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Concepts of GMO-free Environmentally Sensitive Areas

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This paper summarizes a two-part study dealing with concepts of GMO-free environmentally sensitive areas[1] which was conducted on behalf of the Austrian Federal Ministry of Women's Affairs and Consumer Protection. The first part outlines the basic arguments and frameworks concerning GMO-free areas from a scientific and legal point of view and was finished in December 1998. The second part deals with the empirical results of a survey of experts' opinions about GMO-free areas and relates to different problems around the deliberate release of GMOs and the natural or/and agricultural environment (including organic farming). The empirical study was finished in August 1999. Since both parts of the study reflect the state of discussion of 1998/99, this summary includes some new relevant aspects and developments in footnotes.

1. Framework and concepts of GMO-free environmentally sensitive areas

1.1 Main results

In evaluating the different aspects of the release and placing on the market of GMOs and in assessing the current international agenda concerning the protection of biodiversity and the different efforts to define environmental sensitivity, there are many open questions about the release of GMOs in special areas of protection. If we accept the hypothesis that there is a need for the preservation of "natural" biodiversity resulting from natural evolution and that this

evolution as a common heritage is essential for future human development; and if we cannot provide scientific evidence that the direct and indirect effects of GMOs and their artificial gene constructs are without harm to the long-term development of natural environments, we should at least think of a GMO-free demarcation of the following areas:

- protected areas for the preservation of biodiversity (e.g. Natura 2000 network) and adjoining areas;
- areas for organic farming, to secure at least partially GMO-free agricultural production (as far as possible) and to guarantee GMO-free organic seed breeding and the propagation of such seeds, as well as to provide an alternative technological option;
- areas for the enhanced in-situ (on-farm) preservation of plant-genetic resources under GMO-free conditions;
- development or "transition" areas for sustainable agricultural development - similarly defined as in UNESCO's Man and the Biosphere (MAB) programme (especially in the Statutory Framework of the World Network of Biosphere Reserves) to contribute to the conservation of landscapes, ecosystems, species and genetic variation and to foster economic and human development which is socio-culturally and ecologically sustainable;
- mountain areas, whose ecological sensitivity merits special consideration – following Agenda 21, Chapter 13 (Managing Fragile Ecosystems: Sustainable Mountain Development).

Such GMO-free areas would have to cover relatively large biogeographical regions to be effective in the long-term in avoiding future gene transfer to a large extent.

1.2 The legal framework

In the introductory chapters, the study describes the legal framework in connection with the possible implications of Article 13 (5) of Council Directive 90/220/EEC. This Article refers to the placing on the market of GMOs, taking into account "specific conditions of use and the environments and/or geographical areas stipulated in these conditions".[2] If it is generally accepted that Directive 90/220 (based on Article 95 (ex 100a) of the EC Treaty) aims at both objectives on an equal level: protection of human health and of the environment, as well as dissolving disparity between the rules of Member States and facilitating the functioning of the common market; and if Directive 90/220 is to integrate the precautionary principle as it is characterised in Article 174 (ex Article 130r), then besides "*the available scientific and technical data"* the Community should also take into account "*environmental conditions in the various regions of the Community; the potential benefits and costs of action or lack of action; the economic and social development of the Community as a whole and the balanced development of its regions."*[3]

Since Directive 90/220 provides for a special type of product-based Environmental Impact Assessment (EIA) and since one of its main objectives is to preserve biodiversity, it also has to be evaluated within the context of other environmental directives.[4] Interestingly, Council Directive 97/11/EC on the assessment of the effects of certain public and private projects on the environment incorporates a strong regional approach with special reference to the *"environmental sensitivity of geographical areas"* (ANNEX III in connection with Article 4 (3) – see below). There are also some strong connections with the Natura 2000 directives (Habitats and Birds Directive). Especially in Council Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (Article 6) it is stated that *"Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of*

natural habitats" and that *"any plan or project … likely to have a significant effect thereon … shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives"*. Additionally, *"the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."* According to DG XI's Natura 2000 newsletter, this aims to ensure that a site is not damaged until there has been a careful balancing of nature conservation and opposing interests. *"The trigger for applying these safeguards is a likelihood that a plan or project will have a significant effect on the site concerned."* (DG XI's Nature Newsletter, Issue 2, Dec. 1996). So there seem to be obvious contradictions to the possible implementation of Directive 90/220, and the relationship between the preservation of biodiversity and the consequences of unrestricted releases of GMOs into the environment remains to be clarified.

1.3 Approaches to defining environmentally sensitive areas

The terms "environmental sensitivity" or "fragile ecosystems" are used quite often in connection with discussions on special environmental conditions, not only within the EU but also globally. This mainly reflects efforts to describe a general imbalance between the environmental capacity and economic activities of a region and to raise political awareness of regional environmental problems. On the European level, besides the directives mentioned above, environmental sensitivity plays an important role in discussions about the problems of road transport,[5] the impact of tourism, the quality of water and seas (e.g. the Baltic Sea Area), but also in the context of environmental programs as part of the Common Agricultural Policy (CAP).[6]

The best definition of "environmental sensitivity of geographical areas" from a legal point of view is to be found in the EIA Directive, 97/11/EC. Concerning certain case-by-case examinations or the determination of certain thresholds or criteria (Article 4 – Annex III), such areas are characterized as wetlands, coastal zones, mountain and forest areas, nature reserves and parks, areas classified or protected under Member States' legislation, special protection areas of the Natura 2000 network, areas in which the environmental quality standards laid down in Community legislation have already been exceeded, densely populated areas and landscapes of historical, cultural or archaeological significance.[7]

1.4 The uncertainty of the risks of GMOs

The study outlines the causes of danger to biodiversity through modern agricultural practices. It refers to direct and indirect effects of agricultural technology on biodiversity and demonstrates in a historical overview how modern agricultural techniques have caused massive genetic erosion and threatened diverse ecosystems.

