evolución de la investigación e innovación biotecnológica agraria en España.			
Algunos impactos ambientales del cultivo y comercialización de los transgénicos en España.			

Appendix II: Transcriptions of the workshops (main extracts only)

1. Barcelona workshop

Introduction: general issues

Moderator: This is meant to be a prospective exercise about the crop and commercialization agricultural GMOs. The methodology to be used is scenario making, aiming to describe the different driving forces, logics and consequences for every possible scenario. In order to help us to get into the issues we will start by discussing about some general questions. For example, in your opinion do you think Spanish policy about transgenic crops has a specific aim, somehow different from the European one? What are the Spanish policy aims for GM crops?

Luis: There isn't any clear policy, they are working by the moment.

Mercedes: Spain simply awaits for European regulations.

Antonio: Spain is following European regulations, and doesn't have any prejudice against transgenic crops

Gloria: There isn't any specific policy in Spain, and the regulatory measures existing in Spain have been adopted because of the European pressure.

José: Spain has a clear policy which aims for the fast commercialization of transgenic crops. The European policy is a brake for Spanish policy. Spain is the only European country with GM crops and these days, despite of the moratorium, is going to register five new varieties in the Seeds and Varieties Register. Besides, the members of the CNB (*Biosecurity National Commission*) have clearly manifested their pro-GMO attitude.

Mercedes: However the members of the CNB are not always the same, as frequently are invited external experts to discuss on specific issues.

[...]

Moderator: We'll talk about CNB later. Note that there are different points of view about the issues raised, hence I remind you that we are not looking for consensus but for the maximum diversity of opinions.

Sandra: Certainly we [participants] will never agree, as we have absolutely opposite points of view. I think there isn't any explicit policy in Spain; however, there are clues which make me think Spain has a more pro-GMO attitude than other European countries. First, the transposition of 18/2001 Directive has willingly forgotten the inspection of GMO growing fields. Second, Spain has rejected a stronger regime of environmental liability. Third, Ministry [of Agriculture] officials have showed me their rejection to adopting traceability measures. Fourth, five new transgenic varieties have been authorized despite of the moratorium and without the full implementation of the 18/2001 Directive.

Mercedes: For experimentation purposes we are strictly following the Directive requirements.

Sandra: Experimentation is quite different from commercialization.

Moderator: We must be very careful with the distinction among experimentation, voluntary liberation [for experimentation purposes] and commercialization.

Antonio: At the European level, clear and explicit pro-biotech attitude has been stated by the European Commission (EC). The only prime minister in Europe with a stated pro-biotech attitude is Tony Blair. Spain has never showed such explicit attitudes. However I will discuss the environmental liability issue, which is relevant for many activities beyond technology. Spain is one of the countries willing to create an insurance system, but France, the strongest promoter of the transgenic moratorium, is opposing this question because of the burdens this could mean for its well developed biotech industry.

Sandra: I think that Spanish attitude isn't more clearly pro-GMO because of the fear to public opinion response.

[...]

Moderator: We will explore now the relationship among the different agents involved in risk assessment and management, for example, promoter companies, research centres, regulatory agencies. How do these relations influence the assessment and management processes?

Luis: The research programs of EU have neglected transgenic issues with the exception of what relates to risk assessment and management.

Mercedes: This neglecting concerns only to transgenic objects, but more generic tools such as proteomics and genomics have been taken into account by EU research programs.

Luis: Research must have a special status as economic benefit is not its main purpose. Thus if society rejects transgenic crops, research must focus on other issues; however I think that transgenic research should not be abandoned.

Moderator: But what about administrative inquiries for research centers, or about researchers proposals on risk assessment? How do these institutions interact in Spain?

Luis: Our research on transgenic rice crops in the Ebre delta have been broadly publicized every year through campaigns which have allowed us to contact local agents, environmentalists, press, etc.

Mercedes: The essays made in the Ebre delta have outputted gene flow quantification in order to establish some regulation on environmental risk. The Spanish government, through CNB, encourages this research as it is understood they are necessary for regulation. This is our relationship with the regulatory agencies.

Gloria: I think that more dissemination of the research which is being done is necessary because it doesn't have any social presence, perhaps with the help from the government...

Mercedes: I don't know what else to do, I am constantly lecturing about these issues, talking in the radio, etc.

José: Usually scientific data doesn't reach society, except for some special cases which get media attention.

Antonio: The communicative network is weak. Institutions are still very independent, for example s don't tend to explain their current research topics. In order to get some integration of the different communicative initiatives, they should penetrate into the educative system. There is an interesting initiative of this kind in the University of Valladolid [web page; at children's' schools].

Moderator: What about the statement by which regulatory agencies and companys are the same people?

Mercedes: Companies are not members of the CNB.

Sandra: But they often visit their offices.

José: Permeability is full and absolute between companies and regulatory agencies. The companies' lobby effect over the government is absolute. About the research centers, I think the scientific sphere is broad and complex, but usually the main purpose of the scientist is to get the funds required for their work. But there are also a few group of scientists who have other kind of interests and have become active promoters of GMOs. [Controversy about Daniel Ramón].

Moderator: What about the capacity of Spanish institutions to keep control over risks and interests in the agro-GMO field?

Antonio: The Spanish administrative system is too bureaucratic. We can't even have audience with the CNB for authorization procedures, while in France we can choose which official will make the assessment of applications and keep constant communication with him/her. Communication with CNB is always written and this takes a long time. In any other country there isn't such gap between assessment officials and companies.

Sandra: Researchers who don't share interests with the industry, that is, public researchers, don't earn money to promote biotech. However there are some scientists [Daniel Ramón] who promote biotech beyond the research framework, thus they are defending seeds commercialization as it is happening today. Private research, funded by companies aiming to sell seeds, puts stronger pressure. I think that public researchers who are defending the current transgenic model are wrong because it is an unsustainable model. And about the relationship between government and companies, you can see how most of the members of the Honor Board of the recently celebrated Biospain congress are members of the government and the biotech companies. Besides, the authorization of the five new transgenic varieties was announced in Biospain by Concepción García Tejerina [high official of the Ministry of Agriculture].

Moderator: Once again, what is the institutional capacity of Spain to carry with risk issues?

Antonio: We talk about Spain but it is the same for any country in the world. This is a globalized issue, any country can't isolate from the world, there is a strong dependency. The control capacity of this technology is not to be found in any country, it must rely on broader organizations such as the European Union, and even the EU can't manage it alone.

Moderator: And is there any difference between Spain and other European countries?

Antonio: I don't think so, it's all the same.

José: The Spanish government has a clear attitude looking for a fast commercialization of transgenic crops, which fully agrees with companies interests. There aren't enough guarantees for any kind of control, our regulatory agencies are controlling absolutely nothing [in the field of commercial transgenic crops]. I can buy transgenic maize, plant it somewhere and don't tell anything about it to anybody, so we are not able to know whether this transgenic crop will create any problems or not.

Antonio: When you buy something, if it is legal, you get a certificate. We have to communicate to the Ministry of Agriculture who has been purchasing our seeds.

José: But in this way they aren't controlling where the seeds are planted.

Antonio: If the government needs to know where are being planted crops they have access to the data of people who have purchased transgenic seeds.

Luis: And why do you want to know where it is being grown?

José: If it is a transgenic crop and it has a problem, it is essential to know where it has been grown. There have been cases in which organic crops have been polluted by transgenic pollen, and then farmers don't get the organic certificate [There has been one case in Navarra]. Perhaps the organic farmer doesn't know that farmers nearby are growing transgenics. Incoming seeds are not being controlled in the ports, some rape seed has been brought in Europe and grown in England.

Sandra: The 18/2001 Directive meant to create some registers to deal with the issue of knowing where the transgenics are being commercially grown, but Spain isn't doing it this way by the moment. It is OK to know this but it is still missing some inspection, because we don't know whether farmers are respecting the refuges for Bt crops. Who controls this? Does the Ministry of Environment know where are the refuges? This is necessary for risk control. Risk control at research level must be kept worldwide, but for practical cases the direct intervention of countries is needed.

Antonio: Before the 18/2001 Directive, Spain had already been required monitoring measures. However, transgenic crops are as safe as conventional and don't need a wall to be built around them. One central requirement of this monitoring is to evaluate the new resistances to Bt protein. I think this isn't an issue concerning risk but the efficiency of the product. By the moment, neither here nor in the US has the borer been developed resistance to the Bt. This study is being developed in Spain by CSIC (High Council for Scientific Research), not by Biotech company, and began analyzing the changes in the sensitivity [to Bt] of the different Spanish borer families. Another issue being researched are the possible impacts on soil bacteria. Crops are not planted and left away but are being monitored.

José: But there some scientists who state that there are and others who deny them.

Sandra: I agree with all these assessments, but I don't agree with large scale liberations to the environment [of transgenic crops] before the conclusion of the evaluations.

Antonio: But we are evaluating the effects of large scale liberation. We have already evaluated the effects on insects, for example, but what will be the results in large scale? The current monitoring measures are not looking at large scale effects.

2. Precaution: implications for risk assessment and participation

Sandra: Then we haven't put into effect the precautionary principle.

Luis: In this kind of debates I always feel underscored, because I like to clearly know all data and if it doesn't go this way I doubt about many things. And I often find starting points of view completely dogmatic. For instance, transgenic crops are bad, or some people talk about pollution.

Sandra: But it is pollution.

Luis: But talking about pollution, it is something bad, not desired to be in my product.

Sandra: Of course.

Luis: Let's talk about manipulation. In the Spanish language, when someone is manipulating is not merely handling. To manipulate means using all resources, not always legal, to make other people agree with your interest.

Moderator: Let's try to answer the questions, for we will not change the worldviews.

Luis: the word "genetic manipulation" isn't a neutral one, I didn't mean to say that you [Sandra] were manipulating. Genetic manipulation means that using bad arts you are going to do something bad. [conflict arise]

Moderator: These confrontations arisen here are in some way a representation of the social contest which will be present and will last for the next years. When talking about

large scale effects we have arisen the issue of precaution. How do we interpret the precautionary principle for the GM crops? What does it imply, for research, industry, regulation, etc? Does it imply anything or is it useless?

Luis: there is one way to assess risks which distinguishes probability from magnitude [the metaphor of walking by the cliff]. People use the term risk relating to these different elements and this leads to confusion.

