Estado Plurinacional de Bolivia

MMAyA Ministerio de Medio Ambiente y Agua

Bolivian Position on Socioeconomic Considerations In the Context of the Cartagena Protocol on Biosafety

February, 2011

I Summary of Socioeconomic Concerns Related to Living Modified Organisms

The Plurinational State of Bolivia recognizes the multiple and intertwined ecological and socioeconomic interactions that occur along the life cycle of living modified organisms (LMOs). This is the particular case of agricultural crops and, more recently, genetically modified mosquitoes in terms of their potential adverse effects on biological diversity and long-term social welfare.

Based on the current knowledge, including the published literature and narratives, the Plurinational State of Bolivia recognizes that changes in biodiversity and ecosystems caused by LMOs are linked to pressing socioeconomic (SE) concerns. These changes with SE implications can be summarized in the following:

- ***Increased weediness*** in the wild or agricultural lands resulting from development of herbicide tolerant weeds or volunteers crops (in the case of herbicide tolerant crops)[1, 2]

- ***Unforeseen adverse effects on non-target organisms*** important to maintain the equilibrium among insect populations[3,4], the natural pollination dynamics[5], and soil biology[6,7] (in the case of insect resistant crops, e.g. *Bt* crops).

1 Martinez-Ghersa, M.A., C.A. Worster & S.R. Radosevich, 2003. Concerns a weed scientist might have about herbicide-tolerant crops: A revisitation. *Weed Technol* 17: 202–210.

2 Clark, A. (2006). Environmental risk of genetic engineering. *Euphytica* 148: 47–60.

3 Hilbeck A. 2002. Transgenic host plant resistance and non-target effects. In Genetically Engineered Organisms. Assessing Environmental and Human Health Effects. D.K. Letourneau, B.E. Burrows, eds. (Boca Raton, CRC Press), pp. 167-185.

4 Schmidt J.E.; Braun C.U.; Whitehouse L.P.; Hilbeck A. (2009). Effects of Activated Bt Transgene Products (Cry1Ab, Cry3Bb) on Immature Stages of the Ladybird Adalia bipunctata in Laboratory Ecotoxicity Testing. *Arch Environ Contam Toxicol* 56:221–228.

5 Ramirez-Romero R.; Desneux N.; Decourtye A.; Chaffiol A.; Pham-Delègue M.H. (2008). Does Cry1Ab protein affect learning performances of the honey bee Apis mellifera L. (Hymenoptera, Apidae)? *Ecotoxicol Environ Saf*. 70:327-33.

6 Stotzky G. (2004). Persistence and biological activity in soil of the insecticidal proteins from Bacillus thuringiensis, especially from transgenic plants. *Plant Soil* 266: 77–89.

7 Castaldini, M., Turrini, A., Sbrana, C., Benedetti, A., Marchionni, M., Mocali, S., Fabiani, A., Landi, S., Santomassimo, F., Pietrangeli, B., Nuti, M. P., Miclaus, N., & Giovannetti, M. (2005). Impact of Bt corn on rhizospheric and soil eubacterial communities and on beneficial symbiosis in experimental microcosms. *Appl. Environ. Microbiol*. 71: 6719–29.

- ***Potential population replacement*** (in the case of *Bt* crops and LM mosquitoes) resulting in the emergence of new pests or potential of niche replacement of disease vectors, requiring new (phyto)sanitary measures[8].

- ***Contamination of wild and agricultural biological diversity*** due to natural and anthropogenic gene flow[9,10, 11].

- ***Introduction of novel foods in the food web and with potential adverse health effects in* wild fauna, farm animals as well as to human beings**. This based on findings from studies in small mammals (e.g. Dona and Arvonitoyannis, 2009[12]; Domingo, 2007[13]; Malatesta et al., 2008[14]) and the capacity of persistence of LMO by-products along the gastrointestinal track[15] and high processing[16].