In the context of the use of GMOs in agriculture, the impact on biodiversity may be twofold: On the one hand there are possibilities of direct risks which can be assessed within some limits according to the status of science and technology (e.g. crosspollination, effects on non-target organisms). But there still remains an area of uncertainty as even the best and most modern scientific methods cannot provide us with the means to predict ecological long-term effects and/or implications for human health. So it is beyond the competence of the scientific system to answer such a question (SCHOMBERG 1998).[8] On the other hand there may also be a range of indirect effects through the change of agricultural production systems and management methods (e.g. combination with pesticide strategies; mono-cropping or expansion of the limits of crop rotation; more regional and operational specialisation and

concentration with cumulating environmental problems). But these indirect effects seem to be causally related to a single technique only in rare cases. Most times this possible negative environmental impact is translated through socio-economic processes like the concentration of enterprises, the monopolization of the seed industry or of the supply of means of production, the destruction of local infrastructure, etc. (see ALTIERI 1998).[9] Especially in view of these possible indirect effects of modern biotechnology in agriculture there is a need for alternative technological options and structures (e.g. organic farming).

In connection with the uncertainty in the environmental risk assessment of releasing GMOs to the environment, two expert analyses were conducted. The appraisal by PASCHER/GOLLMANN (1998a) outlines limits of prognosis of ecological behaviour of plants with special reference to introgressive hybridisation. It is pointed out that our knowledge of evolutionary relationships and genetic compatibility, especially of grasses, is too limited to allow predictions on the consequences of releases. Since most of the agricultural areas in the alpine regions are meadows or pastures, *"the ecological impact of transgenic grasses may be pervasive"* (see PASCHER/GOLLMANN 1998b). The analysis by MÜLLER (1998) demonstrates in a more general and theoretical context that the contamination of natural gene pools through synthetic genes is incalculable in principle in predictive risk assessment.

It may well be the case that environmentally sensitive areas like mountain regions have to carry higher technology risks since these areas have a higher potential for environmental change (e.g. soil erosion, landslides and avalanches, rapid loss of habitat diversity), but there is not usually a stringent causality.[10] At the same time, conceptualising environmentally sensitive areas in relation to the release of GMOs could also mean counterbalancing possible risks.[11]

There is an example of the geographically limited placing on the market of GMOs in the US. According to the rules on deregulation, Bt corn may be used as seed in the Southern States only in very limited quantities.[12] The restriction is justified with the fact that the corn earworm/bollworm (CEW) causes multiple damage: to corn as well as to cotton and vegetable plants. In cotton regions the resistance mechanism should therefore not be additionally supported by the cultivation of corn. Although the basis of argumentation is causal, the resulting demarcation is rather rough and general. However, this crop-specific restriction may at the same time strengthen mono-cropping tendencies - a side-effect with an indirect negative environmental impact.

1.5 Concepts and strategies for GMO-free environmentally sensitive areas

1.5.1 Protected areas

The study outlines in detail the (legally binding) conditions of the Convention on Biodiversity (CBD), especially with regard to the in-situ conservation and sustainable use of genetic resources (Article 8 of the CBD). It deals with basic strategies for protected areas and describes the status of negotiations on the so-called "Biosafety Protocol".[13] Furthermore, the requirements for the consideration of the knowledge, innovations and practices of indigenous and local communities are discussed. Within the European context, too, the participation and involvement of local communities is crucial for the conservation and sustainable use of biological diversity.[14] Nowadays, it is commonly accepted in expert discussions that the participation of local communities is the most relevant point for the successful preservation of biodiversity. Thus, as the Natura 2000 network is an important element of European

strategies, the term "opinion of the common public" has been included in the Habitat Directive.

Concepts of GMO-free ecologically sensitive areas have to be seen in the context of preserving biodiversity. Special areas of nature protection like the Natura 2000 network and adjoining areas depend upon special agricultural management systems which are in many respects in contradiction to the context of GMO farming. From this point of view, public participation and the involvement of local communities could be one crucial element in solving problems in connection with possible releases of GMOs and their potential impact on biodiversity. But this participatory process is also highly relevant in the context of defining GMO-free areas.[15]

1.5.2 In-situ (on-farm) conservation of Genetic Resources for Food and Agriculture[16]

Activities to protect agricultural genetic resources have to be seen in the context of the so-called FAO Global System. The FAO established the Commission on Plant Genetic Resources (CPGR),[17] which was renamed in 1995 to Commission on Genetic Resources for Food and Agriculture (CGRFA). This Commission coordinates, oversees and monitors the development of the Global System for the Conservation and Utilization of PGR; activities include the (non-binding) International Undertaking (IU), the so-called Global Plan of Action (which defines in-situ conservation and/or on-farm management of PGR as leading priority activities), as well as the development of an international network of in-situ conservation areas and crop-related networks, in addition to an existing international network of ex-situ conservation.

