



ECOGEN

Soil ecological and economic evaluation of genetically modified crops

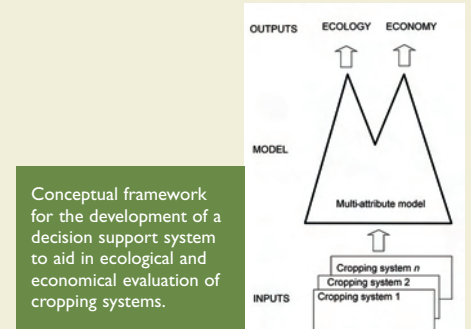


In conclusion, the ECOGEN results indicate no difference of biological relevance in the impact on soil organisms between *Bt*-maize line MON 810 and conventional non-GM maize. These results are

		Social Benefits and Costs	
		Private	External (Public)
Reversible	1	2	
	Reversible Benefits Reversible Costs	Reversible Benefits Reversible Costs	
Irreversible	3	4	
	Irreversible Benefits Irreversible Costs	Irreversible Benefits Irreversible Costs	

The two dimensions of an *ex ante* analysis of social benefits and costs of transgenic crops.

in line with other research findings obtained over the past ten years since first commercialization. The few differences observed were inconsistent and within the natural variation expected for maize crops. Soil type, plant growth stage and the use of pesticides have a higher impact on soil organism



Conceptual framework for the development of a decision support system to aid in ecological and economical evaluation of cropping systems.

diversity and function than the type of maize crop grown (GM or conventional). Furthermore, the adoption of reduced tillage technologies, facilitated in certain types of GM crops, may contribute to preserving the quality of agricultural soil.

The economic analyses indicate that the EU corn growing farmers would forego direct economic benefits in the area of 150 million Euro per year by postponing the full introduction of MON 810. The direct economic benefits are high enough to compensate for possible but highly unlikely irreversible costs of full introduction.

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ECOGEN is a project funded by the EU under the 5th Framework Programme. Based on results obtained from soil biodiversity studies and economic evaluations, ECOGEN assessed the impact on soil organisms of different agricultural management practices, including those involving genetically modified (GM) crops.

Soil organisms form a complex ecosystem that is crucial to the productivity of agricultural soils. ECOGEN evaluated the diversity and function of soil organisms in various agricultural soils using selected parameters. Soils from fields where GM maize was grown were compared to soils from fields where non-GM conventional maize (8 different varieties) was planted. In addition, economic assessments of the GM crop were performed by quantifying the differences in variable costs, revenues and external effects in comparison with the conventional variety. The implications for the EU Common Agriculture Policy were then evaluated. These two major factors – ecological and economic – were then integrated into decision support models for predicting the overall consequences of introducing GM crops into an agricultural system. *Bt*-maize line MON 810, resistant to a widespread insect pest called the European corn borer, was chosen as the model GM crop since it has been approved for planting in the EU and been available to growers in Europe since 2003 (introduced first in Spain), with commercial plantings being conducted in five Member States in 2006 on more than 63,000 ha. MON 810 maize was first commercialised in the US

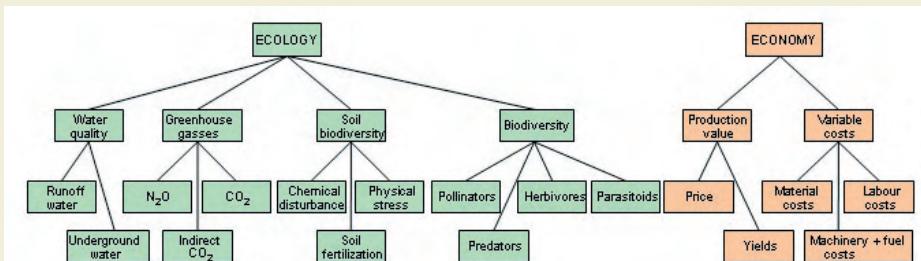
in 1998 and has been planted on millions of hectares worldwide since then.

In the ecological assessment, the effects of *Bt* maize were assessed at three levels of increasing complexity:

- Laboratory tests on single species: the main groups of soil organisms covered were bacteria, protozoa, nematodes, springtails, mites and earthworms;
- Green-house model ecosystem or mesocosm studies to analyse ecological interactions;
- Field studies in three climatic zones of Northern and Southern Europe where *Bt*-maize management was compared with conventional management (that included insecticides) for possible ecological effects. Different soil tillage programmes were included.

In the economic assessment, an extended social benefit cost analysis was used, where social benefits and costs (reversible, irreversible, private and public) were considered.

As mentioned above, the ecological and economic results were integrated into a decision support model to facilitate the assessment of the impact of various cropping systems on soil quality and economics.



Topmost levels of the ECOGEN model for the assessment of ecological and economic impacts of cropping systems.