Publications of the Academy of Finland 3/08

Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms (ESGEMO)

Evaluation Report

Academy of Finland
Research funding and expertise

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Evaluation Report

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Contents

Description

Publisher	Academy of Finland	Date 13 May, 2008
Author(s)	Evaluation panel	
Title	Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms (ESGEMO)	
Abstract	In November 2002, the Board of the Academy of Finland decided to launch a research programme on the environmental, societal and health effects of genetically modified organisms (ESGEMO) with the aim of increasing basic knowledge of gene flow between GMOs and natural populations in and between different organisms, developing tools for risk assessment and enhancing multidisciplinary collaboration. Ten research projects were funded by the Academy of Finland, the Ministry of Agriculture and Forestry, and the Ministry of the Environment for the years 2004–2007. The programme was funded with the total of 3.6M€. In 2008, after the termination of the funding period, an international panel, consisting of four experts and appointed by the Academy of Finland, evaluated the success of the programme in fulfilling the objectives set for it in the programme memorandum. The added value and impact, interdisciplinarity, applicability of research, networking and dissemination of results were also evaluated against the starting points of the programme and the funding volume. The evaluation was made on the basis of the evaluation material in-cluding annual reports and self-evaluations of the research projects and coordination, publications by the projects and interviews with the Programme Steering Committee, coordination, project leaders and re-searchers. The panel concluded that many of the scientific goals of ESGEMO were achieved, though the quality of the scientific outputs varied greatly among the projects. Considering the time of four years, the funding volume was seen as inadequate for building up collaborative links and relationships. However, the inter- and multidisciplinarity of the programme were clearly seen as resulting in a greater integrated capacity for studying the societal and environmental implications of GMOs in Finland. The impact of the programme in creating a pool of researchers and experts with relevant knowledge of and experience in GMOs was also evaluated being important. The results of the ESGEMO evaluation are presented in this report. The report also includes the panel's recommendations for the future.	
Key words	ESGEMO; genetically modified organisms; GMO; environmental, societal and health effects; research programme; evaluation	
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Julkaisun nimi	Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms 2004–2007 (ESGEMO). Evaluation Report	
Tiivistelmä	Marraskuussa 2002 Suomen Akatemian hallitus teki päätöksen muuntogeenisten organismien ympäristö-, yhteiskunta- ja terveysvaikutukset käsittävän tutkimusohjelman (ESGEMO) käynnistämisestä. Ohjelman tavoitteena oli tuottaa lisää perustietoa geenien leviämisestä muuntogeenisten ja luonnonpopulaatioiden ja eri organismien välillä, kehittää riskinarviointityökaluja sekä parantaa monitieteistä yhteistyötä. Suomen Akatemia, maa- ja metsätalousministeriö sekä ympäristöministeriö myönsivät rahoitusta kymmenelle tutkimusprojektille vuosiksi 2004–2007. Ohjelmalle myönnettiin rahoitusta yhteensä 3.6M€. Rahoituskauden päätyttyä, vuonna 2008, neljästä asiantuntijasta koostuva kansainvälinen arviointipaneeli arvioi ohjelman onnistumisen ohjelmamuistioon kirjattujen tavoitteiden saavuttamisessa. Ohjelman luoma lisäarvo ja vaikuttavuus, tutkimuksen monitieteisyys ja tulosten sovellettavuus, verkostoituminen sekä tiedon välittyminen arvioitiin myös ohjelman lähtökohtiin ja rahoituksen määrään nähden. Arviointi tehtiin mm. tutkimusprojektien ja koordinaation vuosi- ja itsearviointiraporttien, julkaistujen tutkimustulosten sekä ohjelmaryhmän, koordinaation, projektien johtajien sekä tutkijoiden haastattelujen pohjalta. Tuloksissaan paneeli arvioi ESGEMO:n saavuttaneen monet sille asetetut tavoitteet, vaikkakin tulosten tieteellisen laadun katsottiin vaihtelevan suuresti projektien välillä. Rahoituksen määrän ja rahoituskauden pituuden arvioitiin olleen riittämättömät kattavan yhteistyöverkoston ja yhteyksien rakentamiseen. Siitä huolimatta ohjelman monitieteisyyden ja tieteidenvälisyyden nähtiin selvästi lisänneen mahdollisuuksia tutkia GMO:ien yhteiskunnallisia ja ympäristövaikutuksia Suomessa. Ohjelman vaikutusta ajankohtaisen tiedon omaavan asiantuntijajoukon kartuttamisessa pidettiin myös tärkeänä. Tässä raportissa esitetään arvioinnin tulokset sekä paneelin antamat suositukset tulevaisuutta ajatellen.	
Asiasanat	ESGEMO; geenimuunnellut organismit; GMO; ympäristö-, yhteiskunta- ja terveysvaikutukset; tutkimusohjelma; arviointi	
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Preface

Since the 1980s, researchers have been enhancing the agronomic traits, such as herbicide tolerance, resistance to plant pathogens or herbivores, of crop plants by using GM technology. In addition to crop plants, GM trees, microbes, fish and domestic animals are also in the interest of current research on agriculture, forestry and environmental technology.

These recent attempts to improve living organisms through genetic engineering have launched a lively public debate internationally. Concern about potential risks has focused on three types of issues: (i) the gene flow and environmental impact of GMOs, (ii) the health risks of the food and products derived from them, and (iii) the ethical questions related to GM technology and the production and use of GMOs. The scope of application of the GMOs is extraordinarily wide and thus collaboration between ecologists, molecular biologists and social scientists is essential for assuring the safe use of GMOs.

In 2001, the Academy of Finland organised a one-day workshop with the aim of exploring the needs of new knowledge in the field of GMOs in Finland. As a result, the workshop found the present state of knowledge on GMOs inadequate and identified several essential research areas that should be developed in Finland. In 2002, the Academy made a decision to launch a research programme on Environmental, Societal and Health Effects of Genetically Modified Organisms (ESGEMO) aiming to increase the basic knowledge on gene flow between GMOs and natural populations in and between different organisms, to develop tools for risk assessment and to enhance multidisciplinary collaboration.