Taking this FAO Global System as a starting point, the on-going implementation activities for PGR at European and national level are discussed (see Report on the 1998 European PGRFA Symposium). The disappearance of small seed companies and the erosion of the European genetic heritage is recent history. But protecting PGR, including their wild relatives in centres of origin or centres of diversity, in situ and managing the (re-)use of PGR and so-called land races or "folk varieties" on farm is essential for maintaining diversity and guaranteeing long-term food security. Additionally, special attention is paid to activities of private initiatives and so-called grassroots movements. Globally, and also in Austria, genetic erosion has led to reactions in the form of popular movements which try to save vanishing seeds and which are the main actors in in-situ (on-farm) conservation of PGR (see BERG 1996).

Especially for Austria, the in-situ conservation of herbs and grasses which grow in the alpine grasslands and pastures is of great importance. Particularly within the alpine regions there is a highly differentiated structure of ecological systems with different climatic conditions, land forms and soils. But there are large gaps of knowledge concerning the dynamics of the change of biodiversity and its endangerment in the alpine region (BUCHGRABER/SOBOTIK 1995; also see CERNUSCA et al.).

Small-scale agriculture, present mainly in disadvantaged and mountainous regions (also in Europe) or due to an orientation toward self-sufficiency, has made a substantial contribution to preserving plant genetic resources. Obviously, small-scale agriculture in these areas (including the Austrian mountain regions in particular) can be useful for the re-establishment of preservation on farm and for the improvement and development of Genetic Resources (see HAMMER 1998).

For example, the following points would have to be considered additionally to the measures suggested in the context of the Austrian biodiversity strategy and additionally to the development of a regional concept for the in-situ (on-farm) conservation of Genetic Resources:

- creation of a "protected area" for the exchange of and small-scale trade in Plant Genetic Resources in order to achieve harmonization with the laws regulating seed markets;
- improved support schemes for the utilization of Genetic Resources in the context of Agro-environmental programs;
- project-related support of the cultivation of PGR, including scientific monitoring;
- intensified evaluation of existing PGR, in particular with the perspective of (re-) utilization in less-favoured areas and in regional markets;
- supporting breeding and improvement measures for PGR to enhance their economic utilization;
- using local diversity for appropriate breeding, multiplying and seed propagation;
- improving communication and exchange of information (material, knowledge, information) within and among different groups of actors (science, ex-situ conservation, breeders, farmers and local communities);
- documenting farmers' knowledge, the knowledge of local communities, information on varieties and plant traits of interest in on-farm management;
- involvement of stakeholders with special reference to the role of [schweres foul!] farmwomen and to women's traditional responsibility in seed breeding and utilization.

1.5.3 Organic farming as an alternative, GMO-free technological option

On the basis of the principles of organic agriculture (system integration, precaution and risk avoidance, reversibility, see IFOAM Basic Standards[18]), GMOs are not used in organic agriculture and its products. The clear and European-wide positioning of the organic movement together with the support of consumer rights associations caused the European Parliament to include the following passage, reflecting the position of the organic agriculture movements, in its Report on amending the European Union's Council Regulation (EEC) 2092/91 on organic production: *"Genetically modified organisms (GMOs) and products derived therefrom are not compatible with the organic production method; in order to maintain consumer confidence in organic production, genetically modified organisms, parts thereof and products derived therefrom should not be used in products labelled as from organic production."*[19]

As multiple releases and the marketing of GMOs are irreversible processes, one must assume that due to natural gene transfer (generative, introgressive and horizontal) and due to technical impurities (in particular connected with processing), products of organic agriculture will also contain GMOs even if they are produced strictly on the basis of organic guidelines. As a result, organic products will have to carry a relatively high burden of contamination with GMOs in the long term.

So if organic farming, which means GM-free production by definition, is going to continue and if it is to meet consumers' expectations and preferences in the long term, there is a strong need for additional protective measures for this production system. Particularly, defined areas are required which can be used to build up and maintain a separate, GM-free branch of seed breeding and propagation.

As long as there are uncertainties in the prediction of the ecological long-term effects of GMO production systems, there is also a strong argument for supporting and developing an alternative option of agricultural technology to counterbalance unexpected risks.

Austria has about 19,000 farmholdings producing according to organic standards and cultivating about 300,000 ha UAA (Utilized Agricultural Area - excluding alpine pastures). This represents a proportion of 8% of all farms and about 9% of national UAA. In regional terms, organic farming is concentrated in the mountainous and alpine areas in western and southern Austria where alpine grassland and pastures prevail (mainly in the Federal Provinces of Salzburg, Tyrol and Styria). 86% of all organic enterprises are at the same time defined as operating in mountainous areas, so within the sector of mountain farming, organics already represents a proportion of 20%. Especially in the mountainous areas of Austria (defined according to Regulation (EEC) No. 950/97), organic agriculture is relatively widespread. Broken down by communities, 35% of all communities in Austria have a higher proportion than 10% of UAA operated organically.

In the context of preservation and sustainable use of biodiversity in combination with agricultural production, which is an essential basis of cultural landscapes in Europe, organic farming could play an important role. As organic farming is part of the Austrian agro-environmental programme, its impact on biodiversity has been extensively evaluated. One of the main conclusions was that "using organic cultivation methods" together with the "non-application of specific yield-enhancing means of production" and "upkeeping ecologically valuable areas" had strong effects on ensuring and enhancing species diversity (BLÜMEL et al. 1996).