To these changes in biodiversity and ecosystems should be added the changes related to the production systems on which LMOs rely on (particularly agricultural LMOs). These are:

- ***Decrease in agricultural biodiversity*** due to: i) R&D of agricultural LMOs that focuses in few profitable crops to secure returns on investment on R&D of LMOs[17] and ii) production of LMOs in industrial production systems, meaning large-scale monocrops. This contributes to accelerate the decrease in number of farmed crops and varieties, resulting in genetic homogeneity in large agricultural regions[18].

- ***Bioaccumulation of toxic substances*** from the increased application of agrochemicals (in the case of herbicide tolerant crops)[19] or permanent presence of pesticides (in the case of Bt crops).

- ***Habitat destruction***, particularly forests due to the expansion of cultivated areas with agricultural LMOs[20].

From the Bolivian perspective, these changes in biodiversity and ecosystems are related to a series of potential adverse effects on rural livelihood, public health and food sovereignty, which can be summarized (but not restricted to) by the following:

---

8 Then, C. (2010). New pest in crop caused by large scale cultivation of Bt corn. *In Large-area Effects of GM-Crop Cultivation. Theorie in der Ökologie* 16, B. Breckling and R. Verhoeven, eds. (Frankfurt, Peter Lang), pp. 94-97.

9 Dyer, G.A.; Serratos-Hernández, J.A.; Perales, H.R; Gepts, P., Pineyro-Nelson, A.; Chávez, A.; Salinas-Arreortua, N.; Yu´nez-Naude, A.; Taylor, J.E.; Alvarez- Buylla, E.R. (2009). Dispersal of Transgenes through Maize Seed Systems in Mexico*. PLoS ONE 4(5):* e5734. doi:10.1371/journal.pone.0005734

10 Ellstrand, N. (2003). Current knowledge of gene flow in plants: implications for transgene flow. *Phil. Trans.R. Soc. Lond. B* 358:1163-1170.

11 Idem as 2

12 Dona, A,; Arvanitoyannis, I. 2009. Health Risks of Genetically Modified Foods. *Critical Reviews in Food Science and Nutrition,* 49:164–175

13 Domingo, J. 2007.Toxicity Studies of Genetically Modified Plants: A Review of the Published Literature*. Critical Reviews in Food Science and Nutrition,* 47:721–733*.*

14 Malatesta, M.; Boraldi, F.; Annovi, G.; Baldelli, B.; Battistelli, S.; Biggiogera, M.; Quaglino D.(2008). A long-term study on female mice fed on a genetically modified soybean: effects on liver ageing. *Histochem Cell Biol.* 130:967–977.

15 Schubbert, R.; Renz, D.; Schmitz B.; Doerfler, W. (1997). Foreign (M13) DNA ingested by mice reaches peripheral leukocytes, spleen, and liver via the intestinal wall mucosa and can be covalently linked to mouse DNA. *Proc. Natl. Acad. Sci*. 94:961–966.

16 Agodi, A.; Barchitta, M.; Grillo, A.; Sciacca. A. (2006). Detection of genetically modified DNA sequences in milk from The Italian market Int. J. Hyg. Environ. Health 209: 81–88.

17 Pray C., Naseem A. (2007). Supplying Crop Biotechnology to the Poor: Opportunities and Constraints. *Journal of Development Studies* 43(1) 192–217.

18 Mascarenhas, M., Busch, L. (2006). Seeds of Change: Intellectual Property Rights, Genetically Modified Soybeans and Seed Saving in the United States. *Soc. Ruralis* 46,122-138.

19 Vila-Aiub M., Vidal, R., Balbi M., Gundel P., Trucco F., Ghersa, C. (2008). Glyphosate- resistant weeds of South American cropping systems: an overview. *Pest Management Science* 64:366–371.

20 Pengue, W. 2004. Environmental and socio economic impacts of transgenic crops in Argentina and South America: An ecological economics approach. In *Risk Hazard Damage. Specification of Criteria to Assess Environmental Impact of Genetically Modified Organisms.* B. Breckling and R. Verhoeven eds. (Bonn, Federal Agency of Nature Conservation), pp. 49-59.