Antonio: We are discussing about biotech because it brings to light many things underlying our society. There shouldn't be a specific precautionary principle for biotech, it should be present in all spheres of our society, regulations, etc. For example, George Bush is using the precautionary principle in the case of the Kyoto Protocol, arguing that its ratification can lead to economic difficulties for the US industry. This is a selfish interpretation of the principle, which is absurd. And what is the risk of no action? This is not evaluated. Risk perception of any activity is quite different between experts and non-experts.

Sandra: We often hear the argument by which the effects of transgenics on human health and the environment haven't been demonstrated hitherto. Therefore it is argued that we can go forward, let's grow and feed ourselves with transgenic food. The precautionary principle has an opposite meaning. It means that while we face such uncertainty and while its innocuousness has not been demonstrated, we must not liberate transgenics to the environment and use them as food. I don't agree with you [Antonio] when you talk about the magnitude, which you understand that society doesn't perceive in the same way that experts do; the most important issue here is that the magnitude of the effects of transgenics can be very important. Liberated GMOs are live organisms, science doesn't know what will happen with them in the environment, and we are moving to a non-return position. We will not be able to turn back when some problem happens. According to the precautionary principle, we must evaluate risks and benefits of new technologies. If risk is too high compared to benefits, the society won't take that way. In the transgenic case, benefits are very relative and risks very high, thus...

Moderator: We are talking about the limits to scientific knowledge...

Sandra: Knowledge in biology is nowadays very limited, there is a lot of uncertainty. Interactions between genes, the environment, etc. are little known.

Gloria: We [consumer associations] are frequently asked by the press about transgenics. We always state the need of putting into effect the precautionary principle. How do we define the precautionary principle? Our position is to advise the use of transgenic technology when there isn't any alternative, as it is the case for some medical treatments, but not for foods.

Moderator: This is the kind of debate we are looking for: what does the principle imply? In the case of the consumer organizations does it implies the existence of a positive advice for health issues and a negative advice for foods issues?. What does it imply in other fields, for example, in the lab, for companies...?

Antonio: From our point of view, it has implied the most terrifying and restrictive regulation in the world for almost any kind of product. Europe has created the vastest regulatory body ever made for any product. Any other food product is subject to the controls that transgenics do. With our current knowledge we think these products are as safe as any other, though there is nothing with zero risk. According to the precautionary principle, and although we think so [that risk level is equal], we have planned some measures in order to deal with future evidences on the issue, something like a red light indication to warn us.

Luis: Transgenic crops don't mean any benefit for consumers in the way they are being commercialized now. There are other countries in which the context is quite different, and when they evaluate risks and benefits they clearly adopt a pro transgenic policy. For example, China grows transgenic rice not because of famine but because of diseases caused by the excessive amounts of chemical treatments required by conventional rice. The balance risk-benefit is dependent of the different contexts.

Moderator: And what are the implications of this principle in Spain?

José: In Spain the precautionary principle hasn't been put into effect. The same has happened in the US, who is the main promoter of GMOs. When talking about the precautionary principle, this implies two very important things: the future of both agriculture and of feeding the world. The principle concerns the things which we don't know. The transgenics have been commercialized because the companies needed to make profits from their investments in research. When commercialization takes place under this requirement, the precautionary principle is absolutely neglected. We neither needed transgenic crops then nor need them now, nor have they solved any problem.

Mercedes: The precautionary principle isn't being put into effect neither for transgenic crops or food nor for non-transgenic ones. The main goal of any company is to sell its seeds. When many years ago was commercialized the hybrid maize, nobody made even 0,1% of the evaluations currently being done for transgenics. So far, the only described problems of biodiversity loss have concerned non-transgenic plants. Transgenics have been cultivated for eleven years without any evidence of that kind published in serious journals.

Moderator: We can relate this with the next question. What could happen in the case of a new strengthening of the international regime of precaution?

Mercedes: Nothing would happen, in the sense that for whatever it could happen we shouldn't do anything. In the case of transgenic and of everything else.

José: But it's not the same to talk about the agriculture and feeding worldwide than other things.

Mercedes: Probably, but if we had put into effect the precautionary principle for the case of insulin, which is mostly made using transgenics, we wouldn't produce enough of it.

José: In the case of insulin GMOs are not liberated to the environment.

Mercedes: But you put the protein into yourself.

José: When I am sick, I know that I can suffer secondary effects, but it is my problem. I'm not giving pills to everybody. In the case of insulin GMOs are not being liberated to the environment. In this case [agriculture] we are liberating such organisms to the environment.

Mercedes: And what is different?

José: For example, when the American river crab was brought here, it exterminated the indigenous river crab, and we don't know how this is going to evolve.

Antonio: And it wasn't a GMO.

José: Precisely because of the genetic modifications there is an extra risk.

Sandra: I don't agree with the proven non-existence of risks for transgenics, we've got the Mexican example.

José: Mexico is a biodiversity hotspot, and precisely one of the risks concerning transgenics was that they could pollute these places.

Mercedes: I think you are misinformed and that you should know more before talking about it [she quotes papers in scientific journals].

Sandra: About the precautionary principle, Spain has been forced to slightly put it into effect because of its European membership. The EU has set an important brake, and I don't mean its legislation is something wonderful, but there's a moratorium and this hasn't allowed Spain to pass new authorizations. The precautionary principle is missing in the issue of Bt-176.

Moderator: Any other measures or implication? It is very clear what the principle has implied for consumer organizations, as they have had to advise: this yes, this no. Anything else on the monitoring plans?

Luis: Nowadays there is a lot of misinformation about transgenics. Many people being asked about it think that they can purchase transgenic foods in the market. Some interested parties could have been misinforming [on purpose].

José: We have never done so, neither Greenpeace, nor Friends of the Earth, nor Ecologistas en Acción. Another thing is what people can be saying. People go to the market and see that tomatoes are all the same, then they state: this is transgenic.

[Brief discussion on Vida SElisabet,]

Moderator: Getting back to precaution, some people state that precaution implies participation. In what sense can precaution imply the participation of the different social agents?

Luis: I consider our trials on gene flow as an example of the previous work required for risk assessment. I'd like to extend these trials to other crops.

Moderator: Eh... and what about participation? We are moving in a field defined by uncertainty and limits to knowledge, and thus by values and ethics. Precaution could imply the consideration of other value sources. Is this strategy followed in Spain? For example, there is the Commission on Bioethics, which could complement the more expert judgments of the CNB. Does precaution mean only security?

Luis: Undoubtedly I agree with the creation of this kind of committees, but I meant to say that when I started to speak publicly on biotech, I was convinced that there was a problem with the ignorance of what happens with genes. We had been taught at school that genes were almost our soul, and this idea still remains in many people. Later I understood later that there was not only a problem in knowledge but many more things overlapping. And I don't refer only to commercial interests, which are there, but also to some social interests, conducted by social organizations; in fact, the idea of wilderness is largely spread. There are also political questions, and even religious ones. When I hear about wilderness, specially the Wise Mother Wilderness, I get excited, because after this statement anything can happen. Then, what I am trying to state I that when assessing risks it is so difficult to avoid these previous attitudes. Therefore, as we can't escape from ourselves, we need these committees, which must be as broad and experienced as possible. For instance, we [the workshop participants] could be such a committee.

Antonio: In this dialectic process, where there is a thesis and its antithesis, we ought to reach some synthesis somehow. I think we are still in a context in which this synthesis is impossible.

Moderator: the question is: is this kind of participation necessary for risk assessment? And not only for risk assessment: what about the suitability of this technology? Is it possible to increase the participation of the social agents in Spain?

Sandra: If consumers reject transgenics, as it is happening in France, this is possibly caused by an edrivingal response, certainly aided by the recent food scares which

shocked Europe. I think too that knowledge has little to do with the issue, as our own campaigns reach a small number of people.

Luis: People have suffered a series of robberies, food scares, and is highly sensitive because of scandals such as dioxins, clenbuterol, mad cows, etc. People are sensitive, the mass media have exploited it, and now in this context transgenic plants have come into scene. I'd like that all the traceability requirements for transgenic crops were extended to all kind of foods, because we are still buying meat of unknown origin.

Sandra: Public pressure has forced politicians to adopt precaution measures: we've got the moratorium and all the regulations which are being developed. I don't understand this as being caused because of social organizations influence, but because of public opinion is asking for some precautionary measures.

José: There has been a problem with food scares, and a problem with consummated facts policies too. How have transgenics been introduced in the world? They were firstly introduced in the US, where public opinion made nothing, thus companies thought that transgenics were going to be introduced in the same way that Green Revolutions did, this is, in an unnoticed way, and companies also thought that worldwide agriculture would be transgenic in five or ten years. But there have been several food scares and thus an increasing public awareness to food issues. When cows began to be fed with meat, things would have happened in a different way if the precautionary principle had been put into effect; nevertheless, we scientists knew what was going to happen.

Moderator: We will begin to discuss about the scenarios right now. Anything else before?

Mercedes: Maybe environmentalist organizations and scientists have slightly influenced EU policies, but I think that there are economic interests behind its policies, specially aiming to put a brake on imports from the US, such as rape, maize, etc.

Antonio: The European fitosanitaries industry is very happy, because Europe isn't following the American way of replacing weed-killers for genetic technology from Monsanto and others. Bayer, Basf and others don't need that any small company [such as Monsanto] develops plants which don't require weed-killers.

Mercedes: I think the world is pushed more by economics than by politics.

3. Scenarios

Moderator: We have developed three different scenarios according to the responses to some question papers and interviews. These scenarios are: full prohibition, full liberalization, and an intermediate one. Do you think these scenarios are adequate?

[brief explanation of the scenarios]

Luis: I think that precaution is a key issue here, because there are many underlying interests which are frequently embodied with the precautionary argument.

Moderator: Then, according to Luis, precaution isn't an outstanding item in any scenario. Let's talk about these scenarios for the Spanish case, and for ten years onwards.

Luis: We must consider that Spanish safety and control agencies are far from reaching the American level and public trust. Spanish people mistrust the government controls. This explains why some things are allowed in the US: if FDA says OK, then the public is confident. The situation is quite different here, and people are reasonably mistrustful.

Moderator: In the case of a full prohibition of transgenic crops, it could be caused by the public lack of confidence in our institutions...

Antonio: I think that the determinant factor of a prohibition would be the government.

José: But the government is carrying out actions [in this respect], there must be some reason behind.

Luis: I'm sure that if some political party could bring together the vote from environmentalists worried about wilderness and purity, though the politicians of this party were not of such condition, which are two ideas that reach everybody [wilderness, purity], it could become a strong pressure agent. When a political party comes into scene, it can't be stopped; this is really a non-return situation, because once created the main aim of the party is to keep itself in power.