If it is generally accepted that, according to EU-Regulation 2092/91, GMOs and their products are not compatible with the organic production method, and if European society wants continued production and development of organic agricultural and food systems as a GM-free standard, there is a strong need for special areas of protection

- to avoid GMO contamination of organic seed breeding and multiplying,
- to support efforts to protect and preserve biodiversity within organic agricultural systems,
- to create alternative technological systems or paths to compensate possible failures of conventional farming, and
- to have some mechanism of counterbalancing unexpected risks.

1.5.4 Transition areas modelled on Biosphere Reserves –an example of GMO-free, sustainable development

Besides the FAO and the Environmental Program of the United Nations (UNEP), it is above all the United Nation Educational, Scientific and Cultural Organisation (UNESCO) which has for several decades made important contributions to the preservation of biodiversity. In 1968, the UNESCO Conference on the Conservation and Rational Use of the Biosphere was the first major intergovernmental meeting to examine these issues, and it gave rise to the launching of the Man and the Biosphere (MAB) Programme. The Biosphere Reserve concept was a key component for achieving MAB's objective to strike a balance between the apparently conflicting goals of conserving biodiversity, promoting economic and social development and maintaining associated cultural values (see UNESCO 1998).

The name "Biosphere Reserve" was chosen in the early 1970s to select special experimental sites. Biosphere Reserves are areas of terrestrial and coastal ecosystems which collectively constitute a World Network.[20] At present, Biosphere Reserves consist of a core area, a buffer zone and a transition area, and only the core area requires legal protection. A number of Biosphere Reserves simultaneously encompass areas protected under other systems (such as national parks or nature reserves) and other internationally recognized sites (such as World Heritage or Ramsar wetland sites). With regard to GMO-free areas, transition zones would be of particular interest as examples of sustainable regional development.

After the United Nations Conference on Environment and Development in Rio de Janeiro (UNCED 1992) and in accordance with recent activities (Agenda 21, the Conventions on Biological Diversity, Climate Change and Desertification) there was a need for practical examples integrating the ideas and objectives of sustainable development. This also led to a change in the strategies for Biosphere reserves. In 1995, the International Conference on Biosphere Reserves (held in Seville, Spain) confirmed that Biosphere Reserves indeed provide such examples of integrated sustainable development (the Seville Strategy). Biosphere Reserves therefore have a new role to play at the global level. This means that the network of Biosphere Reserves is no longer exclusively a network of protected areas but has been changed into an instrument of area and regional planning as well as of sustainable development.[21] According to the Seville Strategy the main objectives are (in short):

- to use Biosphere Reserves (BRs) to conserve natural and cultural diversity;
    - to improve the coverage of natural and cultural biodiversity (e.g. by promoting a comprehensive approach to biogeographical classification including vulnerability analysis – or by giving special attention to fragmented habitats, threatened ecosystems, and fragile and vulnerable environments, both natural and cultural);
    - to integrate BRs into conservation planning (e.g. by integrating BRs in national strategies of biodiversity conservation and sustainable use – or by using BRs for in-situ conservation of genetic resources including cultivated and domesticated species);
- to utilize BRs as models of land management and sustainable development;
    - to secure the support and involvement of local people;
    - to ensure better harmonization and interaction among the different BR zones (core zone, buffer zone, transition area);
    - to integrate BRs into regional planning;
- to use BRs for research, monitoring, education and training.

Since the implementation process of Biosphere Reserves has been handled rather stringently in the past, it is not clear whether the new strategies will be convertible to concepts of GMO-free areas. Up until now, especially in industrialized countries, Biosphere Reserves have only covered small areas, which would not meet the requirements for large, GMO-free biogeographical regions. But at the same time the new concepts and strategies of Biosphere Reserves state that there is a need

- to recognize environmental sensitivity and/or fragile ecosystems whose stability can be ensured by sustainable management processes;
- to establish larger protected areas which are not only designed for the in-situ conservation of "natural" biodiversity but also for "cultural" biodiversity (see in-situ (on-farm) conservation of Genetic Resources for Food and Agriculture);

- to be aware that, in order to be successful, the conservation of biodiversity cannot be separated from cultural diversity and the involvement of local people and communities;
- to create model regions which give impulses for biodiversity conservation and sustainable development.
- Sustainable development, especially under the dynamics of industrialized society, is not given and fixed per se, but needs a space of experimentation in order to be researched and adjusted to prevailing social and economic conditions. Models are required to develop alternative paths of technology development.[22]

1.5.5 The requirements of Agenda 21 - Chapter 13, "Managing Fragile Ecosystems: Sustainable Mountain Development"

Within the framework of the UNCED process and in particular within Agenda 21, the far-reaching programme for sustainable development, the special environmental and social problems of mountain areas were recognized for the first time at an official international level. Especially Chapter 13 deals with the environmental sensitivity of mountain areas and the need for their sustainable development. Within the introductory paragraphs it is stated that mountain areas as a major ecosystem represent the complex and interrelated ecology of our planet and that at the same time mountain environments are essential to the survival of the global ecosystem. These areas are threatened by rapid change. *"They are susceptible to accelerated soil erosion, landslides and rapid loss of habitat and genetic diversity…. most global mountain areas are experiencing environmental degradation. Hence, the proper management of mountain resources and socio-economic development of the people deserves immediate action."*

Furthermore, mountain areas represent a very important part of global biodiversity and are home to many endangered species. Although these areas are not usually the richest regions in terms of biodiversity, they are characterized by a special vulnerability. *"Because the ecosystems are relatively barren, native species tend to require large tracts of continuous ecosystem for survival and regeneration. As a result, pressure on the size and continuity of the ecosystem habitat can have significant detrimental effects on the continued existence of native species"* (OECD 1998). With regard to agriculture, mountain areas are often centres of origin or centres of diversity of Plant Genetic Resources as they represent diverse environmental conditions in the context of the traditionally diverse agricultural demands of their inhabitants.