- ***Impacts on access to, tenure and use of natural resources key to production and sustainable livelihoods***. This is the case of restrictions on the free use of seeds and the process of land marginalization. The commercialization of most LMOs relies strongly on intellectual property rights (IPRs), most commonly patents, to secure profits[21]. First and foremost, patents on seeds deteriorate the fundamental farmers´ right to save and exchange seeds and improve local varieties[22]. Second, seeds are central for social stability since they are assets for knowledge generation and economic self-reliance. Consequently, restrictions on free access to seeds may lead to rural communities erosion[23]. In relation to land marginalization, the trend of land concentration and expansion of the agricultural frontier (mostly by deforestation) geared by the pressure on the expansion of area cultivated with agricultural LMOs is contributing to the exclusion and expulsion of small-scale and subsistence farmers to lands that are unsuitable for or unfeasible to agricultural production. This has resulted in cases of rural and indigenous migration to urban centers[24].

- ***Emergence of new economic risks***. Introduction of LMOs does not inherently mean higher yields since LMOs are not developed to yield more[25]. In addition, the accumulated experience on production of agricultural LMOs show that related changes in biodiversity (e.g. increased weediness, pest replacement, deterioration of soil, development of pesticide resistance, etc.) result in higher production costs, reducing net incomes[26],[27]. Finally, contamination of non-genetically modified production results in loss of differentiated market opportunities [28], [29], [30], [31] and financial liabilities due to infringement of IPRs[32].

- ***Impacts on community welfare***. Resulting from diverse causes such as conflict between farmers when production of LMOs adversely affect non-adopters this technology, decrease in social equity between rich and poor farmers due to impaired access and distribution of benefits from LMO production, erosion of knowledge on local biodiversity linked to the legal excludability of LMOs, decrease in job opportunities since most agricultural LMOs rely on highly mechanized production systems, weakening of self-determination due to restriction on farmers and

21 Heinemann, J.A. (2009). Hope not Hype. The future of agriculture as guided by the International Assessment of Agricultural Knowledge, Science and Technology for Development (Penang, TWN), p. 160.

22 IAASTD (International Assessment of Agricultural Knowledge Science and Technology for Development), ed. (2009). Agriculture at Crossroad. Synthesis Report (Washington D.C., Island Press), p. 94.

23 Fransen, L.; La Vina. A.; Dayrit, F.; Gatlabayan, L.; Santosa, D.A.; Adiwibowo, S. (2005). Integrating Socio-Economic Considerations into Biosafety Decisions. The Role of Public Participation. (Washington, WRI), pp47.

24 Palau, T.; Cabello, D.; Maeyens, A.; Rulli, J.; Segovia, D. (2007). Los refugiados del modelo agroexportador. Impactos del monocultivo de la soya en comunidades campesinas de Paraguay (Asunción, BASE-Is), pp. 363.

25 Idem as 21.

26 Idem as 20.

27 Van Acker, P. C., Brule-Babel, A.L., Friesen, L.F. (2004). Intraspecific gene movement can create environmental risk: The example of Roundup Ready® wheat in Western Canada. In *Risk Hazard Damage. Specification of Criteria to Assess Environmental Impact of Genetically Modified Organisms*. B. Breckling and R. Verhoeven eds. (Bonn, Federal Agency of Nature Conservation), pp. 37-47.

28 Barkman J., Thiel M., Theuvsen L., Eschenbach C., Windhorst W., Marggraf R. (2010). GM maize and oil seed rape in Germany: Economic welfare losses from large-scale adoption scenarios. In *Large-area Effects of GM-Crop Cultivation*. Theorie in der Ökologie 16, B. Breckling and R. Verhoeven, eds. (Frankfurt, Peter Lang), pp. 21-27.

29 Schmidt, G., Breckling, B. (2010). The Triffid case: A short résumé on the re-discovery of a de-resgistered GMO. In *Large-area Effects of GM-Crop Cultivation. Theorie in der Ökologie* 16, B. Breckling and R. Verhoeven, eds. (Frankfurt, Peter Lang), pp. 79-81.