Moderator: Then a political party could lead to this scenario.

Luis: I think so.

Sandra: It could also happen that consumers absolutely reject these products, once they were labeled, of course. But with the current legislation some products will remain unlabelled, therefore we couldn't be talking of a full prohibition. But if we allow consumer to choose... I don't mean this to be happening right now, but it could in the future.

Moderator: How could we reach that point [of full prohibition]?

Sandra: I don't think it could be possible.

Mercedes: So do I, for one reason. If I create a transgenic product, and I publicize it in TV with good-looking famous, people will buy it in the supermarket.

Antonio: Everything is possible, as it is in last stance depending of personal willingness. I think that a full prohibition scenario would be caused by a demagogic attitude of the government, which would be willing to show itself as worried about consumers. There are some countries with green parties within the government, such as France, which produces 70% of electricity from nuclear power but it remains an uncontested issue; however transgenics are sacrificed because the government isn't aware of its significance. "I sacrifice this small thing for you [green]" and everybody's happy.

Gloria: I think of this scenario as something difficult to happen, because consumers mistrust equally in both government and environmentalists. But the most mistrusted item is labelling. Nobody understands the labels, there is much confusion with them. And even if they could understand the labels they aren't going to trust the labelling source or the agency which controls this issue. Maybe this scenario could be driven by events in other European countries, which could lead to restrictive European legislation and fully putting into effect the precautionary principle; then Spain would be forced to do it the same way.

José: The driving force of this scenario would be always the consumers' pressure, followed by the government's action. Why is there such rejection of transgenics in UK? Because they suffered the mad cows.

Moderator: I see you agree with our previous settings, by which the key agents of this scenario were consumers and regulatory agencies.

Antonio: The most determinant factor would be the government's willingness.

Mercedes: I think so.

Luis: It would be a direct action willing to take advantage of a social feeling.

José: So you think that this is the driving force.

Luis: It would be the driving force which could take us to this extreme position [the full prohibition].

José: I think that the government is the agent who has to state: prohibition. But I don't think that any Spanish political party with the possibility to reach the power would introduce a moratorium.

Mercedes: But this is something hypothetical.

José: Our political parties would choose the moratorium only if they were pressed to do so.

Antonio: But it isn't strictly necessary a great pressure. Any government would do that way [moratorium] if it was heavily pressed, except for our government [PP]. Without the existence of strong pressure, somebody could try to take advantage of a general feeling.

Moderator: And who would do this?

Antonio: It has to be a government.

Sandra: There is another way to reach this scenario, which is through facts instead of official statements. For example, EU could strictly regulate about [OMGs] liability, in a way that all such problems caused by liberations were compensated by the companies, through insurances. EU could also regulate about coexistence of transgenic and non-transgenic crops, for example demanding large refuge areas (4 km) around transgenic rape fields. This kind of facts would make very difficult to grow transgenic crops.

Antonio: I agree with you that this could happen, but it would be framed in a restrictive scenario, because I understand that a full prohibition would also mean that the commercialisation of transgenic crops and its use as food were banned.

Sandra: That's right, I was talking about growing transgenics.

Antonio: Full prohibition means that nothing can be introduced.

José: For commercial purposes.

Antonio: Yes. The Euro notes are transgenic. Then it would mean that even the Euro notes couldn't be transgenic.

[cotton for Euro notes is bought in the US and is transgenic]

Moderator: Do you think that a stronger responsibility [regime] could be an important element in the intermediate scenario?

Mercedes: It could be in the origin of high costs for growing transgenics, which could drive to such an extreme situation as it is the first [full prohibition] scenario.

Luis: Our experience has shown us that farmers are open to any growing option if they understand that they can get profit from it. If they calculate that growing some varieties will reduce their costs thanks to the reduction of weed-killer inputs, they will choose those varieties. But they wouldn't choose this same option if they foresee that they are going to have difficulties to sell their products. According to this last possibility, if farmers think that their early advantage of low weed-killer costs will be overwhelmed by the difficulty to sell their products, transgenic crops will slow down their expansion.

Moderator: What is the role of precaution in the full prohibition scenario for Spain?

Luis: From my scientific point of view it means the reproduction of the ever-lasting, typically Spanish motto: "let the others invent".

Moderator: But isn't this a consequence?

Antonio: Why are you going to research on something that you don't really want?

Moderator: We've already talked about driving forces, and we will talk now about consequences. But before that, what about precaution? What about the interpretations of precaution and its derived logics?

Antonio: I think that the precaution interpretation required to reach that scenario [full prohibition] is that we have to do nothing in a uncertain situation. I think that it is a perverse interpretation.

Moderator: In the answers [to questionnaires] which we received yet there were two different logics. First, prohibition has been the output of an active policy. Second, it has been the output of a lack of political decision. Do you agree with any of these two logics?

Sandra: I think they're right.

Antonio: We've got the Italian case, where the government is trying to make this scenario real though the Italian society isn't asking for it more than other societies do.

Moderator: And what about consequences?

Luis: Full prohibition would mean to stop researching on this field, as researching funds are distributed according to priorities. It would make no sense to fund research on something useless.

Mercedes: Transgenics wouldn't be a priority.

José: We would research on other items. It doesn't mean "let others to research", for we would be researching on other issues.

Luis: Weaponry?

Moderator: Then one consequence could be a greater research on ecological agriculture.

Sandra: Or more sustainable forms of agriculture. Or rural development.

Antonio: It is more probable that weaponry research were funded.

[Discussion about weaponry research]

Sandra: There's something about the consequences that I can't understand: the working paper has someone's statement by which there would be widespread fraud in GMOs labeling. That can't happen if there is a full prohibition.

Antonio: It can happen if Spain bans transgenics and it is still introduced in the country.

Sandra: Then you mean illegal imports.

Antonio: Yes, and labeling would be fraudulent as it wouldn't state the existence of transgenics. If prohibition happens only in lonely countries, the fraud probability is high. An outstanding point here is the implication of the full prohibition meaning, because foods can be made from transgenic crops though this can't be detected. How will you know if some sugar is made from transgenic beet if they don't state this in the country where it is grown?

Sandra: Then a worldwide prohibition is required.

Antonio: Coherence requires that transgenic enzymes were also banned in a full prohibition scenario. However, how is made most of the cheese nowadays?

Moderator: Then this full/global prohibition scenario relates to a stronger international regime on precaution.

Luis: I don't think that Spain will develop any scenario different from the European one.

Luis: I'm sure that things are going to change when transgenics will have advantages for the consumer, such as the famous "light" rice.

Sandra: I think it doesn't exist because companies aren't interested.

Antonio: Whoever can create them she/he will earn lots of money.

Mercedes: In this case, the problem is merely a technical one. The first transgenic varieties have been created because the interesting character is only determined by one gene. They are very simple products. However, processes which affect the general metabolism are determined by multiple genes. I think that companies are willing to create those products but the process to do them is quite complicated.

José: There are two contradictory things here. There are more and more products in the market with added properties, such as calcium, Omega-3, etc. But there is also a general trend to avoid manipulated, modified or processed foods.

Luis: Yes, foods are processed, but this has always been so.

Antonio: There is a double discourse, something quite similar to what is happening with queries about TV programs; everybody says that watches documentaries and educational programs, nobody says that watches Crónicas MarciElisabets [trash TV program]. On the one side, everybody states to want what is good for him, and this is identified with all what is natural. But at the very real moment of buying, this isn't an important criterion.

José: I'm drawing my attention on what the companies are selling. They carry out market Analysis and know the main trends.

Antonio: But they distinguish between what they sell and what they advertise. It isn't the same the real product than the way you advertise it.

Moderator: The product item has shown to be a very important one for the question related to the full liberalization scenario. I was talking yesterday with Elisabet Fresno [CNB chairman] about the importance of developing products with advantages for the consumers. Anything else before talking about the full liberalization scenario?

Sandra: I don't understand why the role pressure groups trust is reduced in this scenario [full prohibition].

Luis: With the prohibition you [environmentalists] loose your opponents.

Sandra: We'll find something else [to do].

Luis: Neither I agree nor disagree with it; this is what it means.

Sandra: I don't agree with the possible loss of competitiveness of the Spanish agrarian sector though I understand why somebody can have argued this way.

José: I think it would happen the opposite possibility for the case of a full prohibition. Spain is a country with a very diverse agrarian sector, and finally, the added value of the products is the most important thing.

Antonio: No.

Mercedes: No.

José: I think that the added value of the agrarian products would increase very much. In Europe, the organic agriculture is expanding very fast, and the European agrarian policy is directed towards the quality products. Therefore the Spanish agrarian products would increase their added value if there were a transgenics ban in Spain. It is happening something similar in Brazil, whose soya is bought because people know that it isn't transgenic.

[Controversy about illegal soya crops in Brazil]

Mercedes: I think that there would be a loss of competitiveness. The European agriculture is a subsidized one. Most crops wouldn't be reliable if they weren't subsidized. The genetic improvement programs that have been developed during the last years have outputted more productive varieties, and in many cases this selection has caused the loss of many resistance genes. I agree with the possibility of having a reliable agriculture if both organic and transgenic crops are grown, because there are few varieties which can meet the requirements of organic agriculture nowadays.

Luis: There would have to be also some program to recover the old varieties which had the resistance genes.

Antonio: I think that biotech will favour these works on gene searching, because it ultimately needs those varieties. Spain is an agriculturally poor country, because we have never been able to completely feed the Spanish population, we have always needed to import, and in fact we are very deficitary in cereals. We can't grow no more than now, because this is a desert with four minor river streams and many mountains. Spain is a bad agrarian producer. If we renounce to our intelligence to move forward, we'll go worse. If you ban transgenics, people will continue to use fertilizers and weed-killers.

Sandra: I don't agree that transgenic crops increase productivity.

Mercedes: I think you didn't understand what I meant to say.

Sandra: I think that our situation fairly reflects that some people believe that transgenics are wonderful and other people believe that they will cause many troubles to agriculture. Some people state that they will increase competitiveness and other state the opposite.

Mercedes: I didn't mean to say that transgenics are going to increase competitiveness, but that competitiveness will be lost because the alternative isn't feasible with our current tools.

Sandra: Then competitiveness will be lost.

Mercedes: I think so.

Luis: We should consider for this case what would be happening in the other countries. It is very different if Spain bans transgenic crops and Europe allows it, in which case we would surely lose competitiveness. If the ban affects the whole of Europe, then we are favouring the US and we would also lose some competitiveness. But for the case of the Spanish ban and a permissive or middle-permissive European regulation, we would lose.