In the programme, ten research projects were funded by the Academy of Finland and the Ministries of Agriculture and Forestry, and the Environment with a total of 3.6M€ for the years 2004–2007. The success of the programme in attaining its objectives was evaluated after the funding period in 2008. The evaluation was done by an international evaluation panel set up by the Academy of Finland and consisting of four impartial experts. The panellists were Dr Jeremy B. Sweet from Cambridge, UK (Chair), Prof. Allison A. Snow from the Ohio State University, USA (Vice Chair), Dr Jane Lecomte from Université Paris-Sud, France, and Prof. Philip Macnaghten from the Durham University, UK.

The panel was asked to assess the following main aspects of ESGEMO:

- Success of the implementation of the programme goals and objectives
- Contribution to researcher and expert training, collaboration and networking of the researchers
- The scientific quality and applicability of research
- Recommendations for the future.

This report presents the results of the evaluation and the recommendations for the future suggested by the evaluation panel.

March 2008

Susanne Heiska
Programme Coordinator

1 Introduction

The use of genetically modified organisms (GMOs, organisms modified with gene technology) is a very topical issue which has given rise to a lively public debate in many European countries and internationally. Public concerns relate to the safety and sustainability of the new technologies as well as to ethical questions related to them. A high level of expertise in and information on the impacts of GMOs is crucial for their safe use and public acceptance, and thus questions concerning the ecological, health and societal effects of GMOs need to be addressed in a scientifically sound manner.

1.1 Background

To illuminate the effects of GMOs on our environment and society and to explore the potential needs for research in this field in Finland, the Academy of Finland, the Finnish Environment Institute and the Advisory Board of Biotechnology jointly organised a one-day exploratory workshop on 5 November 2001 on "Genetically Modified Organisms – Impact on the Environment and Society". Nearly a hundred participants attended the workshop and 72 of them took part in six working groups discussing the subjects from different points of view: agriculture (microbes, plants, fish and animals), forestry and environmental technologies. In conclusion, the workshop found the present state of knowledge of GMOs inadequate and identified several essential research areas that should be developed in Finland.

Based on the results of the workshop, the Board of the Academy of Finland made a decision at its meeting on November 2002 to launch a research programme on the environmental, societal and health effects of genetically modified organisms (ESGEMO) for the years 2004–2007 with the aim of increasing the basic knowledge of gene flow between GMOs and natural populations in and between different organisms, developing tools for risk assessment and enhancing multidisciplinary collaboration.

1.2 Organisation of the programme

The ESGEMO programme was steered and directed by the Programme Steering Committee with the help of the Programme Coordinator. The Steering Committee was appointed by the President of the Academy of Finland in 2003. The Steering Committee consisted of representatives of the Academy's Research Councils, other funding bodies and experts (Annex 1). As the composition of the Academy's Research Councils changed during the programme, the Steering Committee was reappointed in 2004 and 2007. The Steering Committee was responsible for the strategic planning of the programme including the preparation of the follow-up and evaluation and supporting and steering the coordination of the programme.

As a result of the bidding competition, the coordination was outsourced to the Department of Applied Biology of the University of Helsinki. Dr Reetta Kettunen started as part-time coordinator in 2003. The position was reannounced in 2006, and Dr Karoliina Niemi continued as part-time coordinator in May 2005. Due to the leave

of absence of Dr Niemi, Dr Sirpa Huuskonen continued as part-time coordinator in January 2007. Dr Susanne Heiska continued the locum post as full-time coordinator in January 2008. The Programme Coordinator, in close cooperation with the officers of the Academy of Finland, was responsible for the operational implementation of the programme. The role of coordination was especially strong in enhancing multidisciplinarity by organising the meetings, workshops and courses. Coordination also organised public hearings on GMOs and communicated with e.g. journalists and non-governmental organisations to arouse public debate that has generally been quiet in Finland.

1.3 Objectives of ESGEMO

The objectives of the programme were to

(i) create new knowledge on the environmental and health effects and potential risks of GMOs used in agriculture, aquaculture, forestry, and environmental applications, particularly in boreal conditions. Basic knowledge of related ecology and population genetics was also emphasised.

(ii) develop novel tools for research and assessment of the potential impacts of GMOs on the nature and its complex processes and enhance the training of researchers and experts.

(iii) evaluate the socio-economic and technological impacts of the use of GMOs, including ethical considerations and public acceptance of novel biotechnology. However, biomedical research or direct health effects of novel food or feed were not covered by the programme.

The results of the programme were aimed to be used by several stakeholders: consumers, industry, agriculture, aquaculture, forestry, as well as the scientific community. For achieving these objectives, multi- and interdisciplinary cooperation between researchers and projects in biological, economic, social and technical sciences was highly encouraged.

1.4 Research themes

Research covered natural and man-made ecosystems as well as cultivated plants. Furthermore, research on ethical issues, risk conceptions and public acceptance of novel biotechnology was also included in the programme.

1.4.1 Ecological and health impacts of the use of GMOs

The use of GMOs may cause complex, beneficial or undesired effects on populations, food chains and ecosystems. More basic knowledge on biological processes and interactions between processes and organisms is therefore needed for developing better methods of predicting and assessing the environmental and health effects of GMOs, particularly in boreal ecosystems. Under this heading, the following research fields were eligible:

- direct ecological impacts of the use of GMOs
- indirect ecological impacts, e.g. changing the functioning of the food chains
- impacts of monocultures, e.g. clonal plantations, on the biodiversity

- effects of introduced traits (not genes as such) on the natural or cultivated ecosystem
- health effects caused by the use of GMOs in terms of new pathogenic traits and altered microbial flora of humans, animals and soil
- co-effects of environmental changes and the use of GMOs
- development and application of realistic ecological models for better understanding of ecosystem effects which may result from new management practices in agriculture and forestry made possible by the use of GMOs.

1.4.2 Gene flows and interactions

The possible spread of GMOs depends on gene flow among individuals and populations, and of transfer by the vectors and susceptibility of recipient populations. Hence, the research should address the following topics, part of which can be studied with or without using GMOs.

- gene flows and interactions in and/or between different organisms (virus, fungi, microbes, plants, animals, and humans), populations, ecosystems including the analysis of health effects
- containment of GMOs
- inter-biotic processes and the selective value of introduced traits in natural populations
- monitoring the techniques of gene flow and interaction.

