

Comments on the report:

**Maize biodiversity:
The effects of Transgenic Maize in Mexico**

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GENERAL COMMENTS.

Given the scope of the recommendations that may arise from the report, and considering that the repercussions of certain measures may be felt far beyond the environmental sector, as well as the intersectoral nature of the phenomenon under analysis, and in order that all recommendations may be implemented efficiently, they should be submitted not only to the environment ministers but also to the Secretaries of Agriculture, Health, Economy, Education, Social Development and Finance [in Mexico], and to their US and Canadian counterparts.

It is highly important that all chapters be available in the three languages. Given that the persons who first filed the suit are mostly indigenous organizations, all chapters should be available in Spanish in order for them to have access to the report.

It should be ensured that the summaries presented for each chapter be consistent with the respective chapter's text. In some cases the summary does not correspond to the chapter text; this is understandable as in most cases the summaries were submitted before the full text was prepared. However, their congruence must now be sought, either by correcting the summary or by adding the chapter's complementary information.

As a result of this lack of consistency between the summary and content of the chapters, it also appears that some authors refer to the contents of other chapters that again do not correspond to the [present] text.

Most of the chapters lack bibliographical references, both for specific data without providing citations, and also for quotations in the text for which no reference is cited at the end of the chapter. This lack detracts from the formality of the chapter text and limits its use and service, and therefore it is very important to correct it.

During the Oaxaca conference, there was a perception that Chapter 10 dealt with a summary or conclusion for the other chapters. It should be made clear that this is one more chapter on a particular topic, and as such does not deal with the conclusions for the rest of the report.

We suggest that the cultural aspects relating to maize be covered in more detail, as none of the chapters deals properly with the religious, symbolic or culinary aspects of maize. Consideration of these and other cultural aspects may allow for an improved perception of maize by small growers and Mexican consumers.

The order of chapters makes overall comprehension difficult. The order proposed by Larson and Chauvet (Chapter 9) is more logical and facilitates chapter comprehension. Thus, it would be appropriate to change the order in the final draft.

SPECIFIC COMMENTS

CHAPTER 1

All information in the first part of this chapter, from the origin of maize to the section on erosion of the germplasm of maize and its wild relatives, is clear and well-founded. However, this contrasts with the text and contents, starting with the section on the presence of transgenic maize in Mexico through the end of the document, which is confusing and lacking foundation.

Following are some relevant comments, mostly on the second part of the document. In the second paragraph of [the text on] page one it is important to clarify that Mexico's imports of transgenic maize are for food or feed and processing, and furthermore the *de facto* moratorium imposed applied only to the environmental release of genetically

modified (GM) maize for experimental purposes, as the environmental release for commercial purposes has yet to be regulated.

In the list of factors causing genetic erosion, not all numerals correspond to different causal factors but rather to different examples of the same factor, namely the substitution of landrace maize varieties with crops that may provide an economic advantage.

Starting at the heading on page 18 ["Presence of transgenic maize in Mexico"], where the report seeks to narrate a series of events about the presence of transgenic maize in Mexico, many references are incorrectly cited and do not appear at the end of the chapter.

It is not clear whether the first paragraph following the heading on page 18 refers to the entry of transgenic maize into Mexico from the transboundary movement of commodities or its intentional release into the environment.

The text states that the importation of transgenic maize was not regulated, and that presently it remains unregulated [page 19, second paragraph]. This assertion is incorrect, as from the September 2003 entry into force of the Cartagena Protocol—of which Mexico forms part—the transboundary movement of living modified organism commodities are regulated, precisely under the Protocol.

The types of seeds produced by biotechnology companies mention "resistance" to herbicides in addition to resistance to insects [page 19, fourth paragraph]. We suggest that this be changed to the appropriate, commonly used term of "tolerance" to herbicides.

On several occasions the text uses the term "deregulated," but as there is no legal concept in Mexico associated with "deregulation" of crops it is important to clarify to what such term refers—whether GM maize does not require notices, permits or authorizations for planting, movement, storage, use and consumption, or for only some of these activities.

We suggest that the authors take into account [in their revision] the new policies of DICONSA, which is the government agency responsible for bringing low-cost food to Mexico's poor regions. Due to the problems in Oaxaca, this state-run agency apparently has restricted the acquisition of maize, for storage and subsequent distribution, only to domestic production, and no longer buys imported maize.

