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# Implications of GM-Crop Cultivation at Large Spatial Scales



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## Foreword

Ecological, agricultural and economic implications of genetically modified (GM) plants on large spatial scales are currently discussed in science, administration, and in the context of agricultural practice. It is still controversial how effects with great spatial extent can be assessed in risk analysis, in the approval procedure, in the planning of co-existence measures, and in post market monitoring.

With this volume we present the proceedings of the international conference on “Implications of GM-Crop Cultivation at Large Spatial Scales, GMLS 2008”, which was held at the University of Bremen, Germany, 2<sup>nd</sup> to 4<sup>th</sup> of April 2008.

The conference provided a platform to collate and discuss available methods, strategies and the state-of-the-art in the relevant disciplines. Presentations are documented in this volume. Expertise from different fields was brought together to communicate innovative approaches and to enhance progress in assessing large scale implications of GM cultivation. Topics include empirical work related to risk assessment, theoretical concepts, as well as methodological aspects such as modelling and data analysis facing large spatial and temporal dimensions.

Strategic implications for good governance and handling approaches for unknown effects have been discussed from a social ecological perspective. The presentations showed, that a sufficiently complete assessment of relevant environmental effects of genetically modified organisms (GMO) requires systematic studies that integrate effects beyond the farm scale or landscape level.

The editors wish to cordially thank all conference delegates for their contributions as well as the German Ministry for Education and Research (BMBF) for the funding of the conference within the Social Ecological Research programme.

*Broder Breckling, Hauke Reuter, Richard Verhoeven*

## Welcome Address



Karin Mathes  
Vice President of the Bremen State Parliament

Ladies and Gentlemen, dear guests,

as vice president of the Bremen State Parliament it is a great pleasure for me to welcome you to the Conference on Implications of Genetically Modified Crop Cultivation at Large Spatial Scales. I hope, you had a pleasant journey and that you are looking forward to an interesting programme of lectures, posters and discussions.

Let me say a few words about Bremen. Bremen is an independent city state. Since the reunification of Germany in 1989 we have – as you all surely know – 16 states in the Federal Republic of Germany. Each has its own legislation and government. Bremen is the smallest of these states, but with a very long tradition as a free independent city republic. It consists of two communities: Bremen and Bremerhaven. Throughout its long history, the Free Hanseatic City of Bremen has always been an open-minded and cosmopolitan place. So what you can expect here is to find a long grounded openness to new developments.

Here in Bremen, you are in a historical place. Having developed from times of Charles the Great in around the year 800, Bremen gained trans-regional importance as place of Christianisation of Northern Europe. You can see this heritage in the Cathedral. The city became a major trading port during the times of the Hanseatic League. Later, Bremen expanded further in the industrial realm with a focus on shipping and shipbuilding. We are very proud that the UNESCO has accepted our 600-year-old town hall and the statue of the Roland – Bremen's symbol of freedom – as a world heritage.

The modern structural transformations in our community led to the development of new industries when some of the older ones vanished. Today, Bremen is in particular active in aviation and space technology, and in automobile manufacturing. Additionally a range of companies involved in diversified maritime industries as well as in renewable energies has expanded very quickly in the last years. We set up priorities especially in the wind energy sector and in connecting the developments in environmental technologies with internationally relevant research. The state of Bremen has two universities, one public and one private, as well as three universities of Applied Sciences. They all enjoy an excellent reputation. The fact that Bremen was nominated in a national competition as ‘City of Science’ 2005 is an immediate consequence of this excellent infrastructure in education, science and research.

### **To dare and to win – traditional and modern risk management**

There is an old wisdom of the Bremen traders, which still holds for all who are active in bringing up new developments: “Buten und binnen, wagen und winnen” (translating to ‘to dare and to win – outside the city walls and within’). Valuating the options for new developments, we can build on a long historical experience how to anticipate potential results. Traditionally, any of the commercial endeavours require very careful considerations about the risk implications. How probable is it to achieve a potential benefit and how does it balance with the possibility of a loss. The loss of a sailing ship and the goods it carried due to adverse conditions could well result in the traders loss of all his wealth. Securing against risk has always been a strong Hanseatic tradition, involving also the emergence of the first insurances on the basis of mutual support.