1.4.3 Ethical and socio-economic aspects connected with the development and application of GMOs in nature

The development and application of GMOs may have a variety of new impacts on nature and society. The state and civil society perceive these impacts as a matter of policies to be legitimated and pursued by a variety of actors. This topic was further elaborated by the following thematic research areas:

- ethical considerations and public perceptions on the use and development of GMOs
- political rhetoric, policy options and the role of experts in the development of GMO policies and utilisation
- the role of gene technology in inducing the socio-economic changes and development of other technologies, in industrial as well as in developing countries
- drivers of innovation and diffusion of environmental technologies using GMOs
- analysis of legislation and policies, including domestic and EU legislation, and international agreements, regulating the utilisation of GMOs.

1.4.4 Risk assessment and management of GMOs

The objective of an environmental risk assessment is, on a case-by-case basis, to identify and evaluate potential adverse effects, direct or indirect, immediate or delayed, on the environment and human health of the deliberately released GMOs. The environmental risk assessment should be conducted with a view to identifying whether there is a need for risk management and, if so, the most appropriate methods to be used:

- the methods and theory of predictive risk assessment
- evaluation of risk management practices.

1.5 Research projects in the programme

The ESGEMO call was carried out in two steps in 2003. The deadline for the plans of intent was 15 May 2003 and for the full proposals 15 September 2003. (Annex 7) A total of 31 letters of intent were submitted by the deadline. Twenty-four of the applications were for individual projects and seven were for the sub-projects comprising three consortia. At this stage, a total of 12.4M€ was applied for.

Twenty of the best applicants were invited by the Steering Committee to submit their full proposals. The full proposals included 17 applications, of which ten applications were for individual projects and seven applications for three consortia. The total funding applied in this stage was 6.4M€.

An international review panel, consisting of three panellists (Prof. Pere Puigdomenech, Institut de Biologia Molecular de Barcelona – CSIC, Spain, as Chair, and Dr Rosemary Hails, Center for Ecology & Hydrology, (CEH), UK, and Dr Phil Macnaghten, Institute for Environmental Philosophy and Public Policy, UK, as members) evaluated the scientific quality of the applications at its meeting on 29th November 2003. In addition, two of the applications were evaluated by external experts.

The Steering Committee ranked the applications based on the evaluation by the panel and the external experts and made recommendations for the funding bodies. Funding was finally granted to ten projects for the years 2004–2007. Three of the funded projects comprised a multidisciplinary consortium ARGUE. For the list of funded projects and funding, see Annex 2.

According to the Academy's plan of equality, both genders are recommended to have a minimum representation of 40 per cent in the research programmes. In all, the number of group leaders, sub-group leaders, post docs, PhD students, MSc students and assisting personnel funded by ESGEMO had a total of 58, of which 57 per cent were female and 43 per cent male (Fig. 1).

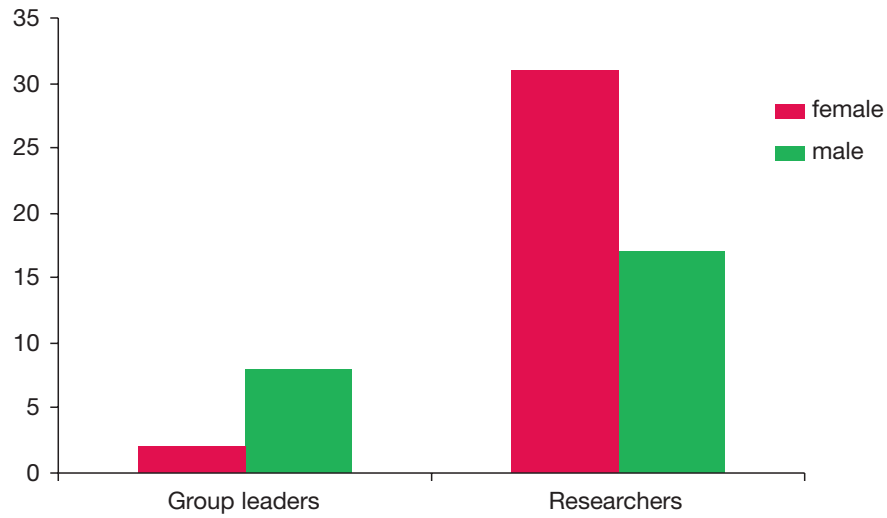

Figure 1. Distribution of the group leaders and researchers (incl. sub-group leaders, post docs, PhD students, MSc students and assisting personnel) by gender. The bars represent the number of persons funded.

1.6 Programme funding

The programme was funded by the Academy of Finland (3.0M€), the Ministry of Agriculture and Forestry (140,000€) and the Ministry of the Environment (136,000€). Funding allocated for the coordination was 270,000€ for the years 2003–2008. The funding for the coordination included the costs of the final evaluation. An additional funding of 70,000€ was allocated for workshops and travelling and enhancing the role of research concerned with ethical and socio-economic aspects connected with GMO's. For the distribution of the funding in the field of research covered by ESGEMO, see Fig. 2. In all, the funding of the programme totalled 3.6M€.

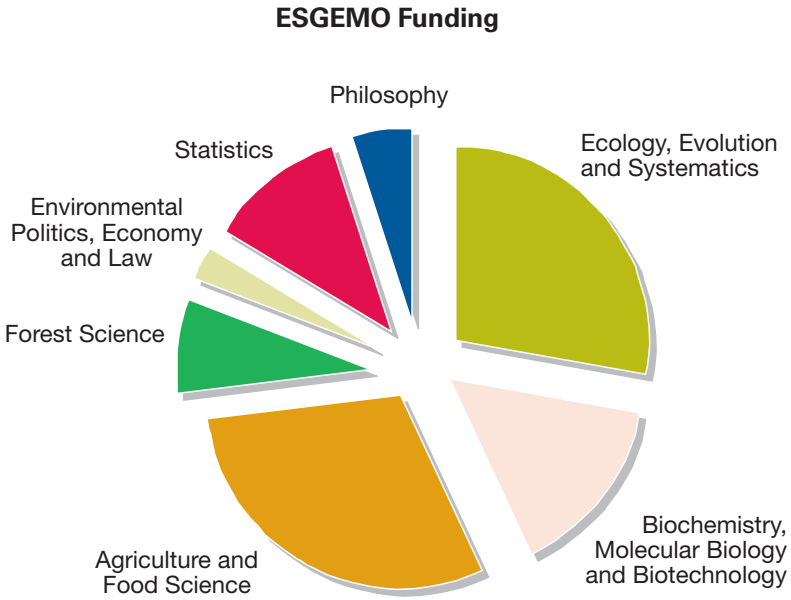

Figure 2. Distribution of the funding of the research projects in the discipline covered by ESGEMO.