Antonio: I think that Spain has a very intensive agriculture, because we have to irrigate the fields. To keep growing some kinds of agriculture is more expensive in Spain than in France or Germany, where they double outputs with half of our work. Besides, our fields don't have the amount of organic inputs that other places do, what makes the alternatives more difficult. If we ban transgenic crops, then we need more amounts of weed-killers and water, what is a real problem.

José: From my point of view, when we talk about transgenic crops we are talking about more than only that, we are talking about different conceptions of agriculture. I think that transgenic crops sink deeply in the errors of the Green Revolution, which for me was a great error. The Green Revolution increased productivity, I don't negate it, but it also brought many problems and was finally useless, because famine hasn't been resolved, it has increased.

Antonio: But there are many more people eating in the world.

José: Food production has increased faster than population. To ban transgenic products while keeping what we have nowadays Murcia [a super-intensive agriculture area] is something demerital, with or without transgenic food.

Luis: However, that's a different issue.

José: What kind of agricultural production do we want for our country?

Antonio: But if we ban transgenic crops and keep everything else the same, where are we going?

José: Therefore we need a different agrarian policy.

Luis: I have been talking with entomologists about the imagery of an idyllic world, where no treatments are made and every crop is organic. Nowadays the existing organic crops take profit of mitigated pests thanks to the treatments made elsewhere. The organic farmers don't make any treatment but everybody around them does so. What will happen when nobody will make treatments because every crop will be ecological? This would be something like the Egyptian Pests.

José: I would like to clarify this. Before the Green Revolutions the agrarian loss due to pests was about 7%, but nowadays it is about 30% despite of the use of weed-killers, pesticides, etc. Therefore the pests haven't been mitigated.

Luis: I think we should look for the source of this data. Conclusions are often made too fast.

José: Pests have increased their resistance very fast.

Moderator: We've got many opinions for this scenario, so we could talk about the next one [intermediate].

Luis: I'd better like to talk about the last one [full liberalization].

Mercedes: I think Luis's is a better option.

Moderator: Then let's talk about the third one [full liberalization]. In this scenario many patents now paralyzed are be put into effect. One of the driving forces is the elaboration of foods with extra value, such as medicinal foods. The biotech companies have got major institutional support.

Luis: I think this scenario isn't concise enough because the most important element isn't the full liberalization, in the sense that anything goes if we get profit with it, but the measures introduced by the government to guarantee the environmental safety and the new patents blooming. We should give more precision to this scenario.

Sandra: When I answered the questionnaire, I described this scenario as the current American situation, because it can be understood to be a liberalization of not everything, but many things. I don't agree with somebody who has labelled this scenario as coexistence, because that wouldn't be a truthful situation. Once transgenic crops are liberated as it has been done in the US, everything is transgenic. Coexistence is impossible under these circumstances.

Mercedes: But this isn't the case for every crop. According to the current knowledge, it will be very difficult to achieve coexistence for rape, it is possible for maize if some measures are introduced, and it is highly possible for rice.

José: Do you refer to crossed polinisation?

Mercedes: I refer not only to crossed polinisation but also to seeds transportation, etc.

Sandra: But the different crops can be mixed. I'm sure everything will be mixed in the US when they will grow wheat or rice.

Mercedes: It will rely on the legislation.

Antonio: It relies on the market.

Moderator: I think you are talking about consequences...

Mercedes: Coexistence will depend on the crops. It's reasonably possible for some crops and impossible for other ones.

José: But you are referring to the cross-pollinisation possibility during the growing process, but not to the later commercialization process.

Mercedes: I don't know if rice is commercialized in the same way than maize, but these products are not always going to be mixed afterwards.

Antonio: If the market pays more for your non-transgenic product, then you'll take special care to keep it non-transgenic, because this will be a reliable job. I think that the best thing which can happen to organic agriculture is the transgenic crops introduction, because it will reinforce its identity and value.

Sandra: Transgenic crops will remove organic agriculture.

Antonio: You must make your product something different from the rest. Organic agriculture has revaluated in front of other less concise forms of agriculture, such as integrated agriculture. Nowadays the value of organic farming is clear and the market pays for it.

Sandra: Organic agriculture is meant to be a non-transgenic one.

Antonio: Organic agriculture can have a 5% degree of processed products.

Sandra: But without transgenic varieties.

Antonio: But why do you allow 5% degree of non-ecological product and 0% degree of transgenic product? We should also think about the concept of zero.

Sandra: Zero would have to be the minimum detectable amount.

Antonio: But this relies on the current technical capabilities.

Sandra: This fully non-transgenic agriculture which is demanded by many consumers is going to be removed if transgenic crops are large-scale introduced.

Mercedes: It depends on the different crops.

Sandra: It will happen that way with rape, and there is a medium-high risk for maize. The ecological agriculture as it is known nowadays is going to be removed. Another issue is the measures that organic farmers will have to implement to protect their fields from pollution, which should have to be implemented by those introducing transgenic crops. Costs to prevent pollution raise until 41% for maize according to an EU survey. Thus the great paradox is that consumers willing to eat the same food than they always did are going to pay more for it.

Moderator: This is a consequence.

Sandra: The consequence is the prize increase for consumers.

Mercedes: I'd like to say that this European survey also considers potatoes, which have a low-risk pollution.

Moderator: Which role has been assigned to precaution in the full liberalization scenario?

José: I think that there isn't any kind of precaution in this scenario.

Antonio: I think that the problem is about what we understand for liberalization, for it shouldn't mean that there aren't any controls for products before they reach the market.

Mercedes: I don't think this could be a plausible scenario as full prohibition and different degrees of allowance are. If this scenario means "there we go"...

Antonio: I see that we agree about this issue [transgenic crops]. However, for the conventional [agricultural varieties] improvement methods there is actually a full liberalization.

Mercedes: Without any controls.

Antonio: Conventional improvement can be much more dangerous than genetic engineering.

Mercedes: It has really been this way.

Luis: When any crossing is made with wild varieties, which are pursued due to its interesting characteristics, there isn't a lonely gene transference as it happens with genetic engineering; many genes are transferred, some of which can be lethal for the plant, some other can produce harmful active substances.

Mercedes: Some of this cases were commercialized and then had to be removed from the market.

Antonio: This is an existing scenario nowadays and with more dangerous elements.

Mercedes: With conventional improvement you can register any new variety and put it into the market without having been previously submitted to toxicity or allergy Analysis.

Moderator: I think that you mean that there are two interpretations for this scenario. On the one side, there hasn't been any precaution. On the other, precaution is required for liberalization to happen; for instance, labeling has been put into effect as a precautionary measure in order to liberalize transgenic crops.

Luis: This last possibility could happen because of new scientific findings which show that there isn't any problem with transgenic crops. We can have been eating such products for a long without any problem, thereby due to the precautionary measures implemented we have concluded that there aren't any risks.

Antonio: We could also reach this situation by implementing an US-like defense system, by which we allow many things to be done but if there is any problem the legal liabilities is very important

Moderator: So you mean that the higher liberalization, the higher responsibility.

Sandra: I can't see so much responsibility in the US regime. There is a clear responsibility regime at a market level, but not for pollution problems.

Antonio: Some cases of conventional pollution have been harder to compensate for companies in the US than in Europe.

Sandra: But we've got very different worldviews. In the US everything is solved in the court. Here people aims for a more general protection; we don't denounce anybody for a one day disease due to a defective food. And the US legislation doesn't make pollutants pay for their pollution.

Moderator: What about the driving forces of this scenario? Could extra value foods, companies achieving their goals, or institutional support lead us to this scenario? Is there any missing element?

José: I think that this scenario would have to be happening in the whole of Europe in order to be possible in Spain. I preferably agree with the second possibility.

Mercedes: Do you mean the strategic association of companies?

José: I think it is the most important element in the leading to this scenario, as it was the government for the full prohibition scenario. And about the consumers, I agree with Luis

about the double dialectics. On the one side, everything the companies are selling is told to be “natural”, because people understand that “natural” things are the best ones. On the other, the companies are also selling extra value products. Nevertheless, I think that the first ones [“natural”] are winning the contest, thereby the product characteristics won’t be a determinant factor for this scenario [liberalization]. “Natural” products are being favored by the many food scares recently experimented. The extra value products embedded with new properties are also being bought, but I think that there is a general trend to choose natural products.

Sandra: I think that products with medicinal properties could even play against the expansion of transgenics. People invent many things about food properties or origins, and when they’ll hear of products with stranger properties, such as hepatitis curing bananas, they will be even more scared.

Moderator: Then there are also two different driving forces for this scenario.

José: Fear is the driving force behind the rise of organic agriculture.

Luis: However the controls over organic agriculture are quite disappointing.

Mercedes: There is some legislation but there aren’t any controls.

Luis: We’ve learned that farmers tend to make treatments to crops in front of the very first adversity.

Antonio: I think that the fact that some heavy metals, such as lead, are allowed for organic farmers is a big mistake.

Luis: I think that consumers have their right to purchase authentic organic products, but this isn’t happening nowadays.

Sandra: Maybe we should ask about the inexistence of controls over organic agriculture and its existence over other kind of agriculture.

Antonio: Of course, one is kept under the lens and the other is the “good” one.

Sandra: And if there aren’t any controls over organic agriculture, how has it been possible to detect organic crops polluted with transgenic crops in Navarra? [there have been a case we are now researching]

Antonio: The most absurd control which could be made has been implemented over those affected crops, and it is to set the zero threshold of transgenic content allowance. The detected amount of Bt maize was minimum and it didn’t even require its labeling. However the presence of transgenic is quite easy to detect with the PCR technique. The existence of other processing is not surveyed.

Luis: The latest detection techniques reach the detail level of little amounts of molecules. Thus we must forget about the zero amount of transgenic.

Antonio: We can set thresholds, such as 0,001, but we can’t establish zero as such.

Mercedes: However, and about conventional or organic crops, plants can be treated with heavy metals but this kind of Analysis aren’t made. There are people who are using treatment products actually banned, and besides, those like us who have worked with farmers know that when there is some harmful pest farmers make treatments which sometimes are also harmful. And all farmers do this way because there isn’t any structure to control these treatments. I think that organic farmers will have some alarm in the future.

Antonio: An executive from the Alcampo mall in Sabadell, who by the way has little knowledge about transgenics, told me that their two best sold products were Coca-cola and Tarradellas pizzas [fresh pizzas, not frozen]. You can then interview with people and they tell you what they want while they’re buying these two products.