Concerning the key measures to be taken, Agenda 21/Chapter 13 calls for action to improve our knowledge of mountain ecosystems, to foster integrated watershed development and to create alternative livelihood opportunities for mountain peoples. However, at international level, programmes lack approaches for integrating mountain development, and at country level, government agencies and legislation rarely deal with mountain issues in a comprehensive way (see FAO 1997, see McNEELY 1995). As for selected future priorities in dealing with the problems of mountain areas, they should be oriented towards the following issues (see UNCSD 1997):

- recognizing the special status of mountain areas (e.g. formulating national mountain development plans as part of general development plans);
- stimulating investment in mountain development and conservation;
- facilitating a clearer understanding of resource flows;

- ensuring greater empowerment, equity and equality of women and recognizing their status;
- recognizing mountain areas as valuable sites for preserving cultural integrity and conserving biological diversity (e.g. more concerted action is needed to address these increasingly important areas of concern).

As for Central Europe, the framework of Agenda 21/Chapter 13 was to some extend integrated in the so called Convention on the protection of the Alps (Alpine Convention). This Convention is approved also on behalf of the European Community. Although the Alpine Convention refers to the principle of prevention and the 'polluter pays` principle, it is formulated in a very general way and it only constitutes a framework for the preservation and protection of the Alps. More details had been elaborated within the different protocols based on the Alpine Convention, which are not yet signed by all Contracting Parties.

Dealing with environmental problems of GMO releases, there are a lot of activities in the context and follow up of the Alpine Convention, especially activities from NGOs like the International Commission for the Protection of the Alps (CIPRA). Arguing that mistakes in the cultivation do have much faster and more severe consequences in mountainous areas compared to the plains and require faster corrections and a higher degree of precaution, and as most human interventions and actions in the Alps have to be made more careful and gentle and considering present technological activities and the future potential of technical intervention, CIPRA took a critical position to the releases of GMOs in the Alps. Consequently, CIPRA has in February 1998 adopted a resolution on the establishment and preservation of "GMO-free Alps". It asks for a GMO-free area covering the entire Alps and refuses insular-solutions, such as high-alpine areas or certain territories (CIPRA 1998).

2. Results of a survey of experts' opinions about GMO-free environmentally sensitive areas

In order to evaluate the different conceptual frameworks of GMO-free environmentally sensitive areas and to assess the profile of opinions of people who may be confronted professionally with problems and possible environmental effects of the release of GMOs (especially at local level), a survey was conducted on the basis of the framework outlined in chapter 1. The main focal points of the survey were:

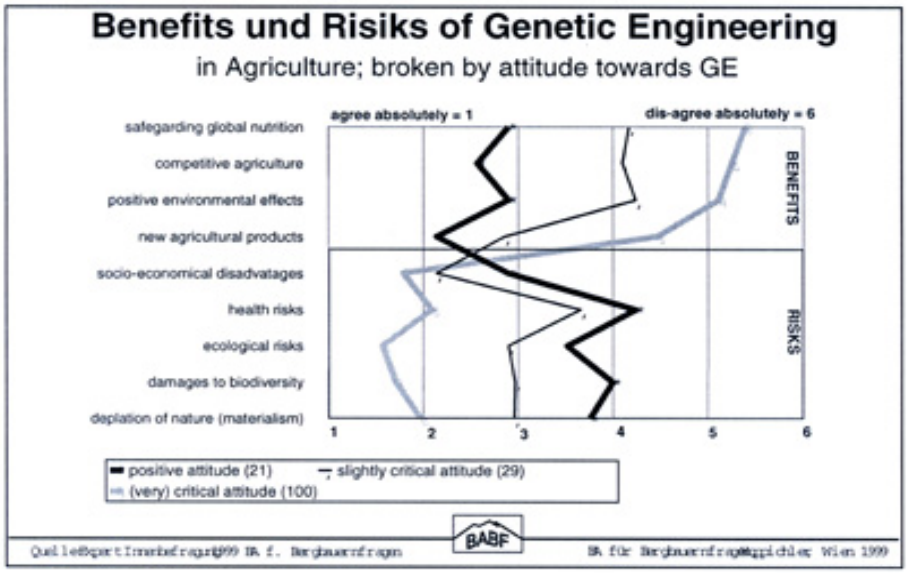
- the relationship between the release of GMOs and the requirements of nature preservation (especially concerning the Natura 2000 network);
- public involvement in decision making;
- possible (indirect) effects on agriculture in environmentally sensitive areas;
- the requirements of GMO-free production in organic farming;
- ensuring GMO-free in-situ (on-farm) conservation of Plant Genetic Resources;
- evaluating possibilities of defining alpine and mountain regions as GMO-free areas;
- problems of implementation in the context of defining GMO-free areas.