2 Evaluation procedure

2.1 Introduction

The objective of the evaluation was to assess to what degree the ESGEMO Research Programme succeeded in fulfilling the objectives originally set for it in the Programme Memorandum. Of specific interest were the programmatic approach, added value and the programme impact, interdisciplinarity, the applicability of research, networking and dissemination of results.

2.2 Scientific evaluation of the programme

The Academy of Finland appointed an international evaluation panel in October 2007. The members of the evaluation panel were Dr Jeremy B. Sweet from Cambridge, UK (Chair), Prof. Allison A. Snow from the Ohio State University, USA (Vice Chair), Dr Jane Lecomte from Université Paris-Sud, France, and Prof. Philip Macnaghten from the Durham University, UK.

In the evaluation, the panel assessed the programme as a whole and reflected especially the following issues (Annex 3):

- Establishment of the research programme
- Scientific quality of ESGEMO
- Success of the implementation of the programme goals and objectives
- Contribution to researcher and expert training, and promotion of research careers
- Collaboration and networking
- Applicability of research and importance to end-users
- National and international impact of the programme
- Recommendations for the future

The evaluation material (Annex 4, 5) was collected during the whole duration of the programme by the coordinator and sent to the panellists at the end of January 2008. The evaluation panel had its meeting on 26–28 February, 2008 in Helsinki at the Academy of Finland, Vilhonvuorenkatu 6. The panel work included examination of the reports, self-evaluation assessments, publications and other products of the programme as well as discussions with the members of the Programme Steering Committee, key stakeholders, researchers, and programme coordination during the panel's meeting. For the programme of the panel meeting, see Annex 6.

3 Results of the evaluation

3.1 Establishment of the research programme

The panel of reviewers applauded the suitability and topicality of the programme and its relevance to science and society.

The context to the research programme was a lively public and policy debate concerning the safety, sustainability and societal acceptability of GMOs in Europe. The ESGEMO programme was set up to add to knowledge of the impacts (incl. unanticipated effects) arising from the use of GMOs through the development of novel tools and assessment, and through new forms of collaboration between ecologists and those developing GMO technology. Given the political, social and ethical sensitivity of the issue, it was decided to embrace social sciences and philosophy to foster an integrated and multidisciplinary approach.

The aims and goals of the programme were excellent in that they were a) responsive to a relevant policy agenda, b) sought to add to knowledge of the environmental impacts of GMOs, c) aimed at improving novel interdisciplinary collaboration including between and across the social and biological sciences, and d) designed to build capacity at a national level to inform decision-making on potential agricultural and forestry uses of GMOs.

The level of funding (3.6M€) over a period of four years was recognised as inadequate in terms of resources and time. Four years was insufficient time to build the collaborative links and relationships necessary to undertake the research. The sum of 3.6M€ was an insufficient resource to develop new knowledge of and insight into such a broad range of topics. The decision to restrict the remit of the programme to research on the environmental effects of GMOs (rather than environmental and health effects as set out initially) was seen as a proper and appropriate response to what was already a rather overambitious set of objectives.

The application procedure took place in two stages involving a plan of intent, of which 29 were submitted in May 2003, followed by 20 full applications submitted in September 2003. In retrospect, this was an understandable yet modest response to the call. The lack of good responses from the social sciences was especially striking, with a couple of exceptions. The lack of economics and innovation studies was seen as a particular limitation. The level of effort in developing the preconditions necessary for the programme was seen as inadequate.

The level of effort in developing the preconditions and pool of applicants for the programme was seen as suboptimal. The panel suggests that there should have been further additional preparatory work aimed at a) attracting a broader range of applications from a wider range of disciplines b) fostering the conditions for genuine interdisciplinary collaboration, and c) focusing research on strategic and state-of-the-art questions. This could have included further preparatory workshops with international participation, an initial phase of 'scoping' research aimed at building interdisciplinary relationships, more stakeholder interaction to frame the questions for research, visits from the Steering Committee to Centres of Excellence in the biological and social sciences to encourage applications.

The gender balance across the programme varied with the status of the researchers. Most project leaders were male (8:2) reflecting the ratio of the applicants. However, at the level of sub-project leaders, postdoctoral researchers and postgraduate students the genders were more evenly matched (Fig. 1)

3.2 Scientific quality of ESGEMO

All ESGEMO research groups have active programmes and are well regarded in their respective fields, although most were new to the research themes of ESGEMO. The panel's evaluation of scientific outcomes of ESGEMO is based on the project leaders' self-evaluations of completed work, peer-reviewed and other papers already published or in preparation that are directly related to ESGEMO, interviews with seven of the ten project leaders, and interviews with a subset of researchers and graduate students. The panel's conclusions are based on currently available information, recognising that more publications will be forthcoming.

Many of the scientific goals of the ESGEMO programme have been met, although the quality of scientific outputs varied greatly among the projects. For some projects, peer-reviewed publications from ESGEMO will be widely cited by other researchers on an international arena. Examples of **published outputs with broad significance** include:

- Articles modelling the dispersal of transgenes from forest trees and possibilities for mitigating this process (Arjas' group).
- Articles on the effects of climate change and ozone exposure on plant-herbivore-predator interactions in Bt rapeseed (Holopainen's group).
- An article showing that transgenic lines of Gerbera daisies did not exhibit unintended traits such as cytotoxicity or novel metabolic fingerprints (Teeri's group).
- A modelling study of factors that affect the survival and persistence of transgenic fish (Kaitala's group).
- The edition on Genetic Democracy: Philosophical perspectives (Räikkä).