Last, we consider that the inclusion of “alternatives” requiring the government’s yes/no response [beginning on page 21] is an oversimplification of the complex phenomenon we face, and adds no relevant information worthy of serious treatment.

CHAPTER 2

This chapter considers theoretical elements of risk analysis, and represents an appropriate introduction to Chapter 8. However, some paragraphs should be modified or deleted because they represent value judgments mixed into paragraphs that describe “true” facts or events but that do not necessarily apply in the case of Mexico. Furthermore, we believe that this chapter involves a subjective analysis of the potential consequences of the presence of transgenics in Mexico, which is not the purpose of this document.

The Latin name of the bacteria used to introduce nucleotide sequences should be corrected to *Agrobacterium tumefaciens*. Section 2.3 is repeated twice in the chapter numbering, on two different topics.

The fact should be considered that to a great extent the application of farm technology, which has worked in developed countries for high-input growers, will not necessarily work in developing countries for subsistence agriculture, which mostly takes place in highly diverse environments with marginal physical or socioeconomic conditions. For example, the International Center for Agricultural Research in the Dry Areas (ICARDA¹) questions conventional improvement and for years has been implementing a new policy of improvement, called participation and decentralization. This system involves grower participation and the use of hybrid-breed and local varieties. These kinds of experiences in Mexico are mentioned in Chapter 9 of the report.

Section 2.6 [beginning on page 12], under the topic “Socioeconomic risks,” states that food production by small subsistence farmers has a considerable risk component. This is followed by a series of reasons why crop damage may have both economic and environmental consequences, and ends by emphasizing that such problems are faced by independent growers whether or not they have GM crops. However, the section does not clarify that this type of risk is also faced by high-

¹ ICARDA. *Farmer participation and use of local knowledge in breeding barley for specific adaptation*. Final Report. GTZ Project No 95.7860.0-001.13. February 2001.

input farmers in the United States and Canada, perhaps even to a greater extent than low-input farmers because low-input growers often diversify their crops.

It is also important to distinguish the types of economic risks faced by large businesses that make informed decisions whether or not to invest in a given technology, from the economic risks of small farmers facing a type of technology they opted not to use and for which information is lacking.

Lastly, we believe that the comparison of risks and benefits is inappropriate. Risks are identified and levels of exposure and damage are estimated, where quantification and analysis are not monetary. To a large extent it is preventive, as risk management and mitigation strategies are based on the risk analysis. In contrast, an analysis of the benefits also implies a cost analysis, and this type of cost-benefit analysis is monetary.

We believe it is important to put the benefits of biotechnological farming in context, recognizing that no one technology solves all problems (see http://www.cimmyt.org/whatisimmyt/Transgenic/Iwanaga_051202.htm). It should also be recognized that the use of different agricultural alternatives should be decided as a function of the types of problems and characteristics of the application of the systems themselves.

With respect to pesticide reduction being one of the positive impacts of GM crops that offer resistance to certain pests, we believe that this assertion is premature because in many cases the elimination of a pest will open an ecological niche for another. Such a later pest will limit the aforementioned benefit and would be a common occurrence in megadiverse environments—and pests—such as in the case of Mexico.

CHAPTER 3: Assessment of Effects on Genetic Diversity

This chapter deals primarily with the effects of gene flows on the genetic diversity of maize. It mentions different studies that could be undertaken, and provides the following recommendations, the comments on which follow.

Although the chapter states or can be understood as saying that the matter of maize is complicated and the studies that have been done in other countries, such as the United States, are insufficient or cannot be extrapolated for countries such as Mexico it does not state specifically in the case of maize that studies are required before transgenic maize is intentionally released in Mexico. In this regard, one recommendation could be to permit experimentation with transgenic maize, to try to obtain answers to Mexico's specific problems. In this respect, we would add the following to the final recommendations:

- As the diversity and taxa of teosinte are unknown, it would be advisable to estimate such diversity and the gene flow rates.
- The presence of F1 hybrids among maize and teosinte is recognized, but studies are needed on what happens with the subsequent generations of hybrids, in particular to determine whether there is any introgression. Detailed, specific studies are required to know if any introgression exists.
- It is necessary to perform studies on the stability of the transgene when inserted into new genetic contexts, and how it would affect individuals.