30 Hewlett, K.L, Azeez G.S.E. 2008. The Economic Impacts of GM Contamination Incidents on the Organic Sector. http://orgprints.org/view/projects/conference.html.

31 Vermij P. (2006). Liberty Link rice raises specter of tightened regulations. *Nature Biotechnology* 24, 1301 – 1302.

32 Idem as 21.

consumers choice, among others, leading to the overall medium and long-term weakening of community welfare [33], [34], [35], [36].

In addition to these reported SE implications related to LMOs, for the Plurinational State of Bolivia of special concern are the following issues:

- ***Potential eco-social impacts in mega-diverse countries and centers of origin and diversification***, such as Bolivia. These potential SE adverse effects are related to the conservation and sustainable use of biodiversity and the consequent impacts on traditional and subsistence farming systems, local varieties improvement and *in-situ* conservation. Also, to local and indigenous communities whose food security and sovereignty depend on the local biodiversity, local crops land races and related knowledge, and non-monetary economic dynamics of native crops (e.g. potato, maize, Andean tubers and grains), among others[37].

- ***Current gaps of knowledge and uncertainties on the safety of LMOs and potential impact on public health***. This includes LMOs intended for food, feed and processing, nutritionally enhanced plants, pharmaceutical-based plants and GM mosquitos to control vectors of diseases. Under the Bolivian perspective, there exist several unanswered questions on the safety of LMO-based food, feed and derivatives[38],[39],[40]. Moreover, the chemicals associated with the production of LMOs have proved highly risky to animal and human health[41], [42]. These concerns are of particularly importance to the socioeconomic context of Bolivia, where the proportion of undernourished population is still significant and gastrointestinal disorders are common.

- ***SE impacts on non-adopters of LMOs***, ranging from individuals (e.g. farmers who decide not to produce agricultural LMOs) to sectors (e.g. non-LMO production clusters and markets, particularly the organic farming sector)[43], and communities (e.g. indigenous communities that prefer to implement GMO-free regions). In the Bolivian perspective, illegal introductions, lack of traceability and labeling schemes, and lack of awareness on the presence of LMOs contribute to increased potential SE impacts on non-adopters of LMOs.

- ***Ethical concerns related to the promotion of LMOs as part of a strategy to eradicate hunger, decrease poverty and improve health***. The Plurinational State of Bolivia recognizes that these global socioeconomic problems are rooted in economic and political issues far beyond the application of specific technologies.

---

33 Binimelis, R. (2008). Coexistence of Plants and Coexistence of Farmers: Is an Individual Choice Possible? *Journal of Agricultural and Environmental Ethics 21:437-457.*

34 Idem as 23.

35 Idem as 20.

36 Idem as 24.

37 Catacora, G. (2006). Papa transgénica en el centro de origen: Riesgos e implicaciones. Gaceta Oficial del Parlamento Andino. Año 3 Nro. 012. Bogotá.

38 Schubert, D. (2008). The Problem with Nutritionally Enhanced Plants. *J. Med Food* 11 (4): 601–605

39 Idem as 12.

40 Idem as 13.

41 Benachour N., Séralini G.E. (2009). Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic and placental cells. *Chem Res Toxicol* 22:97-105.

42 Séralini, G.E.; Vendômois, J.S.; Cellier, D.; Sultan, C.; Buiatti, M., *Gallagher, L.; Antoniou, M.; Dronamraju, K.R. (2009). How* subchronic and chronic health effects can be neglected for GMOs*,* pesticides or chemicals*. Int J Biol Sci*. 5:438-43 3.

43 Catacora G. (2007). Soya en Bolivia: Producción de oleaginosas y dependencia. En *Repúblicas unidas de la soja. Realidades sobre la producción de soja en América del Sur*. J. Rulli (Ed.). (Asunción, BASE-IS).

Accordingly, the promotion of LMOs under unfeasible SE promises is completely unethical.

Under this context, the ultimate concern of the Plurinational State of Bolivia in relation to SE considerations of LMOs is their high potential to negatively impact food and health sovereignty, particularly of peasant and indigenous communities.