Several projects provided **new tools for research**:

- Retrotransposon markers for detecting infrequent gene flow and perhaps allowing the sources of unapproved GM Brassicas that are inadvertently introduced into European countries to be unidentified (Schulman's Group; no publications to date).
- Approaches for modelling dispersal of pollen from trees (AMELIE; Arjas' Group).
- An open-source website forum for encouraging productive debate and discussion (from Haila's group).
- The development of the PROTEE methodology to evaluate research projects to provide socially robust knowledge (Jørgensen's Group).

Other projects made significant contributions to scientific knowledge that is directly **relevant to Finland and other boreal regions**. These included studies of:

- Phenotypic characteristics of sterile and lignin-modified birch trees (Häggman's and Keinänen's groups)
- Persistence of volunteer Brassicas and potatoes (Schulman's Group)
- Control of invasions by Colorado potato beetle with Bt potato (Kaitala's Group).

In contrast, the scientific outputs of several projects are limited to date due to reasons such as:

- Not enough time to complete the proposed research (need for better planning)
- Loss of key personnel or lack of data (e.g. due to vandalism or lack of expected collaboration)
- Insufficient experience with environmental, field-based research
- An emphasis on molecular biology studies with minimal relevance to environmental risk analysis
- Insufficient time to develop interdisciplinary collaborative relationships.

The panel felt that it was unfortunate that several projects involved searching for random, unintended effects of transgenes rather than impacts with ecological consequences. Such unintended differences, if found, could be attributed to position effects that are not especially relevant to risk assessments, if the plants have not already been screened and optimised for commercial use. Although it is useful to show that no negative effects of transgenes were found, other questions about the environmental consequences of particular transgenes are more urgent. Investigators also tended to be less enthusiastic about publishing these negative results.

The panel felt that greater involvement of ecologists in framing questions and designing research approaches would have been helpful for planning projects with greater relevance to risk assessment. For example, it is more valuable to test for the ecological effects of novel traits that have greater biotic activity, such as pesticidal proteins and traits associated with fitness or invasiveness, than to test for unexpected effects of transgenes that confer sterility or metabolic differences. It would also be desirable to include more than one ecologist in the review of research proposals for future funding.

In conclusion, the volume of published results that can be directly attributed to the ESGEMO programme and its goals appears to be satisfactory at the time of this evaluation. However, the international significance of these publications does not appear to be strong in many cases. It will be possible to obtain a more thorough view of the programme's outputs after the final compilation of peer-reviewed papers is available. Most of the original ESGEMO research themes were addressed by one or more projects, but the small size and short time-frame of the ESGEMO project has limited its overall impact.

3.3 Success of the implementation of the programme goals and objectives

The programme achieved the following major objectives:

a. New knowledge on plant responses:
   - Effects of sterility genes on growth of birch
   - Effects of Bt genes on endogenous plant responses to insect attack
   - Lack of pleiotrophic and unintended effects associated with novel genes in Gerbera, birch and Brassica.

b. New tools:
   - Development of models to determine gene flow in forests and models for assessing invasiveness
   - Molecular tools for characterisation of crop and varietal identity

– A website forum for allowing public discourse and discussion of issues associated with GMOs.

c. Other new knowledge: Analysis and understanding of the regulatory system in Finland and its limitations in comparison with other systems.

Functioning of the programme: Generally the programme operated as intended in the initial planning with good interaction between scientists, regular meetings, workshops etc, though the time and funding constraints limited these to some extent. Reliance on PhD students has meant that some projects have been hampered by them leaving for other posts. Some projects have failed to complete their work within the time frame and the publication of results has been delayed.

Added value: Involvement in the programme allowed all participants to develop a broader understanding of GMO issues and the implications of the research results and studies. The multidisciplinarity of some projects and the programme resulted in interactions between different disciplines both within and between projects, e.g. between molecular biologists and ecologists, natural sciences and social sciences. Research students and post docs particularly mentioned the added benefits of being involved in a programme of this scale and the interactions with people in other projects.

Some projects provided knowledge that was of value outside the immediate scope of the programme. For instance, the project of Dr Holopainen explored interactions between Bt plants, industrial pollutants and elements of climate change.

Enhancing inter- and multidisciplinarity in research: The programme had a mix of social and natural sciences from several disciplines, which allowed:

- Development of a better understanding of social issues and communication requirements in scientists
- Development of a better understanding of biological and environmental issues by social scientists
- Good interactions between ecologists and molecular biologists
- Good interactions between mathematical modellers and biologists.

This has resulted in Finland now having a greater integrated capacity for studying the social and environmental implications of GMOs and raising the profile of Finnish R&D capacity within the EU.

Scientific and administrative coordination:

- The general functioning of coordination was good and effective. However, the low level of funding for coordination meant the appointment of part-time coordinators who often worked in more than one job, and a high turnover of coordinators.
- Communication with the public was not well coordinated at the programme level and was often delegated to individual projects.
- Projects were generally well coordinated and conducted, but several projects did not complete their work within the time frame and have had little time for the publication of results.
- The limited funding meant that projects used PhD students instead of post docs, which resulted in some delivery problems due to staff leaving.

3.4 Coordination of the programme

A part-time coordinator was allocated to the programme for its duration. The project leaders interviewed considered that the coordination was good and supportive. The coordinators brought the different research groups together through seminars, workshops, courses and other events, and enabled fruitful discussion between biologists (molecular biologist and ecologists), modellers and social scientists. This point was valued by researchers coming from different research fields who did not have "the same language". At the regular meetings, people involved in the programme came to know each other and established a rapport. The courses for PhD students on ecological risk assessment of GM plants and on bioethics were considered an added value of the coordination. However, the panel considered that interaction between the researchers was limited due to the duration of the programme. Four years is too short a period to build up strong collaboration between different research areas and disciplines. Moreover, the panel regrets a lack of exchange between the programme and the general public and a lack of people attending the public meetings. The programme should have anticipated public sensitivity to GMOs and prepared a communications programme in advance to inform the public and journalists of the nature and overall objectives of the programme, as well as of the objectives of individual projects, especially those which involved field releases. This may have prevented the destruction of a field trial.