Page 14, paragraph 2 discusses the effects on genetic diversity from the introduction of a transgene for individuals with high levels of heterozygosity and effective recombination. It says that the genome region linked with the transgene may be very small, and therefore the region that may be affected by selection and present a decrease in diversity as a result of selection may be very small, when compared to maize's overall genome. However, if these individuals show better adequateness and there is sufficient migration of the transgene, there could be a displacement of individuals not having this modification, along with the rest of the genetic diversity they contain.

CHAPTER 4

This chapter is well-developed with current information properly focused on the topic being analyzed. It could be improved by presenting the specific data from studies performed in other countries, principally Canada and the United States, on the effects of transgenic crops on natural ecosystems, focusing on aspects of population ecology. In this regard, we believe it is important to include studies performed in Mexico, in an analysis of this kind of information.

CHAPTER 5

This chapter is an essential part of the report. It gives true importance to the reasons why there are problems from the loss of maize biodiversity in Mexico, and suggests that the intelligent use of technology might even solve part of the essential problems under which Mexico is losing diversity in its landrace breeds.

The authors further recommend, correctly, that if GMOs represented a real threat, the solution would be to strengthen germplasm banks and maintain and develop appropriate genetic improvement programs.

They should clarify the legal liabilities in the case where transgenics appear in landrace maize.

The chapter is clear and provides well-founded information with respect to the fact that if there were a national will, Mexico could be maize self-sufficient.

CHAPTER 6

There are three groups of growers considered in the chapter's context: noncommercial, semi-commercial and commercial producers. However, Mexico has documented more than 100 ways to produce maize, and therefore it seems to us that this view reduces the forms of production to a minimum. While the chapter perhaps does not deal exclusively with a single topic, we suggest it be broadened, as it is covered only very briefly on page 4. This is an important component to consider for the analysis of the social and cultural effects of the production of transgenic maize.

It would be appropriate to differentiate, from the figure of total tons imported, how many are yellow maize and how many are white maize, as well as in the reference made to the distribution of Mexican production for the different maize uses ([last paragraph,] page 7).

The authors' mention of how maize is regarded as a commodity in the United States is very important with respect to Mexico, emphasizing the fact that US production for human consumption is minimal. This should be considered not only in this chapter, but rather be taken into account in the recommendations.

We suggest that the topic of subsidies be covered in greater detail and with more emphasis on the difference between US and Mexican subsidies, also recognizing the fact that US subsidies are for producers while Mexican subsidies are for production (Section I.B.2.a).

We suggest that the cultural aspects be covered in more detail. In fact, as we mentioned in the general comments, none of the chapters deals specifically with the religious or culinary aspects of maize. In this case, Section I.C.1. refers to cultural aspects, but very briefly and without any reference to the different uses of maize associated with the different varieties. However, on page 23, paragraph 7 of Section I.C.3., "Use of new technology," very superficially mentions that *"improved maize [varieties] is [sic: are] limited because they are developed for tortillas but not for other uses, such as pozole (hominy soup). Traditional varieties are kept for these uses..."* It is **VERY** important to recognize the cultural aspects associated with maize; if a specific chapter on them has not been considered, this could be one of the more appropriate chapters to do so.

The second paragraph of section I.C.6 [found on page 27], states that *"gene insertion has not produced plants that are substantively different from plants produced by conventional breeding methods..."* We believe it is dangerous to use this type of assertion without having a serious reference, because it may give the wrong impression that a transgenic is the same as a plant produced by conventional handling. Furthermore, this assertion brings us to discuss the term "substantial equivalence," which has been used on products and byproducts (food) produced from GMOs. But in biological terms, and in reference to a whole living organism, it is not appropriate to use the term "substantial equivalence." A Bt maize plant expresses a bacteria protein and this differentiates it from a maize plant improved by traditional methods. Phenotypically the plants may seem the same, but this is not enough to call them "substantially equivalent." Lastly, generalizations should not be made, as the biotechnological application is far from reaching its limits.

It is important to consider the fact that, given the diversity of producers, ecosystems and farm practices in Mexico, it is necessary to undertake multidisciplinary studies by region to assess the socioeconomic impacts of the introduction of transgenic maize, considering the CEC recommendations to the three governments.