In modern times, risk analysis has grown considerably and became more complex than it has ever been. While the trading houses calculated their own individual risks to make decisions, we nowadays have also to calculate how risks and benefits are distributed between the different sectors, between individuals and with respect to the overall community. The society agrees to provide a framework that allows gaining a fortune. However, a fortune that comes with the potential to cause drawbacks and damage to others has low acceptance.

In general terms, for modern conditions it is not sufficient to demonstrate that an innovation facilitates individual gains. It has also to be shown, that not only single adopters benefit, but that this benefit does not affect the well-being of the larger society. This applies to genetic engineering in the same way as it holds for any technological development, which cannot develop without public acceptance.

### **Policy has to assure the freedom of choice**

Genetic engineering is a technological approach that allows for inserting new genetic material across species borders. It opens up the possibilities to produce organisms with

properties that cannot be achieved by conventional breeding. This can bring certain benefits. Otherwise the development of genetically modified organisms would not make sense. However, after more than a decade of commercial experience in some countries outside Europe it seems apparent, that several initial expectations could not be met, for example concerning overall reductions in pesticide use and improvements of the situation of smallholders in developing countries. Furthermore, in many states of Europe, a stable majority of consumers simply does not wish genetically modified food on their plates

It is important for the society and for policy makers to assure the freedom of choice by implementing appropriate regulations. The definition of impurity thresholds and distance regulations are steps in this context. These regulations imply additional costs, some of which the state, or lastly, the tax payer has to cover. For example, the extended ring-tests to assure the methodological capacity to detect all the developed or tested GM varieties, the set-up of the EU community reference laboratory and according laboratories on the national and federal level, together with the European Network of GMO Reference Laboratories operate on public expense. Some of the additional costs for safeguard measures goes to farmers, who may want to know the possible contamination level of their conventional harvest. Producers active in post harvest processing may have to set-up different production lines for GM and conventional products. Crop segregation and traceability is not for free.

From my previous work as a researcher at the University of Bremen I have a personal background, especially in ecotoxicology. In this field, benefits of new substances have to be accounted against undesirable side effects, indirect and long term implications. So I know how difficult it is to anticipate undesirable effects in ecological systems from spatially and temporally limited single observations and short term experiments.

### **Objective and independent information is necessary**

For genetically modified organisms, this aspect is even more relevant. Unlike chemicals, which mostly degrade by the time, GMO have the potential to proliferate and to persist in the environment, eventually without the possibility to remove them once having been released to nature. This makes risk assessment as well as monitoring a highly important task to minimise the risk of negative effects. It can be achieved only when regulators and authorities operate at the highest possible level of information, qualification and most important, independence and objectivity. Even less than in other fields, a conflict of interest of the involved researchers and regulators is not tolerable. The large dimension of spatial effects needs a very high responsibility of the scientists involved.

With this background, I strongly welcome the efforts that are made in this conference to bring together findings from different approaches to contribute to a more generalising picture of large scale implications of GMO.

We would like to assure you, that the results of the conference will help to inform not only the scientific but also the political discussion in Bremen and beyond. I requested the organisers to provide the public as well as politicians with a summary of the outcome of the conference, emphasising also regulatory implications and identifying open questions and research priorities. In this respect I emphasise the need to balance new options and potential gain with a careful investigation of possible drawbacks to come up with a realistic and complete picture.

I wish you many fruitful discussions and new insight in the interrelation of different findings and the implications for large scales and larger regions. I wish you fruitful exchange of experience as well as lasting contacts and exchange with our scientific institutions.

A handwritten signature in black ink, appearing to read 'Karin Mathes', with a long, sweeping underline that extends to the left and then curves back under the name.