The panel is conscious that this preparation would have increased the workload for the coordinators and recommend that a full-time coordinator with experience in communication should have been appointed. The panel was concerned that the coordinators felt they had to work more than their part-time allowance and that this resulted in having three different coordinators during the course of the programme.

3.5 Steering Committee

The Steering Committee was composed of expert members from university and National Public Health Institutes and members from the Academy's Research Councils (Biosciences and Environment, Culture and Society, Natural Science and Engineering, Health) and three Ministries (Agriculture and Forestry, the Environment, and Social Affairs and Health). Some of the members were also members of the Gene Technology Board. The panel recognised the range of expertise and experience of the members of the Steering Committee and also appreciated their open and frank comments on the conduct and outcomes of the programme. Their clear objective was to develop a research programme that would create a level of expertise and experience in evaluating and managing risks of GMOs by developing a multifaceted research programme considering a range of issues. The panel appreciates the range and depth of the projects within the programme and applauds the innovative decision to address societal aspects in the programme and to support consortiums with natural, mathematical and social sciences. The panel was impressed by the engagement of the Steering Committee throughout the programme and the way by which they actively participated in many of the different issues associated with genetically modified organisms. The panel regrets that many of the biological projects were led by molecular biologists and not by ecologists, which resulted in the

main focus of these projects being mainly oriented towards the plant phenotype level and not towards impacts at the population and community level. This also resulted in rather overambitious projects that were not feasible within the duration of the programme. The panel agrees with the Steering Committee that it was regrettable that no socio-economics projects were funded to fulfil the third objective of the programme to evaluate the socio-economic impacts of GMOs.

3.6 Contribution to researcher and expert training, and promotion of researchers careers

The programme gave an opportunity for several projects to appoint postgraduate research students and will generate several PhDs, which will establish these people with relevant expertise in their subject areas as well as in areas related to the study of GMOs. In addition, researchers at all levels gained useful knowledge and experience through the programme. It is difficult to foresee the future of GMO technology in Finland (and in Europe), and the panel considers that career development may be rather limited in this particular area. However, the programme applied and developed expertise from a wide range of disciplines so that the knowledge and skills developed are fairly broad and applicable across a range of related areas. Researchers will benefit from being associated with ESGEMO (it will strengthen their CVs), and their publications from the programme will be useful for promoting their careers in different scientific fields.

This programme has undoubtedly created a pool of researchers with relevant knowledge and experience who can be called on, if future studies of GMOs and similar or related technologies are required.

3.7 Collaboration and networking

There was evidence of novel collaboration and networking between research groups and disciplines, both within and across the ESGEMO projects, and more broadly at the national and international level.

Within the ESGEMO programme there was one major consortium, ARGUE, which included project leaders from three institutions, and expertise from a broad spectrum of disciplines including law, sociology, mathematics and biology. This was by far the most ambitious and innovative of the ESGEMO projects and the most radical in scope. Although there was evidence of good collaborative links having been developed, it was also evident that the full potential of the project had not been realised. More time and resources would have been necessary to realise the multifaceted objectives of the consortium overall.

There was evidence of a commendable degree of networking across the programme as a whole. The coordinator organised annual meetings for the researchers and project leaders and these have been identified, without exception, as enjoyable and productive. All participants expressed enthusiasm in attending these events as opening their disciplinary bound horizons to wider perspectives and modes of thinking. Additional seminars and workshops organised by the coordinator were also received positively.

The level of international collaboration was not as widespread as it might have been. Given the European context for the research programme it was surprising that there was not wider participation in European Commission Framework Programmes (the exception being Professor Haila and his participation in the Paganini project). The panel suggests that more intensive European collaboration should have been promoted through exchange visits and the coordination of international seminars.

There was collaboration with a variety of end-users including the Gene Technology Board, the Ministry of the Environment, the Ministry of Agriculture and Forestry, and the risk assessors at the Finnish Environment Institute. Collaboration took place through a high-level and well represented Steering Committee and through the Finnish Environment Institute and their participation in the ARGUE consortium.

Given the political sensitivity of the issue, it was imperative that the programme was communicated to external audiences in a proactive manner. Although the coordinator initiated a number of public and outreach events aimed at communicating the programme and its results to wider audiences, this was nevertheless seen as of a variable quality. The panel suggests that the Academy could have developed a more explicit and resourced media and communications strategy. In particular, the panel suggests that the coordinator and project leaders be trained in media skills (especially those involved in GMO field trails), that the coordinator work more closely with the project leaders in writing press releases and in developing public outreach strategies, and that external consultants be used to design and promote programme-wide public outreach events.

3.8 Applicability of research and importance to end-users

The Panel considered that the main application and value of the programme was the development of new research resources in Finland of value to a wide range of end-users involved in GMOs. The projects were variously involved in training people, developing research or specialist expertise, developing research capacity and new tools. The level of understanding and confidence in dealing with GMOs was increased. Thus ESGEMO has developed a platform that will provide support to decision makers in Finland in assessing the scientific and social implications of GMOs.

In addition, the website forum has shown that tools can be developed to inform and engage the public in discussions on GMOs.

4 Conclusions and recommendations for the future

a. *Communications*: GMOs are controversial and there is not universal acceptance of the need to conduct research on them, especially through field trials. The programme should have anticipated these sensitivities and prepared a communications programme in advance to inform people of the nature and objectives of the projects which involved field releases, as well as of the overall objectives of the programme.
b. *The original ideas and concepts* that formed the initial programme were appropriate and correct but needed more time to fine-tune them so that the detailed programme was more focused and applicable. It would have been more appropriate to phase the programme with initial pilot studies that could then be used to shape and direct the main projects. This phasing programme could have involved international workshops to align ESGEMO with other R&D programmes in Europe and elsewhere, and allowed partners to develop more international collaboration and participation in EU projects, etc.
c. *Coordination*: More resources should have been devoted to the coordination to allow appointment of full-time staff skilled in communication who could help with the publicity, promotion and social interaction that were required as well as with the other activities.
d. *Funding and time*: Both were limiting factors in allowing the programme to become more integrated and to achieve some of the scientific and other objectives.
   i) More time and resources should have been allocated to encourage more international exchange and visits so that ESGEMO would have been more integrated with other international and national research programmes.
   ii) Additional funding and time was needed to allow the integration of the sociological and scientific projects and studies.
   iii) More time and funding would have allowed PhD students to complete their PhDs and publish papers during the period of the project.
e. *Reports*: Since the project was relatively short, particularly in relation to some of the environmental studies where several years' data are required, it was unlikely that many papers would be written during the time of the project, most of them being products at the end of the project. This made evaluation of the projects more difficult for the panel. We recommend that, for projects of this type, it is more appropriate that project leaders provide final reports of their projects. These should be written in the style of scientific papers covering the majority of the work in each project.