CHAPTER 7

There should be emphasis on the need to perform studies on the innocuity and allergenicity of GM-maize based foods in the context of the actual Mexican diet. The needed subdivisions, *i.e.*, rural and urban diets, also should be considered, given that maize portions—in proportion to total food and level of processing—is not the same in both sectors. The precautionary principle should be applied even where there are no scientific reports in the United States or Canada on the toxicity and/or allergenicity derived from maize consumption. In this sense, the chapter succeeds at differentiating the consumption patterns of the Mexican diet.

The statement made by Héctor Bourges, that maize and Mexican gastronomy are regarded as patrimony of humanity and as such should be respected, conserved and promoted by the Mexican government, should be emphasized.

We highlight the need for a chapter that truly deals with the religious and cultural components in the discussion of transgenic maize in Mexico. After the public declarations made in Oaxaca during the symposium and other statements, it is imperative to consult with a specialist on the topic (such as historians, anthropologists, philosophers, etc.). The ethical, moral and religious discussion should not be a loose end, and as mentioned, it will help our trade partners to understand the negative response and uncertainty of some sectors of Mexican society.

Although Dr. Lehrer says that the Cry9c protein is not allergenic based on the available scientific information, there are studies (Gálvez, Quirasco, Plascencia and Fagan, 2004) indicating that the protein Cry9c may be detected by antibodies even after having been subjected to the process of milling, cooking and frying. Thus, there should be more care in analyzing the food risk, not taking for granted that there is no allergenic risk associated with GMOs. This point is fully based on the precautionary principle.

CHAPTER 8

Following are some of the points in this chapter that we believe should be pointed out and taken into account for the recommendations:

It is necessary for all interested parties (farmers, peasants, businesses) to be involved from the start of the decision-making

process, so as to facilitate the communication of the different aspects of the different aspects or dimensions of risk that they may or may not assume, with the necessary awareness.

Peasant practices deviate considerably from the goals of commercial agriculture. Transgenics that peasants would be willing to test would be those that offer them a clear benefit.

It is important to keep in mind that the relationship between a transgene and the characteristic it is to express has much less control and more uncertainty in the conditions under which peasants manage maize. When a transgene is under such handling, and under greater stress or with a greater environmental variability, natural selection plays a major role as well. This emphasizes the need for detailed studies on the possible effects of introgression of transgenes into landrace maize populations under traditional management in Mexico.

It is important to take the cultural meaning of maize into account. Maize has a meaning for peasants beyond being a product produced for profit, and this meaning adds another dimension to the perception of risk of introgression of transgenes into local maize populations. While this is mentioned in the chapter, it should be stressed in the final recommendations.

CHAPTER 9

It is important that this chapter in particular be available in Spanish, and that it include the word-for-word comments of the attendees at the organized workshops.

Since it has been said that maize has a strong religious component, a specific report should be included on this topic, stressing its importance (*e.g.*, referring to the case of New Zealand). This would help to clarify the answers to many questions raised by the public with respect to transgenic maize in Mexico.

This chapter makes clear that a comprehensive response is expected of the Mexican government, not only from the Environment Secretary, but a clear policy involving the Secretariats of Agriculture, Health and Environment, of course the Education Secretariat and even what used to be the National Indigenous Institute (*Instituto Nacional Indigenista*). The community response and questions may set the basis for a more comprehensive Mexican government policy.

The recommendations should stress the real need for communication, inclusion and respect for the communities involved in the planting, conservation and use of native maize. This implies a greater commitment from the responsible government agencies.

CHAPTER 10

A small introduction is needed on the chapter's objectives, the aspects to be covered, etc. As all chapters have an introduction, this changes the approach of the chapters in the report.

This chapter appears to be a text written some time ago and which has not been updated. For example, it has data such as the reference to the National Agricultural Biosafety Committee (*Comité Nacional de Bioseguridad Agrícola—CNAB*)—now the the Specialized Agricultural Subcommittee (*Subcomité Especializado de Agricultura*)—which has not existed for several years. Another example is the reference to the General Bureau of Plant Health (*Dirección General de Sanidad Vegetal*), which is no longer so named. It is also necessary to update the number of existing ratification instruments for the Cartagena Protocol (90, as of 6 April).

In the last paragraph of the first section, when it states that there are national programs applying GM technology to solve specific programs in Mexican and Brazilian communities, it should give some examples, especially for Mexico.