The main target groups of this survey were competent persons in agricultural administration (at the level of the Federal Provinces and the regional Chambers of Agriculture), persons in environmental and/or nature protection administration[23] (including the administration of protected areas), teachers at agricultural schools (mainly plant breeding), researchers and scientists (biology, technology assessment, biotechnology), environmental NGOs (environment and nature protection), competent persons within the administration of organic

farming (organic farmers' associations, extension service, controlling institutions), politicians (with responsibilities and activities in environment and nature protection at Federal Province level), persons responsible for consumer affairs (Chamber of Labour) and food safety.[24]

A questionnaire was distributed among 268 experts, who were at the same time personally contacted by phone. After receiving general information, they were asked for their personal opinion (not the opinion of their respective administrative or political institutions). 152 persons responded. The majority of the respondents had a critical view of genetic engineering. 67% defined themselves as critical or very critical towards its agricultural application. Only 14% were in favour of the technology and 19% of the experts defined themselves as slightly critical.

Figure 1:

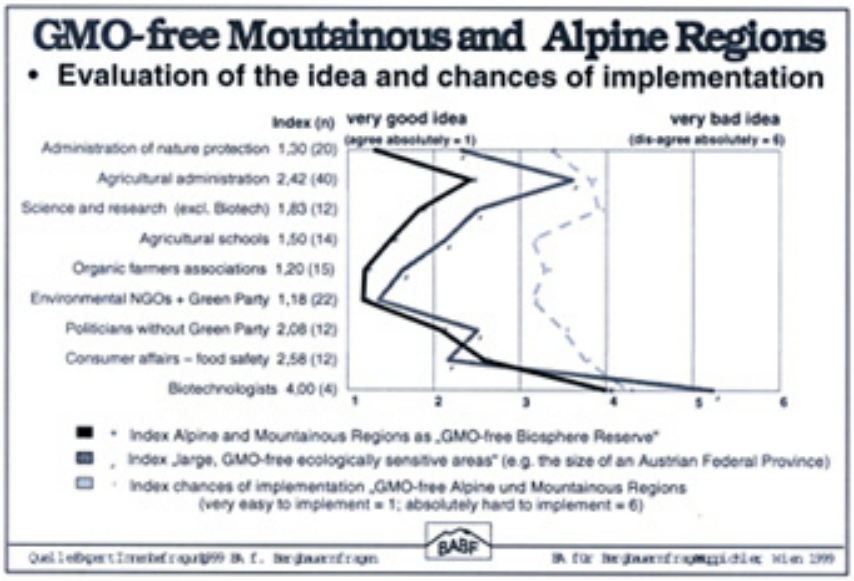


The main results:

- The relationship between protected areas and the application of genetic engineering in agriculture needs to be clarified. 75% of the responding experts think that the use of GMOs causes a significant disturbance in areas of nature protection. They call for a ban on releasing GMOs to areas of nature protection and adjoining areas.
- The concept of defining "large, GMO-free ecologically sensitive areas (e.g. the size of an Austrian Federal Province)" was supported by the majority of the experts (73%). They are relatively convinced that this concept could be argued within the framework of EU regulations. However, some of the agricultural administration staff and some groups of scientists were strongly opposed to this idea.
- The idea of defining the whole mountainous and alpine region of Austria as a "GMO-free Biosphere Reserve" with the following declared objectives:
    - to establish a model region for an alternative path of technological development in agriculture;
    - to implement sustainable agricultural development in combination with nature conservation;
    - to protect mountain and water resources by extensive land use;
    - and to create an area for counterbalancing and regeneration in case of unforseeable negative developments caused by genetic engineering;

was rated as a good or very good idea by 78% of the experts. The concept of "GMO-free Alps as a Biosphere Reserve" met with even greater acceptance than the abstract notion of "large, GMO-free ecologically sensitive areas". (Only experts in the field of biotechnology and persons very much in favour of biotechnology disagreed.) However, the response regarding the chances of implementing this concept within the EU framework was not very conclusive since most experts ticked the middle of the rating scale.

Figure 2:



- There are great deficits in relation to the needs of organic farming. 89% of the respondents called for GMO-free areas for breeding and propagating organic seeds.
- As main strategies for assisting organic farming in coping with the problems of genetic engineering, the experts recommend to support GMO-free production through agricultural environmental programs (60%) and through regional food processing and marketing structures (60%), followed by defining GMO-free areas for seed breeding and multiplying (57%) and demarcation of "large, GMO-free ecologically sensitive areas" (also 57%). In response to the question as to who should bear the additional costs of analyses to ensure freedom from GMOs, 42% of the experts tend towards the "polluter pays" principle and claiming compensation from the seed industry. Only experts in the field of organic farming favour the more realistic scenario of refunding from public budgets (66%) (all percentages multiple responses) (see Table 1).
- The great majority of experts are of the opinion that the in-situ conservation and on-farm management of Plant Genetic Resources should be GMO-free.