f. *Training workshops and seminars*: The panel felt that it would have been appropriate to exploit the ESGEMO programme more by using it as a focus to allow more discussions with students and others on the interaction between the scientific and social issues associated with GMOs. In addition, there should have been more interaction (e.g. international workshops) to align ESGEMO with other R&D programmes in Europe and elsewhere and allowed partners to develop more international collaboration and participation in EU projects, etc. This would have put ESGEMO projects more into an international context and broaden the scope and outlook of researchers.

g. *New focuses*

i) Socio-economics: The panel feels that there should have been a more critical assessment of the role GMOs might play in the future development of Finnish agriculture and forestry and in relation to future food, energy, industrial materials and environmental requirements. There was no such socio-economic or geo-political assessment in the programme and thus there was no assessment of GMOs and their impacts on the context of future developments and trends, particularly against the background of climate change and major economic externalities.

ii) Anticipated effects: Many projects studied unanticipated effects associated with genetic transformations. However, it was felt that more work should have been focused on assessing anticipated risks associated with enhanced fitness and resistance to biotic stresses when introduced into major crop and tree species in Finland.

Forestry is the major land user in Finland and it was encouraging that several projects studied GM trees. However, the introduction of fitness genes to trees would also require more baseline studies to determine the effects on the receiving environments.

iii) Humanities: Because forests are so closely bound to the cultural, historical and mythical heritage of Finland, the panel feel that the consequences of GM trees for people's sensitivity need to be thoroughly explored.

iv) Regulation: The programme examined the regulatory system in Finland and found that it was fairly restricted compared with other European countries. Studies are required that explore how the processes could become more responsive to the agricultural/forestry and environmental needs of Finland, more transparent and allow greater public participation.

v) Environmental risk assessment: The generic approach developed in the programme was not considered appropriate considering the developments taking place outside of Finland. In order to develop ERA methods and skills a greater understanding of global scientific developments and more interaction with risk assessors and scientists working at the international level is required.

Annex 1. ESGEMO Steering Committee

Steering Committee 2003

Chair

Director General Lea Kauppi, Research Council for Biosciences and Environment

Vice Chair

Professor Marja Järvelä, Research Council for Culture and Society

Members

Professor Riitta Keiski, Research Council for Natural Sciences and Engineering

Professor Lars-Axel Lindberg, Research Council for Biosciences and Environment

Professor Pasi Puttonen, Research Council for Biosciences and Environment

Secretary General Markku Järvenpää, Ministry of Agriculture and Forestry
(Senior Adviser Leena Hömmö as his deputy)

Counsellor Tuija Talsi, Ministry of the Environment
(Senior Adviser Pasi Iivonen as her deputy)

Secretary General Irma Salovuori, Ministry of Social Affairs and Health

Project Manager Petri Ahlroth, Ministry of Agriculture and Forestry; Professor Erkki Haukioja, University of Turku; and Professor Matti Sarvas, National Public Health Institute, acted as expert members in the Steering Committee.

Scientific Secretaries Jan Bäckman, Research Council for Natural Sciences and Engineering; Sirpa Huuskonen, Research Council for Biosciences and Environment; Riitta Launonen, Research Council for Culture and Society; and Jukka Reivinen, Research Council for Health, took part in the preparatory work.

Steering Committee 2004–2006

Chair

Counsellor Leena Hömmö, Research Council for Biosciences and Environment

Vice Chair

Professor Eila Helander, Research Council for Culture and Society

Members

Secretary General Markku Järvenpää, Ministry of Agriculture and Forestry

Professor Riitta Keiski, Research Council for Natural Sciences and Engineering

Senior Adviser Jyrki Pitkäjärvi, Ministry of the Environment
(Senior Adviser Pasi Iivonen, Ministry of the Environment, as his deputy)

Professor Pasi Puttonen, Research Council for Biosciences and Environment

Professor Marja Järvelä, University of Jyväskylä; Director General Lea Kauppi, Finnish Environment Institute; and Professor Matti Sarvas, National Public Health Institute, acted as expert members in the Steering Committee.

Steering Committee 2007–2008

Chair

Counsellor Leena (Hömmö) Vestala, Research Council for Biosciences and Environment

Vice Chair

Professor Marja Tuominen, Research Council for Culture and Society

Members

Professor Pertti Mattila, Research Council for Natural Sciences and Engineering

Senior Adviser Tuula Pehu, Ministry of Agriculture and Forestry

Professor Paavo Pelkonen, Research Council for Biosciences and Environment

Senior Adviser Jyrki Pitkäjärvi, Ministry of the Environment
(Senior Adviser Pasi Iivonen, Ministry of the Environment, as his deputy)

Professor Marja Järvelä, University of Jyväskylä; Professor Pasi Puttonen, Finnish Forest Research Institute; and Professor Matti Sarvas, National Public Health Institute, acted as expert members in the Steering Committee.

