

Chapter 2

Understanding Benefits and Risks

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Abstract

This chapter provides a review of key concepts and terminology used throughout the report. Main products of agricultural biotechnology are identified, emphasizing transgenic varieties of maize. Risk implies an estimate of both *hazard*, or the potential adversity that is the initial cause for concern, and also *exposure*, or the probability that adverse events will actually occur. A catalog of possible benefits and hazards is discussed, including adverse outcomes associated with damage to the environment, food safety and the possibility for adverse socioeconomic events. Environmental hazards include adverse affects on non-target organisms, and weakening of the integrity of natural and agricultural ecosystems. Food safety impacts include adverse effects on human and animal health. Socioeconomic events include economic losses or other forms of instability for farmer households and communities, effects on consumer confidence in the food system, and large-scale cultural changes in rural communities or throughout the food system that might be regarded as adverse.

Mechanisms by which environments may be exposed to environmental hazards include establishment of the transgenic crop itself as a pest, gene flow to wild plants, and inadvertent changes in the food web (including toxicity of transgenic plants) that could affect non-target species and the distribution of species throughout an ecosystem. Exposure to food safety hazards would come from unknown products created by the process of genetic transformation, or from systematic change in the prevalence of known toxins (such as nitrates and pesticides) through changes in farming practice. Exposure to socioeconomic hazards can come through events such as crop failures and dramatic shifts in farm prices. Farm prices are in turn affected by international trade and consumer confidence in transgenic crops. Consumer attitudes are affected by unequal distribution of information, and by regulatory decision making that appears to exclude consumer interests or that seems to favor pecuniary interests over concern for environment and safety.

Three approaches for managing such risks are reviewed briefly. Risk optimization attempts to strike the best balance between risk and benefit. Informed consent addresses the problem by empowering stakeholders to accept or reject risk by providing options and information. The precautionary principle is a third approach, advocating a conservative posture when hazards are uncertain or irreversible.