Moderator: Turning back to the consequences, some of you had stated that one of them was the impossibility of coexistence.

Antonio: I don't agree with you, I think that the opposite will happen. I don't think that genetic engineering is something bad, and I'm sure that organic agriculture will soon take advantage of it, as this will allow to remove pesticides, fungicides, etc. Before this happens worldwide, the only possibility for European agriculture is to get more diverse with conventional, transgenic and organic crops. There won't be only one thing, there will be many options both in the future and the market and the interests of farmers will be determinant in this.

Luis: I hope to see how organic farmers accept transgenic agriculture in the future, because there isn't any danger behind genes, and there are many future possibilities to avoid treatments. This will take some time, but it will come to happen. See that we all agree in many non-transgenic issues.

Moderator: In fact one of the expressed opinions in the questionnaires was that transgenic and organic farming had a tendency towards integration.

José: I don't understand coexistence to be possible in this scenario because of the interests of companies. These companies can't get into the organic market, and I'm sure that they have developed transgenics to eliminate organic farming. The Bt is the only pesticide actually used by organic farmers.

Antonio: Bt isn't used for maize in Europe. Nobody has applied for such authorization in Spain.

José: I meant that Bt is the only pesticide used in organic agriculture. Bt plants are going to eliminate the properties of this pesticide because Bt plants are going to generate resistances very fast. The Bt plants are creating the pesticide substance all along their life, in an active form and not inactive like bacteria do. However, organic farmers only use Bt for crisis periods. Resistances will grow rapidly.

Mercedes: But there aren't resistances after fourteen years of cultivation in the US. What do you mean for rapidly then?

Antonio: The wide spreading of Bt that make organic farmers has generated such resistances instead of the concrete generation that Bt plants do.

[discussion about Bt resistance]

José: Anyway, any pest control used does generate resistance.

Mercedes: And refuges have been established as a precautionary measure just because of this. Thus these refuges should be also established for organic fields where Bt is being used.

José: But Bt is only occasionally used in organic fields.

Luis: The concentration of Bt are much higher than those produced by Bt plants.

José: Resistances can raise in many different ways. For example, if you constantly spread non-lethal doses you make the resistance grows, and this happens with everything: bacteria, antibiotics, etc.

Mercedes: You are talking about the general principles but we should talk about empirically informed data. The experimental data which I have accessed shows that there is resistance to Bt powder [used by organic farmers] as it has happened with all pests, and there aren't resistances to Bt generated by transgenic plants.

José: I haven't found any research showing that Bt plants don't generate resistance.

Luis: Not so far but you will find it.

Antonio: Of course, and then we'll have to look for other proteins.

Mercedes: Insects will finally develop some resistance to Bt plants and we'll have to develop other strategies. This happens due to evolution and not due to the specific characteristics of the transgenic plant.

Moderator: If there is any other suggestion about this scenario you can send it to me later. I'd like to know if you think that these scenarios are plausible. According to your expressed points of view, the intermediate scenario looks more plausible. How could we reach this more plausible scenario in Spain?

Sandra: I'd like to insist on the "coexistence" because for we [participants] have got two very different definitions for it. For them [pro-GMO] it means to introduce transgenic in non-transgenic elements, while for us it means to keep part of agriculture fully free of OMG.

Luis: This isn't going to be possible.

Antonio: It is possible if we establish a reasonable threshold.

Sandra: I tried to say that one interpretation means the establishment of thresholds while the other means the fully free of transgenic agriculture.

Mercedes: I think that this is possible depending on the specific crop.

Sandra: But I think that society doesn't want this issue to depend on every different crop. Society doesn't want one thing for rice and other thing for rape. Society wants only one thing. If society wants a threshold, for instance 1%, let the society to choose. If society wants transgenic free food, then the threshold is the minimum detectable amount. It can't depend on every crop.

Luis: If society doesn't want us to develop transgenic crops, then we won't develop transgenic crops. But neither you nor me nor anybody else can't speak for society.

Sandra: Of course I was referring to the different possibilities that society could choose.

José: One thing I don't understand, Mercedes, is when you state that coexistence is possible depending on the specific crop. I can understand it if we refer to the possibility of crossed polinization, but the differentiation of varieties is quite difficult once you have introduced the crops in the commercialization stage.

Mercedes: These different varieties should be distinctively labelled.

[She explains again the case of growing rape, maize and rice].

Mercedes: Coexistence is referred to gene flow, transportation, storage, etc.

Moderator: Thanks to everybody for your participation. If you wish to widen your opinions you can send them to me by e-mail.

2. Madrid workshop

1. Precaution, uncertainty and Spanish policy and institutions

[Moderator: introduces PEG research, and comments on the concept of precaution and its distinction to prevention; and also refers to some discussions held during lunch;]

Juan: So there is a continuous line between prevention and precaution... For instance, we keep an eye on possible new resistances to Bt toxin, though we do not even know if this resistance will happen. Then, what is this? Is it prevention or is it precaution? There is uncertainty on this topic: we do not know if there will be resistances, though we know what we are going to look for.

Moderator: This is a very important question: how do we (you) deal with uncertainty? Do we acknowledge uncertainty?

Juan: Research on the transference of resistances has been developed; for instance, resistance to ampiciline transferred to soil bacteria. Five years of research have concluded that there is not such transference. But we know this nowadays; we knew nothing five years ago. What is this? Is it prevention or is it precaution? We know what to look for, and how to look for it too, but we do not know what is going to happen. We don't know if such resistance, which could possibly happen, is due to a gene transference.

Moderator: But we don't even know what kind of effects will be caused by this resistance.

Juan: Certainly.

Concepción: I think that time is a key factor, for it determines the amount of data, security, and certainty we may have. We always start from a precautionary point, when we do not know what is going to happen. When we have got enough data and we are able to determine the existence of any danger, we can choose either prevention if such danger exists or staying in precaution if such danger does not exist. I suppose we will talk about this later, but social factors are very important for precaution, for instance, the social perception and all this kind of non-scientific issues. These factors are very important for the GMO case.

[...]

Moderator: Are there any implicit objectives in the Spanish policy about transgenic crops? What is the aim of this policy? Are its objectives different to the European ones?

Juan: This is a complex issue. I know what is the policy of my Ministry, thus we could understand that this is the policy of the current government. However, what is it happening in France? The Ministry of Agriculture and the Ministry of Environment have tense relations; Agriculture wants to lift up the moratorium while Environment does not want to. In Spain there are not such oppositions and the different Ministries are pushing for same goals, even the Health & Consumer one. The policy of the Spanish Ministry of Agriculture aims to be open to new technologies, implementing all the precautionary measures which are required, and agreeing to the European legislation.

Elisabet: The policy of the Ministry is to open to new technologies, but why?

Juan: Because we understand that these technologies assist our farmers' labour. Our cotton farmers have a great problem with a worm that causes a productivity decrease, but we know that there are some varieties being grown elsewhere which have already solved this problem. We must provide our farmers with the best available possibilities.

Elisabet: Then it is a competitiveness issue.

Juan: Certainly it is a competitiveness issue because we are referring to production, but always keeping in mind the precautionary principle. What was the exact question?

Moderator: What is the aim of the Spanish policy?

Juan: Relating to the genetic technology, our policy aims to remain open to it. This is also the aim of the Ministry of Environment, as it has always pretended to continue authorising GMO. Sanity & Consumer also agrees with this purpose. Therefore the Spanish policy aims to open to GMO, though implementing the necessary measures to avoid harms related to food & environment security.

Concepción: Answering to your [Elisabet] question about "why these new technologies", I think it is obvious that, for agriculture and any other sector, anything that means

innovation and improvement for citizens must be welcome if we keep applying the precautionary measures required.

Elisabet: I asked that question because of the social factors involved which you referred to earlier. For instance, there is not public participation in the authorisation procedures. There is not the transparency required to keep people properly informed and to make the public perception more favourable to genetic technology. Of course societies must progress, and science is very important for this purpose, but sometimes the lack of information is very problematic. There are some policy objectives, but social agents must be integrated in order to get this progress socially admitted.

Juan: However new technologies are new as well as social participation in these issues is something new too. We are working for this participation too. [...] The Ministry of Environment publishes in its web page news about GMO liberations, requests for authorisation, etc. which have the possibility of social participation. However this web page begun to run last year. Participation is being gradually enhanced. Trying to answer to your question [Elisabet: social participation], and relating to the issues concerning the Ministry of Agriculture [thus risk assessment by CNB and authorisation decision by CA are excluded³], I can tell you that GM varieties are evaluated in the same way that conventional varieties are. Thus the authorisation procedure for GM varieties does not take into account issues such as productivity, cycles, resistance to diseases, etc. because the GM organism has been previously Analysed. Therefore my [Agriculture] relation with the public has little importance. There is some relation with the agrarian and industrial sectors, but this happens for any kind of variety authorisation.

Concepción: I think that one of the main problems on this issue is misinformation. Communication among science, Administration and citizens should be improved. However I think that citizens mustn't participate in the scientific assessment as this would banish its legitimacy. Scientific assessments must be made by scientists, in the case of GMO and in any other case too. Consumers and citizens must participate when the scientific assessment has proven the absence of risks. Citizens must be able to express their opinion and, most important, must always keep their right to choose. This relates to the traceability, labelling and coexistence topics. But I maintain that we have to be very rigorous with the scientific assessment.

Moderator: So from what you say, would you agree in the statement that the aim of the Spanish policy on GMOs could be summarised as the one to be open to new technologies and development while keeping strict security measures. What should we (you) understand for precautionary measures?

Gloria: Yes.

Juan: Yes.

Moderator: However, what kinds of practices are contemplated? As another topic to bear in mind here is the international regime of precaution. What effects could it have on the Spanish policy?

Juan: But what precautions must we take into account? Those which are useful to enhance food & environment security. However this is a very broad statement...

Moderator: For instance, what are the differences with other sectors?

Juan: The first thing we must do to answer this is to know what are the risks involved. What are these problems for GMO? Things such as allergies, pollen transference to wild species, etc. Although these topics are discussed, there is nothing proven; excuse my expression, but I do not know anybody who has died because of eating a transgenic

³ CNB: National Commission of Biosafety, consultant body of experts. CA: Competent Authority.

product. I do not even know anybody with skin irritation, though this could happen. These are the precautions we must adopt.

Moderator: Are they preventive or precautionary measures?

Juan: We can undertake research on gene flow to unveil this possibility. But we will not even know if this flow can be harmful. Many of these risks are not measured.

