

Chapter 8

A Framework for Judging Potential Benefits and Risks

Mauricio R. Bellon, George Tzotzos and Paul Thompson

This chapter provides an overview of approaches and methods that can be used to assess the potential benefits and risks of the introduction of transgenic maize in Mexico and discusses their applicability. Three approaches are identified as: *risk optimization* (risks are seen as justifiable when they are offset by significant benefits), *informed consent* (insuring that people who bear risk do so voluntarily by informing potentially affected parties and allowing them to opt out), and the *precautionary approach* (scientific uncertainty in the phase of threats of serious or irreversible damage to the environment, and/or to human health should not be used as a pretext not to take measures to avoid this damage).

Methodologies based on risk optimization have traditionally been used to assess transgenic technologies around the world. Elements of the informed consent approach have also been employed. The precautionary principle has gained prominence, particularly with the ratification of the Cartagena Protocol on Biosafety by many countries, including Mexico. Risk optimization methodologies rely to a great extent on the scientific method and on scientific evidence, but also involve assumptions, value judgments, and uncertainty. While science plays a key role in the assessment process, many of the choices go beyond science and cannot be settled by scientific evidence alone.

Transgenic maize varieties have been developed in the context of industrialized agriculture. In Mexico, industrialized agriculture coexists with a sector of small-scale, subsistence-oriented farmers (i.e., *campesino* farmers) which is by far the most numerous. Maize cultivation and consumption is very important for farmers and society-at-large, and maize has a great cultural significance, particularly for the rural population. The practices of *campesino* farmers favor gene flow among distinct maize populations. Furthermore, there is the presence of maize's nearest wild relative, teosinte. The case of maize in Mexico hence, presents special conditions not fully covered by risk assessment approaches but which have important implications for hazard identification, the evaluation of risks, and risk management.

While transgenic varieties, if introduced, will be aimed at industrialized agriculture, due to *campesino* practices that favor gene flow, transgenes from these varieties may end up in their local maize populations (landraces). Thus, the introduction of transgenic maize could well generate important externalities—both positive and negative—for *campesino* farmers. Transgenes and the novel traits they code for have not been tested in the context of *campesino* agriculture. This implies uncertainties and the need for research on the impacts of transgenes in this new context. Some of these impacts may be irreversible. Externalities, uncertainty, and irreversible consequences should be considered in assessments, but need not make decisions impossible and do not mean that transgenic

varieties should not be introduced into Mexico, but that the benefits derived from their introduction should be large, highly certain and well distributed within society, including the environment.

Benefits of transgenic maize cannot be taken for granted, they need to be identified and weighted in terms of their magnitude and probability of occurrence. The distribution of potential benefits and risks among different social groups should be taken into consideration for judging them.

Distributional issues also pertain to the extent that benefits and risks are private or public, and how they are weighted. Distinguishing and balancing both types of benefits and risks will be complex but important for the acceptability of this technology. Social participation in the evaluation process is also important, particularly of those groups that may be influenced—positively or negatively—by the introduction and use of transgenic maize in Mexico. Consultation with these groups is fundamental, and cannot be left to end of the assessment process. It should be done early and, ideally, as the process unfolds. Judging the potential benefits and risks of introducing transgenic maize in Mexico is a complex process that may require a combination of approaches, as well as social participation and consideration of social values, particularly the important cultural significance of this crop for many Mexican farmers and consumers. Science can illuminate these choices, but cannot provide all the answers nor serve as the sole basis for judgments.