Tabel 1: Recommendations of strategies for assisting organic farming in coping with problems of genetic engineering (multiple responses)

(responding experts n=150) Strategies for assisting organic farming	**num. of answ.**	**% of answers**	**% of responding persons**		
			Total	**Organic. **n=15**	**Agricult. ***n=41**
GE-free production - supported through ÖPUL*	95	14,7	**62,5**	73,3	46,3

GE-free prod.-supported through regional marketing	91	14,1	**59,9**	66,7	51,2
With regard to regions:					
large, GMO-free areas (e.g. the size of Federal Province)	87	13,4	**57,2**	86,7	36,6
GMO-free areas for breeding and propagating	86	13,3	**56,6**	73,3	39,0
GMO-free areas with >10% proportion organic agric.	68	10,5	**44,7**	80,0	24,4
With regard to costs:					
Seed industry has to pay for costs of analyses	64	9,9	**42,1**	26,7	31,7
Public budgets have to pay for costs of analyses	41	6,3	**27,0**	66,7	22,0
Other strategies:					
Legal administered labeling, (seems to be enough)	39	6,0	**25,7**	13,3	36,6
Organic farmers assoc. should conduct test cases	28	4,3	**18,4**	13,3	14,6
Other strategies	14	2,2	**9,2**	20,0	4,9
TOTAL	**647**	**100**	**425,7**	**547**	**339**

* Austrian Programme on an Environmentally sound and Sustainable Agriculture (Agro-environmental progamme)
** Organic = Organic farmers associations
*** Agricult. = Agricultural administration

During the design of the study and as a result of some face-to-face expert interviews it became obvious that the discussion on deliberate release and placing on the market of GMOs is overlayed by a basic conflict on property rights: whether people who are against deliberate releases and GM foods are entitled to the genetic integrity of their "natural" environment or whether scientists and industry who are in favour of genetic engineering have the right to impose the burden of GMOs on the environment, regardless of obvious evidence of environmental damage.

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CITATIONS

[1] "GMO-free area" means a geographical area where no deliberate releases of Genetically Modified Organisms (GMOs) into the environment and no use of GMOs as seeds take place. This does not necessarily include the marketing of foods and feed, as long as these activities do not result in the reproduction of GMOs or as long as there is no known other environmental risk. Thus GMO-free areas are not thought to be an alternative concept in relation to comprehensive environmental risk assessment but an additional concept of risk minimizing and/or risk management. (see HOPPICHLER 1998b, 1999).

[2] see LOIBL / STELZER 1997. In February 1999 the European Parliament adopted its position at first reading on the proposal for a European Parliament and Council directive on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC. The following amendment in connection with the notification for placing on the market was included: "The competent authority, when granting consent, can impose additional conditions for the protection of environmentally sensitive areas. It shall inform the Commission and the other Member States of this immediately, stating the reasons." The recommendations for the second reading (February 2000) did not refer to this amendment any more since the Council's Common Position (EC) No 12/2000 stated in Article 18 (3c) that "the written consent ... shall, in all cases, explicitly specify:…(c) the conditions for the placing on the market of the product, including any specific condition of use, handling and packaging of the GMO(s) as or in products, and conditions for the protection of particular ecosystems/environments and/or geographical areas." There are also some changes in Annex IV, like provisions concerning the "description of the geographical area(s) and types of environment where the product is

intended to be used within the Community, including, where possible, estimated scale of use in each area;" and with regard to additional information (in accordance with Article 12), "proposed restrictions in the approved use of the GMO, for example where the product may be used and for what purposes".

[3] In February 2000 the European Commission published a Communication on the Precautionary Principle (COM (2000) 1). In this paper the principle is defined more narrowly and as particularly relevant mainly to the management of risk. Although the communication mentions Article 174 as the only explicit reference in the Treaty to the precautionary principle, interestingly it does not cite the full Article including the environmental conditions in the various regions of the Community which, from our point of view, is an important criterion for defining the precautionary principle. Before this the precautionary principle had been introduced in the White Paper on Food Safety (COM (1999) 719) as a guiding principle in risk management, which was criticised recently by the European Economic and Social Committee as "not seeming to resolve the matter entirely", because "it is well known that scientists have to deal with the question of doubt." (OJ C204, 18.7.2000, p. 24).

[4] In the German version, the so called "environmental risk assessment" is translated as "Umweltverträglichkeitsprüfung" ("environmental impact assessment").

[5] Some efforts to define environmental sensitivity have been made especially in connection with the environmental problems of trans-European road transport. The latest initiative was an announcement by the Commission in May 2000 to submit a "Communication on transport in environmentally sensitive areas (the Alps and the Pyrenees)" by the end of the year (COM (2000) 257).

[6] The term "environmentally sensitive areas" may be used for the Less Favoured Areas Scheme as part of EU rural development policy (see FISCHLER 1998).

[7] As a recent approach dealing with differences and diversity of ecosystems also see Norway/UN Conference on the Ecosystem Approach for Sustainable Use of Biological Diversity (http://chm.naturforvaltning.no/Trondheimconf.htm).

[8] Surprisingly enough, in environmental risk assessment of GMOs with regard to biodiversity we do not even know all components of the targeted system in question, let alone their meaning.

[9] Citing Altieri (1998 - www.pmac.net/miguel.htm): "As long as transgenic crops follow closely the pesticide paradigm, such biotechnological products will do nothing but reinforce the pesticide treadmill in agroecosystems, thus legitimizing the concerns that many scientists have expressed regarding the possible environmental risks of genetically engineered organisms."