Elisabet: This is a very difficult topic. Does Spanish legislation clearly establish which are the minimum contents of a risk assessment?

Juan: 2001/18 EU Directive contains these requirements.

Elisabet: And what about the new Spanish Law on GMOs? [passed on April 2003]

Juan: It is a mere transposition of the Directive.

Elisabet: I think that precaution must have some meaning, and risk assessment can fulfil its meaning. Risk assessment should be determined somewhere: the kind of risks, measurement tools, etc.

Concepción: 2001/18 EU Directive addresses these topics.

Elisabet: And are these assessments being undertaken in Spain?

Juan: Risk assessment is made by promoters.

Elisabet: But the Directive was passed in 2001, therefore I suppose that little thing has been done in this brief period of time.

Juan: The application of this item [risk assessment] of the Directive is assumed by the Ministry of Environment in Spain. Both the Directive and our national act demand to the promoters a risk assessment in order to approve their applications. How do we supervise this risk assessment? The documents of the application are distributed to the members of the CNB who are prepared to deal with the issue; Analysis, requests for extended information, judgements, etc. are made in the successive CNB meetings. A quite different issue is monitoring once the GMO has been liberated to the environment.

Elisabet: This is an important issue because the precautionary principle is a very vague one, and these risk assessments are making it meaningful. I think that it is still too early to know about many harmful effects, as it is supposed that nobody is eating these products. Long-term effects require a lot of time to be known, hence precaution is outstanding. [...]

2. Risk assessment, liability and monitoring

Moderator: It seems that here is where it lies the importance of preventive and precautionary measures, as different time and space scales are implied. We are not discussing only about health risks due to eating GMO but of global and long-term risks. You know that there are not any market-stage monitoring plans, thus GMO can not be controlled once they reach the market.

Juan: I agree with you. We have been talking about risk assessment, which is the initial part of the process; but then comes the risk management. The later has been done in the case of GM varieties too, as there are two monitoring plans which have been developed for five years. In the case of the product due to these varieties once in the food chain, nothing has been done because this maize [the GM variety authorised in Spain] is not used for human feeding.

Concepción: I think that we are focusing on health risks while there are other risks which are more controversial and maybe more worrying, such as environmental risks. In the case of human health, the US people have been eating transgenic products for a long time and any strange effects have been detected hitherto. I think that

environmental risks are more debatable, and maybe they are the cause of the social refusal.

Moderator: Due to recent findings, antibiotic resistant GMO have been banned.

Juan: But there is also a monitoring plan for the topic of antibiotics [for Bt maize]. This plan has not revealed any problem. This plan has lasted for five years, but we can't know if there will be any problem on the eighth year.

Concepción: There is a recent finding of a carcinogenic product which is generated in the crust of the bread and other products which we have always been eating. Of course there are not any special research lines for these kind of products which have been eaten for such a long time.

Moderator: We live with many irreversible risks, which can not be removed once they have been created.

Moderator: Let's focus now on the Spanish case. What are the institutional developments in Spain due to the GNO case? How do you appraise them? Are they enough? Are they independent? Can they guarantee safety for GM crops?

Juan: Is the existence of a National Commission of Biosecurity an institutional development?

Moderator: I think so.

Juan: Let's separate the different topics involved. About legislation, we do not have the power of an independent country. We must follow the indications of the Ministries Council of the EU. Therefore our legislation is either a direct application of some European regulation or either a transposition of Directives. We have a set of regulations which are in force or will be so early that transpose Directives. There are many other regulations about labelling and other topics too. There are also some regulations which are to be passed, such as traceability and new foods and feeding stuffs. 2001/18 EU Directive, international trade regulations and Cartagena Protocol are the basic legislation for Spanish normative developments. But they will be basic in a broader scope than Spain, as they must be applied in the whole of the EU.

Elisabet: But the European regulations can be developed in a more strict way by member States.

Juan: You can do it in those items which every Directive stipulates.

Elisabet: However articles 174, 175 and 176 of Maastricht Treaty allow more severe applications of the European environmental legislation.

Juan: Nowadays I think that it is not necessary to regulate further than EU does. Nor it is convenient to choose extreme strategies in such a complicated issue [GMOs]. EU is already legislating about this issue, though in a very slow pace. This is all about regulatory aspects. About institutional developments, you know there is a project to create the National Commission of Biovigilance in the Ministry of Agriculture. This commission will coordinate the agrarian aspects of GMOs: topics like monitoring plans, coexistence, traceability and labelling, etc.

Elisabet: Who are going to be the members of this commission?

Juan: There will be a General Secretary; General Directors of areas involving GMO development, such as Foods, Livestock and Agriculture; spokespersons from the ministries of Environment, Health & Consumer and Science & Technologies; interested agents will be also implied, such as feeding stuffs producers, traders, farmers, scientists; delegates from Autonomous Communities. I think that this commission is an important institutional development in order to monitor all the issues we are relating to. It will be a consultant body: it will inform the Minister. It will also work with sub-

commissions. However this is still a project. I do not even know if your [Concepción] General Director knew about it.

Concepción: I do not know about my General Director, but I did not know anything.

Juan: As this is not still fully developed, our only institutional development so far is the National Commission of Biosafety.

Elisabet: And what about the Inter-ministry Commission on GMO [Spanish CA]?

Juan: It is lead by the Ministry of Environment though its composition extends to more ministries. Its duty is to approve GMO applications. There are two institutions in Spain: CNB and CA; the later is the political body. CNB is the technical body, hence it does not have power to decide. CNB assesses applications and informs CA.

Elisabet: CNB composition is not as open as CNBV⁴, according to your previous expElisabettion. I suppose that future institutional development will try to identify and solve several gaps; in this sense, CNBV could improve transparency and information, thereby increasing citizens acceptance of GMO.

Concepción: This is the aim of CNBV but broad social participation is not convenient in CNB, as security is a scientific matter.

Elisabet: I think that this is the root of the problem, as I think that there are nowadays consumers which are highly informed. Society progresses thanks to technology but civil society does progress too. Knowledge is spreading in the civil society. Positive perceptions will require the involvement of this civil society. Commissions and other institutions must be open to the public.

Concepción: I agree that institutions have to be more transparent, but participation must be restricted to everyone's proficiencies.

Elisabet: However I think that consumer organizations can be sufficiently informed to participate in security issues. It is not necessarily an exclusive scientific issue.

Juan: CNBV will look for this social participation, in order to inform and to give support to politicians. Technical and security commissions must be limited in participation. [...]

Concepción: The basic idea is to separate assessment, management and communication. Assessment should not be "contaminated" in order to keep its rigour, scientific character and reliability. The next steps must follow to this scientific and aseptic assessment.

Moderator: Let's talk about a third topic: assessment procedures. How is risk assessed? How do you appraise the assessment and monitoring measures implemented hitherto?

Juan: This is a complicated issue which can lead to confusion. Varieties approvals are published in a Ministerial Order which contains the instructions for their monitoring plans, which are previously discussed by CNB.

[introduces the recent results of the 5-year monitoring plan of Compa-Cb, Bt maize]

Monitoring plans have to be implemented by promoters and presented in the space of six months since the Order publication. On the other hand, there is also an specific monitoring plan for the GMO as it is stipulated in 9/2003 Act, which modifies 15/1994 Act and transposes 2001/18 EU Directive. Previous Directives did not contain monitoring measures. According to the recent legislation, applications for commercialisation must attach a monitoring plan. This is not the variety monitoring plan

⁴ Onwards, CNB: National Commission of Biosecurity; CNBV: National Commission of Biovigilance.

but the GMO one, though many things will be coincident. Some reiterative items may look to have no sense, but the variety monitoring plan can imply further Analysis.

Moderator: How do you evaluate these plans?

Concepción: Relating to foods section, you know that the moratorium has not allowed approvals since 1999 for human consumption. This issue is addressed by EU 258/97 Regulation on novel foods. Although no GM foods have been approved, other new foods which have been approved, such as yellow fats or high pressure processes, require monitoring plans for promoters and several studies at consumer-stage, such as medical studies. Thus, authorisations for GMO commercialisation will require this kind of studies too.

Elisabet: Then traders must deliver monitoring plans for health effects.

Concepción: Yes, as we are referring to food safety when we talk about foods.

Elisabet: I think that this reverts the precautionary principle because commercialisation is the first step.

Concepción: There is a risk assessment and a long debate previous to authorisation.

Elisabet: But are there any tests on persons?

Concepción: No, medical tests are first made with animals. [...] Monitoring is demanded after the authorisation mainly to assess the reliability of the products. Assessment continues through the market-stage.

[End of tape 1]

Moderator: To what extent can actual safety measures deal with the risks associated to GMO?

Elisabet: Somehow this is related to the CFCs case, I mean, trying to avoid smuggling. You know that some crops could be commercialised out of the law.

Moderator: We all know of the famous case of American Starlink maize, which was not intended for human consumption. Could anything like this happen in Spain?

Concepción: This is a problem relating to risk management instead of risk assessment. These issues have to be differentiated. Assessment can be fully controlled, thus varieties can be authorised when there is evidence that any harm is not likely to happen. Management is a more complicated issue, it depends of many factors, including the good will of traders and those who will use the product in any step of the food processing chain. When the traceability and labelling regulation will come in force, fraud will be more difficult to happen, though it will never be impossible. The traceability and labelling regulation will become a good tool to provide security.

[...]

Moderator: In the hypothetical case of existence of fraud, who would carry with responsibility? Administration, farmers, traders, promoters...? How would we determine responsibilities?

Juan: It will depend of every case. Who is responsible for selling an GMO which has not been authorised? Of course those who sell it. In the case of an authorised GMO illegally used for human consumption... There is a clear example: soy imports from US. EU has authorised this product to be imported (not grown) for animal feeding. If it was used for human feeding... I do not really know what to tell you about responsibility.

Concepción: The ultimate responsible would be that who trades this product. And Autonomous Communities are responsible for detecting this fraud.

Elisabet: In the case of a health problem, public Administration would be the first institution to be claimed for, as it is responsible of controlling this fraud. We had in Spain the case of rape-seed oil, which was used for human consumption though it is toxic. In these cases, the affected people claim to Administration, and then Administration looks for those who are responsible for that fraud.

[...]

Elisabet: In the case of GMO, Administration would be the first responsible for having missed its duty of inspection.

Juan: Of course it is responsible if it should have done such inspection.

Elisabet: However, if there was such inspection but fraud was not detected, then it is a negligence.