II Gaps of knowledge and capacity building needs

The Plurinational State of Bolivia urges the inclusion of socioeconomic considerations (SEC) in national and international biosafety decision-making by transparent, participatory and interdisciplinary approaches in light of:

i) *The objective and scope of the CPB* (Articles 1 and 4, respectively), in relation to the need for safe transfer, handling and use of LMOs to prevent adverse effects on the conservation and sustainable use of biological diversity, taking into account human health;

ii) *The close and complex interrelation of multiple socioeconomic and ecological processes*, specifically in respect of biological diversity in local and indigenous communities (as stated in Article 26 of the CPB) in general but particularly in mega-diverse countries and countries that are centers of origin and diversity; and

iii) *The principles of sustainable development*, that calls for the application of precautionary approaches to secure long-term ecological and social welfare.

As mentioned previously, from the Bolivian perspective, there is a wide gap of knowledge on SE impacts related to LMOs, particularly in relation to local and indigenous communities. The current literature mostly restricts SE assessment to purely economic impacts, (predominantly on impact of LMOs on production costs, cost-benefit analysis, income generation and value of the global current and future markets). Although important, this information is far from being comprehensive to reflect the real impacts of LMOs at local level in terms of welfare and sustainable rural livelihoods.

Accordingly, generally speaking, there is limited or no inclusion of SE issues in the decision-making processes related to LMOs; and safety evaluations and biosafety frameworks are not comprehensive since commonly they do not included SEC associated to LMOs. The drivers of this limited information on SE impacts are the lack of proper methodologies to assess them, lack of knowledge on level of presence of LMOs in the environment and food webs, and underestimation of the importance of SEC in light of international trade agreements and R&D. The Plurinational State of Bolivia is of the view that capacity building on SEC should contribute overcome to these drivers of lack of knowledge by:

- ***Definition of SEC under the CPB***. In other words, the agreement on a basic conceptual framework and methodological guidelines to properly assess SE.

- ***SE research based on the premises of ecological economics and methodological pluralism*** in order to: i) appraise SE implications of LMOs beyond the perspective of economic wealth, cost-benefit analysis and value of environmental services; and ii) appraise the quantitative and qualitative, direct and indirect and

short and long-term SE impacts of LMOs and their production systems, particularly at local level. Some specific issues that require urgent attention for SE research are implications of LMOs in terms of IPRs, genetic contamination in centers of origin, co-existance, risks for non-adopters of LMOs, and labeling and traceability in relation to public health, among others.

- ***Methodologies for transparent and active public participation on SE impact assessment***. This with the aim of applying methodologically robust assessment approaches, and generating a better understanding of SE impacts.

- ***Analysis of cases of biosafety or environmental decision-making that include SEC.*** This will help to identify practical elements for effective inclusion of SE issues on decision-making and regulation of LMOs.

- ***SE valuation of local alternatives to LMOs***, with particular emphasis on comparative impacts on sustainable livelihoods.

Addressing these capacity building needs on SEC and other related topics to be identified in the process would require the establishment of a working group (e.g. AHTEG) with participation of actors from different sectors.

Finally, in the Bolivian view, the effective inclusion of SEC in biosafety decision-making should not be restricted to:

- Specific LMOs, but also their related technological packages (e.g. herbicides that are used with LM herbicide tolerant crops);

- Economic and cost-benefit appraisal, but SEC in terms of sustainability with special focus on sustainability of rural and indigenous livelihoods, making the necessary specifications for mega-diverse countries and centers of origin and diversity;

- Agricultural LMOs, but also other LMOs (e.g. LM mosquitoes, LM fish, LM trees, etc.);

- Direct ecological impacts on biodiversity, but also changes in conservation, access and use of biodiversity that might weaken food sovereignty;

- General socioeconomic groups, but also vulnerable and marginalized groups (e.g. peasant and indigenous communities, rural women and youth, communities with specific health or nutritional disorders, among others), placing special attention to the development of adequate methodologies to address the needs of these groups; and

- Scholars, but also the whole rage of actor potentially affected by LMOs through participatory and more qualitative research.

--- /---