In several instances this chapter makes assertions that are not founded or documented and therefore may appear biased, such as the statement that "*Most of the current GM maize applications available to growers in US would be welcomed by framers in Mexico*" (page 3, Section III, first paragraph).

When it states that there are two positions on whether the gene flow to wild varieties is a low-risk topic versus other authors who argue that it is necessary to take more notice, it would be advisable to state the arguments (or least expand on this point) supporting each position [Section III, third paragraph].

The fourth paragraph of Section III (page 3) oversimplifies population genetics and the behavior of genes within populations. It is not so

simple; in fact, there are several studies and references in this regard (Norman Ellstrand has written many), and therefore we suggest it not be taken so lightly.

Throughout the chapter, talk of gene flows refers to the possibility that this exists between GM crops, landrace varieties and wild relatives, although it does not consider that non-GM maize crops that are not landraces", such as improved hybrids, which could in fact arise.

Section III states that the introduction of transgenes in an open pollination system, in particular those subject to farm practices promoting extensive seed exchange, inevitably will lead to the dispersion of transgenes among crops, with the future impossibility of returning to their original state (page 4). However, other sections later mention the possibility of returning to their original state (page 5 and [Section VIII, sixth paragraph] on page 16), which is contradictory.

In Section IV, the author mentions that to prepare the management strategies, the possible risks should be defined and it should be begin with a series of questions to answer. Four questions are raised on page 5, although they are not readdressed. We believe it is very important to develop these questions in the chapter, as it appears that the chapter is more focused on a review of policy tools more than on a series of guidelines for the development risk management strategies.

Section V asserts that the transgenes found in Oaxaca are not the product of gene flows but rather from the use of seeds that "somehow" came to rural communities. We find this to be unobjective, since while seeds could be brought into the country by Mexican migrants, it is a fact—and a possibility that has not been disproved—that the introduction could have occurred by reason of the planting of US maize imported to Mexico, not identified as transgenic.

With respect to the mention of the "substantial increase" in price due to maize segregation, we believe that unless there are figures from an *ex professo* study on imports to Mexico, such increase should not be qualified. In fact, an international discussion recognized by the International Grain Trade Coalition itself finds that no one is sure how much such a price increase would be, since it has been qualified but not quantified. Thus, it has been proposed that it is necessary to perform studies to estimate such costs.

As regards PIC under the Cartagena Protocol, there should be a distinction that not all transboundary movements of LMOs are under

this procedure, whereas the second paragraph of page 7 seems to state that they are. While later statements say something about commodities, the difference between LMOs for which PIC is or is not applied is not very clear for people not involved in the Cartagena Protocol.

The fifth paragraph on page 7 states that *“Under the Protocol, a 2-year process was established through which further documentation requirements will be considered.”* However, to be specific, it should mention that this is two years after the entry into force of the Cartagena Protocol, which represents a very clear date, namely September 11, 2005.

We believe the chapter devotes too much space to the section on development and national implementation of biosafety systems (page 8), when other matters such as the questions mentioned on page 5 are not covered at all.

In the section *“The national biosafety system in Mexico”*, there seems to be a contradiction between paragraphs 2 and 3 on page 13. First it states that the standard NOM-056-FITO-1995 establishes the requirements for field testing, and then it mentions which products are approved for commercial planting. This should be clarified.

The last paragraph [of Section VI] makes reference to the Biosafety Law (*Ley de Bioseguridad*), specifically the identification of “restricted zones” for the release of GMOs, and mentions the centers of origin and protected areas. However, the correct reference is to “centers of origin and genetic diversity” and “protected nature areas.”

CONCLUSION

A system of participatory improvement for maize in Mexico would be consistent with the open and dynamic system of small peasant farmers described by Bellon & Berthaud (2004, as referenced in Chapter 8) and Louette & Smale (2000, as referenced in Chapter 8).

The Secretariat of Agriculture, Stockbreeding, Rural Development, Fisheries and Food (*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación—SAGARPA*), through the National Institute of Forestry, Agricultural and Livestock Research (*Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias—INIFAP*), should

have a policy promoting agriculture with a participatory improvement to sustainably achieve increased yields. In addition, it would be the best time to justify a higher budget with lines of research into maize improvement, extensionism—which has been lacking for some time—and justifying a policy aimed at maize self-sufficiency and the consequent reduction of transgenic maize imports.