Moderator: We are talking within a current context of GMO being commercialised after passing risk assessments but without market-stage [commercialization] monitoring. Thus we can not know if these products reach the human feeding processes. How will responsibilities be determined? Is there any policy aiming to solve this lack?

Juan: In fact we will have the traceability regulation when the European Council and Ministries Council do pass it. Then we will try to determine responsibilities. Nowadays there are not such responsibilities anywhere, as the only regulation in force is the 2001/18 EU Directive. However GMO have been already commercialised; it is very difficult to determine responsibilities. For instance, traceability regulation will demand products above 0,9% transgenic threshold to be labelled like GMO. Are every soy imports going to be Analysed...? Non-transgenic imports should also be Analysed. Will the Administration have to carry with those Analysis in order to be responsible for its market-stage processes? I do not think that any Administration can afford such demand, thus import traders will have to carry with this responsibility. Administration can only supervise it, but this supervision does not implicitly mean responsibility.

Moderator: There is a gap between what it should be and what it is...

Concepción: Yes, it depends of the capacity to enforce the regulation.

Moderator: Thus nowadays responsibility is for traders.

Juan: I do understand that it must be so. The Administration must assign to resources to make fraud more difficult. This is a topic related to the zero risk question...

Elisabet: We have been talking about human consumption, but there is the environmental harm too. The environmental liability Directive is being discussed just now, and the GMO case has been excluded. However the European Parliament has asked the Commission for a regulation proposal on this topic. In the Spanish case we also have the Penal Code, which could be also applied. Responsibility can be penal, civil or administrative.

Moderator: Hereby we get into the case of Navarra [transgenic contamination of ecological crops]. Who is responsible for this harm?

Juan: There is not any legal responsibility because there is not any regulation about it.

Elisabet: But there is a civil responsibility, as this pollution can make some farmers to lose profit. They can claim for their losses to be restored, as there is an off-contract responsibility addressed by Spanish Civil Code.

Juan: This issue relates to agriculture coexistence, which has not been regulated yet. In the example of Navarra, no one of those involved can be burdened with responsibility because of the lack of regulation. We do not even know if transgenic crops have polluted ecological crops or vice versa.

Elisabet: However off-contract responsibility does not require any specific regulation but the mere existence of harm.

Concepción: We can not give an answer to you because this matter depends on judicial decisions.

Juan: However the lack of regulation affects the judicial process too. We do not know what the judge could do.

Elisabet: In the case of an off-contract responsibility, those affected by harms can claim for its retrieval.

Juan: But we must define what is harm.

Elisabet: Harm has to be proven, of course.

Concepción: In the case of Navarra, I understand that harm exists if any farmer can not label his products as ecological ones [because of transgenic traces]. However I do not know who should be claimed for responsibility because of the lack of regulation.

Juan: Trying to answer to your question [Moderator], coexistence is still a matter of study. Coexistence becomes a new frontier in the case of GMO because neither traceability nor novel foods regulations address this topic. What will happen with liability? The first thing we need is some regulation, though this regulation is going to be developed. There are some European studies about coexistence among the different forms of agriculture (conventional, transgenic and ecological); however member States will be responsible for this regulation according to the subsidiarity principle. The aim of this regulation is to preserve farmers' activity from their neighbours' ones, though this is something difficult to do because it relies on the good practices of farmers. The core of this regulation is economic, thus not relating to ecological nor food security issues. [...]

Elisabet: This regulation will determine administrative responsibilities while there are also civil and penal responsibilities. Penal responsibility is addressed in the Penal Code, but it is a blank regulation which refers to administrative regulation. But in the case of off-contract responsibility, the Civil Code stipulates the requirement to retrieve any harm that could be caused. This does not require any regulation to be broken as there is neither any contract nor any regulatory frame. It only requires the judge to determine the existence of harm if there are any proofs.

Juan: I find it difficult to determine penal responsibilities. I will use a recent example: seed producing, which is highly related to coexistence due to technical similarities. Farmers can produce seeds; in this case, there are some minimum requirements of distance between his fields and others which grow the same specie in order to avoid contaminations which break the producing system. There is also a contractual relation between farmers producing seeds and seed traders; we do not know anything about other farmers. If there is contamination in the seed producing field from a nearby field within the security distance, these last seeds will be removed. However, there are not any responsibilities, thus it depends on good practices.

Moderator: Thus we are talking about current practices in which responsibilities are not being determined.

Concepción: There are precautionary practices instead.

Moderator: There is precaution without responsibility.

Concepción: The novelty of this issue makes us to advance slowly.

Juan: It is very difficult to burden farmers with responsibility. Let's look at the example of a farmer growing an authorised variety containing an authorised GMO... He can not be responsible for it.

Concepción: If he is observing the legal requirements, of course.

Elisabet: However recent developments of environmental liability are addressing objective responsibilities, this means that negligence will not be necessary to be burdened with responsibility.

Moderator: According to what we have been discussing, there will not be any responsibilities until regulation is developed and comes in force.

Elisabet: This is the case for administrative sanctions. However I think that civil responsibilities could be determined nowadays though it depends on judicial criteria. Another problem in Spain is the lack of training of our judicial system to deal with these issues.

Concepción: I think that your example could be compared to the case of those claiming to tobacco producers because of their lung cancer. It is a very complex case, as tobacco is authorised and everybody knows of its harms. It depends on the judges. It is so complex that we can not provide you with any clear answer.

Elisabet: I relies on the judicial system. This kind of claims have been accepted in the US because they have a different judicial system.

Moderator: In the Spanish case, we know that monitoring is supervised by Autonomous Communities, but current commercialisation approvals rely on central Administration.

[...]

4. Scenarios

Moderator: From material gathered in our on-going research, interviews, and a previous workshop, we have developed three scenarios for the future of GMOs crops and their commercialisation...

Juan: There is an easy choice from the three of them: the intermediate one.

Concepción: It looks to be more realistic than others.

Elisabet: However these scenarios do not take into account the recent claim in WTO from US to EU...

Moderator: But we had taken into account the relation between EU and WTO in some cases. You will find it in the graphical explElisabetions.

[Moderator: introduces and explains the three scenarios]

Moderator: what do you think about these scenarios?

Juan: [Again]The intermediate one is more likely.

Concepción: I agree with you: both extremes are unlikely.

[...]

Juan: An indefinite moratorium in EU but not in US would crush the international trading. In this case, it is more likely that US adopted the moratorium too than to continue to trade with those two different conditions.

Moderator: In fact this is one of the conclusions from our previous workshop.

Elisabet: It is not likely because it requires the strengthening of the international regime of precaution while US is leading these negotiations though it is neither member of the Convention on Biological Diversity [CBD] nor the Cartagena Protocol. The CBD dates from Bush father (Rio conference) and it was not signed due to lobbying from biotech industries. It was not a matter of the US Congress willingness but of industrial lobbying, as US policy is determined by companies' interests, which are funding election campaigns. The moratorium scenario is impossible unless these trends undergo some changes. The full liberalisation scenario is unlikely too, even negative: coexistence is

explained like merging, though this really means the lack of coexistence. We would lose, on the one side, the farmers' capability to choose, and on the other side, the consumers' capability to choose too. All forms of agriculture must be defended in order to keep consumers' ability to choose.

Moderator: This is an essential issue. There are two questions about coexistence: is it possible? And is it desirable? We have been talking to both promoters and ecologists who stated that coexistence involved the future merging of agricultural options.

Concepción: I do not agree with coexistence meaning merging. Coexistence means respect instead of imposition of one option over another.

Moderator: Do you think that this is possible?

Concepción: It is not possible in a full liberalisation scenario but it is in the intermediate one.

Juan: I think that coexistence is possible. Something different is the possibility that in twenty years conventional farmers do not worry about transgenics because consumers do not worry. Is it possible to regulate coexistence or to reach good practices in this sense? I think so.

Moderator: Is coexistence desirable?

Juan: It is desirable, as this also relates to good practices.

Concepción: It is desirable because it maintains the ability to choose.

Juan: Farmers have to be free to have access to approved crops. Those willing to grow transgenic crops must be able to do so because it is approved.

Concepción: Non-transgenic farmers must be also free to choose their option.

Moderator: However, according to some ecologists' point of view, coexistence is neither possible nor desirable.

Concepción: Because they do not want the transgenic agriculture to be developed.

Juan: Ecological farming will have to adopt some changes. It is a mistake to admit zero transgenic traces, as this is something impossible to get. I am sure that this is going to change and different criteria will be applied.

Elisabet: We have stated that all forms of agriculture must coexist. However consumers often choose these products according to their price, thus consumers are not fully free to choose. Let's think of a future case in which any harmful effects [for GMO] have not been yet demonstrated and thus agriculture offers its conventional, transgenic and ecological variations. While ecological farmers will keep their option because of their beliefs, conventional farmers will tend to grow transgenics because of producing costs. If no food scare happens, probably transgenic farming will make conventional farming to disappear.

Concepción: Price is one of the involved factors, but it happens the same with clothing. There are Armani, Benetton and Zara. What will you choose? I would like to dress Armani everyday. I would like to buy everyday some wonderful tomatoes from ecological farming, but this is not affordable for everybody. Does this mean that any of your dresses is poor? No, it is only a matter of different quality. Every dress has its quality within its segment. Thus price is an important element though this does not mean that everybody is going to buy the cheapest product, as in fact ecological farming is chosen by more people everyday.

Elisabet: I did not mean that ecological farming is to disappear. I mean that conventional and transgenic farming will merge. Thus I am foreseeing a scenario in which only transgenic and ecological farming are coexisting.

Moderator: This is precisely what some ecologists referred to: in the long term, coexistence is only a previous step for full liberalisation. Time and irreversibility are implicit topics, thus leading us to the precautionary issue. To what extent do these different scenarios rely on precaution? Does the future development of transgenic policy depend of the application of the precautionary principle?

Elisabet: It will depend of the way in which the meaning of the precautionary principle will be progressively constructed. For example, US does not agree with this principle and this is the source of a constant debate in every international round. It depends of the meaning of precaution in the EU too. I know of some European research about the interpretation of this principle by the citizens. Nowadays it is a very vague principle: Rio did not explicit it enough.

Concepción: This also depends of the results we will get in the future. Nowadays we can not foresee such future.

Elisabet: There are currently different interpretations. Some people understand it is like doing nothing. For others like you [Moderator] explained in your paper, it means further action. Interpretations are very different because Rio definition is very vague.

Moderator: What do you think about the consequences of these scenarios? What do you think about them?

Juan: I agree with the consequences you have described.

Moderator: But do you think of them like something positive or negative? For instance, what consequences could full liberalisation or indefinite moratorium mean for rural employment?

