

BMBF Research Programme

Biological safety research on genetically modified organisms

When scientists developed the first genetically modified organisms (GMOs) in the 1980s, government bodies around the world launched research programmes to investigate the safety of the new plants. Germany's **Federal Ministry of Education and Research (BMBF)** has been funding this field of research through its own programme since 1987. The aim is to lay the foundations on which society and politicians can assess the opportunities and risks associated with genetic engineering in a scientific and impartial manner. It also gives government authorities and politicians a basis on which to decide which uses of genetically modified (GM) plants should be permitted. The biosafety research projects focus particularly on scientifically plausible objections and fears that emerge in the public debate about plant genetic engineering. To date, the BMBF has invested **over 100 million euros in more than 300 projects** relating to biological safety research. The projects selected for BMBF funding are chosen by independent, national and international experts. More than 60 universities and other research institutes have taken part in the research projects so far.

The research topics

Most of the research projects funded by the BMBF examine how genetically modified crop plants (particularly potatoes, maize, cereals, oilseed rape and selected woody plants) impact the biological diversity of the agroecosystem and adjacent open spaces. The projects compare the potential ecological risk of GM plants with that of non-GM plants. The projects carried out so far have not found any scientific evidence that GM plants per se present a higher risk than conventionally bred crop plants.

Genetically modified plants with new and modified plant substances could come onto the market in future, including plants that produce substances for industrial or pharmaceutical use. This poses new challenges for biosafety research. In recent years, BMBF-funded researchers have developed biological containment systems – methods designed to prevent these kinds of GM plants from spreading in the environment via pollen, seeds or tubers.

In other projects, scientists are developing new methods for integrating new genes at precisely defined locations in the genome. This would make it possible to minimise or exclude possible interactions with other genes within the plant and minimise the risk of undesirable side-effects.



Finally, some projects are also developing methods that can be used to identify long-term ecological impacts of the commercial cultivation of GM plants quickly. These monitoring activities form part of the conditions attached to the approval of GM plants for cultivation. This means that the BMBF research projects help ensure that the authorities are in a position to specify monitoring activities on a scientific basis.

An overview of biosafety research topics

(1) General environmental effects	a) The undesirable spread of GM plants. These projects investigate the outcrossing behaviour of GM plants, their potential to grow out of cultivation and their invasiveness (the plants' potential to become established in agricultural landscapes or adjacent open spaces and to crowd out other species).
	b) The probability of horizontal gene transfer (i.e. the passing-on of modified genetic material from a GMO to an unrelated organism, e.g. to soil or intestinal bacteria).
	c) Specific impacts of the new traits of GM plants on non-target organisms in the agricultural and wider ecosystem. One example is the research into possible impacts of the cultivation of insect-resistant Bt maize on beneficial organisms like lacewings, bees and ladybirds.
(2) Biological systems for limiting the spread of GMOs	Methods for preventing or limiting the spread of GMOs. Examples include: <ul style="list-style-type: none"> • Genetically modified plants with pollen that is free from genetic modifications • Sterile GM plants (e.g. plants that do not produce pollen) • Cleistogamic plants (these plants form closed flowers that do not disperse pollen)
(3) Optimised gene transfer methods	<ul style="list-style-type: none"> • Integration of the transferred genes at precisely defined locations in the genome in order to rule out unknown interactions with other genes. • Eliminating the need for redundant DNA marker sequences, including antibiotic-resistance genes, in GM plants
(4) Environmental monitoring of commercially grown GM plants	Environmental monitoring is intended to identify negative environmental effects after the start of commercial cultivation. Examples include: <ul style="list-style-type: none"> • Methods for monitoring the development of resistance in European corn borer populations where Bt maize is cultivated • Feasible concepts for environmental monitoring to detect long-term effects of GM plants



Presentation of the research findings

The project results are made accessible to the public soon after they become available, through three channels:

- The research results are published in prestigious scientific journals, which means they can be reviewed by third-party experts.
- The objectives and results of the research projects are publicly accessible on the Internet platform www.gmo-safety.eu. This online portal has been publishing clear, intelligible details of all BMBF-funded projects since 2002, along with background information.
- In addition, status seminars are held every three years to inform the public about the research findings. The last status seminar took place on 30 March 2011 in Berlin. A report on the event can be found in the News section of the website.

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