[10] However, some exceptions are possible. An example: Since HILBECK et al. (1998) pointed out effects of transgenic Bt corn on lacewings and since LOSEY et. al (1999) demonstrated the possible harm of transgenic pollen from Bt corn to some species of butterflies, there has been a lot of discussion on the possible effects of Bt plants on non-target organisms. As HILBECK et al. (2000) summarized, very few studies on insects have been published so far which could serve as a basis for regulatory processes. Especially concerning bees, only two studies are available. In the first study, bee-larvae were fed pure pollen (although larval bees normally cannot digest pure pollen). The second (unpublished) study accounts for this uncertainty; the pollen was therefore provided via worker bees. This study is still in progress in Germany. So there is no scientific evidence till now that Bt pollen cannot affect the biological reproduction of bees.
This question may be crucial under the relatively harsh climatic conditions of the Alpine regions, since in the major Alpine valleys, maize pollen is one of the main sources of larval feed for the reproduction of bees in autumn and spring. Especially the last generation of bees in autumn is quite sensitive with regard to feed and depends on a special hormonal constitution to survive winter time.

[11] The (British) Advisory Committee on Novel Foods and Processes (ACNFP Feb. 1999) says with regard to certain antibiotic resistance marker genes in cotton that: "In the production of novel foods or the exploitation of novel processes, we open opportunities for microbial evolution that would not otherwise exist. The production of large numbers of crop plants increases enormously the biomass of resistance genes. We cannot predict what the effect of such amplification will be…"; the question remains what kind of measures we could take to react to this possible new evolution. An area-specific approach to create an overall counterbalance could be one pragmatic

answer. Furthermore, we could take into account regionally diverse needs concerning environment and biodiversity (see HASLBERGER 2000).

[12] See EPA FACT SHEETS.

[13] Meanwhile the Cartagena Protocol on Biosafety was negotiated in January 2000 and signed in May 2000 in Nairobi. The Cartagena Protocol on Biosafety provides a framework, based on the precautionary principle, for the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health and specifically focussing on transboundary movements. In the preamble the precautionary approach (contained in Principle 15 of the Rio Declaration on Environment and Development) is reaffirmed and the crucial importance to humankind of centres of origin and centres of genetic diversity is recognized. Within the Cartagena Protocol the precautionary principle is specified in Article 1, Article 10.6 and/or Article 11.8 . As for recent discussions on the precautionary principle also see NATURE BIOTECHNOLY 18, 697 (18 July 2000).

[14] Sometimes in industrialized countries interpretations of this part of the CBD refer only to indigenous peoples in developing countries and it is implied that there is no relation to demands of local communities in industrialized countries. But this is a very narrow-minded view point.

[15] In order to enforce the role of effective public participation in decisions related to our environment the so called Aarhus-Convention (Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters) was signed by most of European Environmental Ministers in 1998. To meet the special requirements of public participation and information concerning modern biotechnology a special "GMO Task Force" under the lead of Austria was implemented . This aims at analysing the possibilities of a further development of the Convention concerning this issue (see GAUGITSCH 2000).

[16] "In-situ conservation" means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.
"On-farm conservation" means the conservation of Plant Genetic Resources through agricultural utilization, in particular the cultivation of species and varieties (e.g. traditional land races) on farms. "On-farm management" goes beyond mere conservation, as Plant Genetic Resources will also be improved and developed.

[17] PGR = Plant Genetic Resources; PGRFA = Plant Genetic Resources for Food and Agriculture.

[18] A special General Principle of IFOAM (International Federation of Organic Agriculture Movements) defined in 1999: Genetic engineering has no place in organic production and processing - Certification programmes shall set standards and make every effort including relevant documentation to ensure that no genetically engineered organisms or products thereof are used in organic production and processing. It is acknowledged that in exceptional cases, contamination by genetically engineered products can be beyond the control of the certified operator. Therefore organic products shall not be labelled as GE (genetic engineering) or GM (genetic modification) free in order to avoid potentially misleading claims about the end product. Any reference to genetic engineering on product labels shall be limited to the production method.

[19] In 1999 this passage was definitively included in Council Regulation (EC) No 1804/1999, supplementing Regulation (EEC) No 2092/91 on organic production.

[20] They are nominated by national governments and must meet a minimal set of criteria and adhere to a minimal set of conditions before being admitted into the World Network. Each Biosphere Reserve is intended to fulfil three basic functions: a conservation function (landscapes, ecosystems, species and genetic variation); a development function (to foster economic and human development which is socio-culturally and ecologically sustainable); a logistic function (support for research, monitoring, education and information exchange).

[21] Not only will they be a means for the people who live and work within and around them to attain a balanced relationship with the natural world, they will also explore how to meet the needs of society, as a whole, by showing the way to a more sustainable future (as for mountain research see PRICE 1995).

[22] In the second, empirical part of the study another appraisal was made by SCHERMER (1999): GMO-free areas as an alternative option of technology development.

[23] In Austria most issues concerning agriculture, environment and nature protection (especially protected areas) come under the responsibility of the nine Federal Provinces (Bundesländer).

[24] In the course of analysing the resulting data, the target groups had to be restructured a little. As biotechnologists did not fit the profile of other scientists, they had to be separated. The same thing happened with politicians from the Green Party. They showed the same profile as members of environmental NGOs and were therefore integrated into this group.

Browsing Classification: Agriculture: Production Cultures and Plant Genetics
Agriculture: Cultures de Production et Plants génétiques
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