Elisabet: This is a difficult question because it involves many factors. Maybe harvesting techniques will improve very much in the next years...

Concepción: We are precisely adopting the precautionary principle because of the uncertainty. It is very difficult to appraise consequences as positive or negative because of the lack of results. If we think of long term results showing no risks for GMO, future consequences will be very different than those of the case in which risks overcome. We can not appraise any scenario being better than others because of uncertainty.

Moderator: So you mean that our current period of experience is not enough.

Juan: But it is also very difficult to determine how much time is enough. We have been making trials for some years but maybe something could happen next year. It is very difficult to determine the amount of time required for these trials. However we can learn from the experience of similar cases. Hybrid maize was created by genetic manipulation and was first grown in the fifties around the world and in the sixties in Spain. No precautionary measures were implemented then. Have there been any problems with this maize? No. It is a good experience. Maize yielded 2000 kg/ha in the fifties while it is yielding 10000-12000 kg/ha nowadays thanks to hybrid varieties. Has this caused any effect on employment? I do not think so, because this yields create a new kind of needs, such as making machinery to harvest, etc. Getting back to the question, this is useful as a past experience. During the Green Revolutions, wheat yields were also improved thanks to genetic manipulations which created some varieties with resistance to several pests. Again, there were not any precautionary measures for these varieties. However things are different now, and consumers claim for more security and are organised to get more information. Thus these are the current rules. But if you ask me about the future of the different forms of agriculture, I personally think that in some years the whole of agriculture is going to be transgenic, except for special cases which are demanded by collectives such as vegetarians. There will be a small space for special agricultures because in the future the conventional agriculture will be the transgenic one.

Concepción: I think that in mid-term coexistence will have to be maintained. In long-term, probably the evolution will make transgenic crops and food to be the conventional form of agriculture. It will depend of consumers' demands and social perception, because there are scientific and social criteria involved, being the later from the very first moments a negative factor for the acceptability of these products. This must be respected because social and ethical criteria are very important too. If this perception doesn't change we will have to maintain coexistence even if it shows not to be the natural evolution.

5. Non-expert knowledge and values: information and participation

Moderator: Ethical criteria are really very important. However, how can we take them into account in the scientific decisions?

Concepción: No, they mustn't be taken into account in the scientific decisions but in the political ones, which must merge scientific and social criteria.

Moderator: Some biotech scientists have talked us about an old project to create an ethical committee which finally was not developed. How could we introduce ethical criteria in decisions? Can CNBV deal with this or does it require a more open debate?

Juan: I think that CNBV is a consultant body, though it could also be used to debate some ethical aspects. It could promote questionnaires for farmers to be a more ethical body.

Concepción: Labelling is a good measure too, because you allow to choose even if the different products are equally safe.

Elisabet: I think that ethical assessments could be done in addition to risk assessments.

Moderator: This is being done in Holland.

Elisabet: I have been assessing applications for Marie Curie grants, and I had to determine if applications had sort of ethical implications, so that if that was the case I could submit the application to an expert panel.

Moderator: Ethical issues also relate to the principle of public information and participation which is addressed in 2001/18 EU Directive. How will it be carried out in Spain?

Juan: It has been carried out for the GMO case yet. There is a web page [Ministry of Environment], though I do not know what its contents are.

Elisabet: But this is only information.

Juan: The web page also allows public intervention, as you can express your opinion there.

Elisabet: I do not trust such pages.

Concepción: The proposal for GM foods & feeding stuffs regulation contains the requirement to inform all member States during the assessment and authorisation process. There will be a scientific assessment made by the European Food Agency which will be delivered to the States in order that governments and public can make allegations during a period of time.

Elisabet: This is an European regulation. However Spain does not have the ability required for this participation. For instance, last year there was a web page to send comments within the Spanish Strategy for Sustainable Development. I sent three comments there which were returned to me because that address did not exist. We need new bureaus for public information and trained personnel to attend them. I do not trust the current web pages. None of you [Juan and Concepción] can be at work answering to information requests because it is not your duty, thus we need trained

people to do it: provide information and answers, and communicate complaints or comments to politicians.

Concepción: Participation is quite new and is still under development.

Moderator: The issue of participation refers to a question from my partners in the Open University: how are value judgements taken into account in decisions? I think that Administration officials make such decisions while there is not public participation.

Juan: It depends of what we consider public and what its representatives are. All social sectors will have representatives in CNBV. Civil society is represented by consumers, and consumers' representative will be provided with full information thanks to CNBV.

Moderator: But consumers participate in preventive issues, while environmentalists participate in the precautionary ones... When we talk about precaution we are referring to sustainability and global scales, thus I do not know if these diffuse interests will be represented in CNBV. I do not know if that person who stated that coexistence was neither possible nor desirable can be represented in CNBV...

Juan: This is very complex. This person can either use the web page or address to some information bureau of the Administration to request for information. This is theoretically possible, though neither people is used to nor Administration is fully prepared.

[End of tape 2]

Moderator: Will the Spanish GMO policy depend of developing these participatory institutions?

Concepción: We can not think of the Spanish policy out of the boundaries of EU regulations.

Juan: There is little Spanish policy for GMO; only subsidiary issues.

Elisabet: However, there are member States with largely developed policies for environmental issues, while Spain is merely transposing Directives. There are countries with more tradition, such as Germany or UK, which make more strict transpositions. Thus we can understand that these countries have their own policy for this topic.

Moderator: What is their own policy depending of?

Elisabet: British civil society has a long tradition, while the Spanish one is quite incipient due to our recent past.

[...]

Moderator: But where are the transgenic crops? You can know this in UK; maybe we will know it in Spain too. But to what extent will Spain provide the different agents with this information?

Juan: In first place, farmers are the first to provide us with this information. Then Administration must collect this information and communicate it. Will Spain inform about transgenic crops location? Yes, it will, though "with great pain for our heart". Why? Because of the precautionary principle. Because this information can be used to target transgenic farmers, whose fields could be burnt. I am not exaggerating because these things have happened. We Administration are in middle of different pressures and have to satisfy everybody trying to avoid harm to anybody. [...] The regulation stipulates that Autonomous Communities must have information about [GM] maize crops location, thus this will be done. This public information has not been subject to secret but has been used to protect farmers.

Elisabet: Maybe these registers should be accessible while their contents must not necessarily be widely published. [...] This allows Administration to know who has been asking for such information.

Concepción: However this information will spread. We can not accuse anybody for any burnt field only because he got information about those fields.

Elisabet: But having those registers does require an effort to get the information, besides not everybody knows of their existence.

Concepción: Certainly, but lay people who agree or do not agree with transgenics will not ask for such information, while the organizations which could fire any field do already know how these procedures work. These registers are not a tool to protect farmers.

Moderator: One of the conclusions we are reaching is that Spanish GMO policy aims for the minimum social conflict.

Juan: I agree with you.

[...]

6. Risk assessment versus need assessment in GMO Spanish policy: product versus process

[discussion on the preliminary documents for the workshop and on the origin of the EU moratorium and its current conflict with US at WTO]

Moderator: So, then what was the key element which lead to the recent approval of GM varieties in Spain? [5 new varieties, April 2003]

Juan: Pressure has been strong from farmers, especially from ASAJA⁵, .. and also that we have now a Agriculture Minister who looks at things differently, who has a different vision.

[...]

Juan: Although these products have not proven to be harmful, some GMO can be imported (such as maize from Argentina) but not grown. This is completely out of logics.

Concepción: This is an outrage.

Moderator: This could be explained by the distinction of risks due to product or due to process.

Juan: It is an outrage from farmers' point of view. For instance I could be a maize farmer in a region where corn borer pest is impressive, and there is a GM variety which could allow me to increase production by 40%. I do not have any other option because it is very difficult to fight corn borer. Besides, GM maize from US could be processed in a nearby factory. This GM variety is a risk for the environment yet, as these are not only due to growing: there are also risks due to transportation.

Elisabet: This relates to risk, but about international trade... This is an import of some product which can not be produced in our country.

Moderator: We have identified at least four different topics which are involved in this discussion. On the one side, people distinguish between product and process assessment of risks. On the other, one also talks of risks assessments and need assessments. Need assessment appears as one of the most recent discussions. For instance, what is this maize which is crop in Spain used for?, is it really necessary?

⁵ Asociación de Jóvenes Agricultores, the most important farmers association in Spain [Young Farmers Association].

Juan: It is used to make feeding stuffs.

Moderator: Feeding stuffs which are mostly used to feed pigs, which are then exported. In Catalonia, for instance, there are 6 million inhabitants and 10 million pigs. Do we really need to have so many pigs? Some social pressure want to move political evaluations from simply risk assessment to need assessment. How do you feel about taking into account need assessment into GMOs decisions?

Concepción: We should also move beyond current risk assessment to make compared risk assessments. What is worse for the environment, transgenic cotton crops or non-transgenic cotton crops which require large amounts of pesticide (harmful for the environment and for farmers) to be used?

Moderator: But cotton has also large water requirements and provokes soil erosion. To what extent do we need to grow cotton in regions where it is not adapted, such as the southern part of Spain?

Elisabet: GMO promoters say that these products do increase productivity. However EU has serious problems with overproduction.

Juan: Let me talk of another topic within this context: soy. Have you heard of many things about soy? No. However we are importing large amounts of it, all transgenic. Why? Because there is not any substitutive product. Soy is a basic flour which has not been banned because it does not have any substitutive product.

Moderator: Hence necessity would be dependent of the possibility to get substitutive products.

Concepción: It depends of the economic interests too.

Moderator: But economic interests are not needs. Gandhi said that we can satisfy worlds' needs but not worlds' greed.

Concepción: If there were substitutes for soy there would be economic pressures behind the transgenic soy imports.

Moderator: Do you think it would be interesting to introduce need assessment in Spain? Is it possible?

Juan: Well... yes.

Concepción: I think so. Planning is always positive.

Elisabet: Another debate referred to agriculture is that of the National Hydrological Plan. To what extent is it necessary to have more water in Southern Spain if then this will drive to conflicts with the increasing amount of immigrants who are going to work in the fields;. There is also overproduction. And excessive tourism: the seaside by Valencia is ruined because of tourism resorts. Needs have to be assessed and should lead us to planning. [...]

Concepción: I think that needs relate to ethical questions: why do we bear with risks if there is not any need?

Moderator: Risk depends of need perception. We are currently making risk assessments within a needs context determined by the market.

[...]

Moderator: Thanks to everybody for your participation.