Annex 2. ESGEMO projects and their funding

Jørgensen, Kirsten, Finnish Environment Institute
Assessment and regulation of the ecological effects of GMOs in the boreal environment a multidisciplinary approach (consortium ARGUE)
151,950€ for three years (funded by the Academy of Finland)

Arjas, Elja, University of Helsinki
Assessment and regulation of the ecological effects of GMOs in the boreal environment a multidisciplinary approach: Statistical modelling of the ecological effects of GMOs in the boreal environment (consortium ARGUE)
276,440€ for four years (funded by the Academy of Finland)

Haila, Yrjö, University of Tampere
Assessment and regulation of the ecological effects of GMOs in the boreal environment a multidisciplinary approach (consortium ARGUE)
136,000€ for three years (funded by the Ministry of the Environment)

Holopainen, Jarmo, University of Kuopio
Ecological and environmental constrains of direct and indirect defence in transgenic Bt plants non-target effects on multitrophic interactions
472,240€ for four years (funded by the Academy of Finland)

Häggman, Hely, University of Oulu
Ecological interactions and secondary metabolomics of genetically modified (GM) forest trees
249,880€ for four years (funded by the Academy of Finland)

Kaitala, Veijo, University of Helsinki
Ecological consequences of gene manipulation in organisms; a risk analysis approach
437,540€ for four years (funded by the Academy of Finland)

Keinänen, Markku, University of Joensuu
Environmental risks of birch genetically modified to be sterile
369,990€ for four years (funded by the Academy of Finland)

Räikkä, Juha, University of Turku
Genetic democracy: social and ethical implications of genetically modified organisms
159,990€ for three years (funded by the Academy of Finland)

Schulman, Alan, MTT Agrifood Research in Finland
GMOs and genetic pollution: tools and practices for *Brassica* and *Solanum* under Finnish conditions
502,410€ for four years (funded with 362,410€ by the Academy of Finland and with 140,000€ by the Ministry of Agriculture and Forestry)

Teeri, Teemu, University of Helsinki
Metabolic changes in genetically modified plants
503,700€ for four years (funded by the Academy of Finland)

Awarded to the research projects: Academy of Finland 2,984,140€; Ministry of Agriculture and Forestry 140,000€; Ministry of the Environment 136,000€

Annex 3. The Assignment for the Evaluation Panel

Evaluation of the Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms (ESGEMO)

The Academy of Finland has launched the evaluation process of the Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms. The scientific evaluation of the programme will be carried out by an international evaluation panel. The members of the evaluation panel are Dr Jeremy B. Sweet from Cambridge, UK (Chair), Prof. Allison A. Snow from the Ohio State University, USA (Vice Chair), Dr Jane Lecomte from Université Paris-Sud, France, and Prof. Philip Macnaghten from the Durham University, UK. With this assignment we, on the behalf of the Academy of Finland, confirm your membership in the evaluation panel of the ESGEMO Research Programme.

The objective of the evaluation is to estimate to which degree the ESGEMO Research Programme has succeeded in fulfilling the objectives originally set for it in the Programme Memorandum. Of specific interest are the programmatic approach, added value and programme impacts, interdisciplinarity, applicability of research, networking and dissemination of results.

In the Evaluation Report, the panel is expected to assess the programme as a whole and reflect especially the following issues:

1. Establishment of the research programme
   - suitability and topicality of the Programme Memorandum (2003) regarding to science and society
   - significance in the national and European (international) context
   - research projects funded and funding decisions in creating the necessary preconditions for the Programme.
2. Scientific quality of ESGEMO
   - scientific quality and innovativeness of the research
   - possible impacts of projects by consortia and themes
   - contribution to the development of research area.
3. Success of the implementation of the programme goals and objectives
   - concordance with the objectives of the research programme
   - functioning of the programme
   - added value of the programme
   - contribution to enhancing inter- and multidisciplinary in research
   - scientific and administrative coordination.
4. Contribution to researcher and expert training, and promotion of research careers
   - success to create new expertise, especially in societal sciences
   - programmatic value in creating inter- and multidisciplinary.
5. Collaboration and networking
   - has the programme increased or deepened cooperation
   - collaboration within the programme and with other Finnish groups
   - international cooperation
   - collaboration with end-users.

6. Applicability of research and importance to end-users
   - contribution to promoting applicability of research results
   - relevance and importance to end-users
   - influence on scientific and /or social development.
7. National and international impact of the programme
8. Recommendations for the future (incl. justification for the recommendations), e.g. how to input
   - programme concept
   - researcher training
   - internationalisation
   - science-society collaboration
   - new focuses of the research

The time and place for the panel work have been decided to be 26–28 February 2008, in Helsinki at the Academy of Finland, Vilhonvuorenkatu 6. The preliminary schedule for the panel is as follows:

25 February	Arrival in Helsinki, get-together dinner
26–28 February	Panel meeting at the Academy of Finland
28 February	Departure from Helsinki, late flights, after 4 pm

The work will include examination of the reports, self-evaluation assessments, publications and other products of the programme and possible discussions with the Programme Steering Committee, key stakeholders, researchers, and programme coordination during the panel's meeting. There will also be periods reserved for intensive work of the panel including the preparation and drafting of the Evaluation Report. Technical assistance will be provided during the visit.

Further details of the meeting will be sent to you later.

Sirpa Huuskonen / Susanne Heiska	Jaana Roos
ESGEMO Programme Coordinator	Senior Science Adviser
University of Helsinki	Academy of Finland

Annex 4. The Evaluation Material

An evaluation package was delivered to the panellists on January 2008. The package contained the following material:

- Programme Memorandum and ESGEMO leaflets
- Funding decisions (*a list of projects, incl. also the allocation of the projects to the panel members*)
- The follow-up and evaluation plan
- Project proposals (*incl. the application form and the research plan but no other appendices of the original proposal*)
- Mid-term evaluation reports (*containing annual project reports from the years 2004 and 2005; details such as degrees included*)
- Annual project reports from the years 2006 and 2007
- Summary of annual project reports
- The extended abstracts of each projects (max. 2 pages) (*asked for the final symposium of ESGEMO projects, held November 5–6 in Hanko; see also the programme and instructions of the symposium as Annex*)
- The self-evaluations of the projects (*in the self-evaluation form, a full list of publications and other outcomes of the project as well as the three (max.) most important publications as an electronic version were asked as appendices*)
- Annual coordination reports (*2003–2007; please note that this evaluation concerns only the ESGEMO Programme and not the National Programme on Plant Genomics to which some coordination reports refer*)
- Summary of coordination

Annex 5. ESGEMO Research Programme Evaluation Form

Environmental, Societal and
Health Effects of Genetically
Modified Organisms
ESGEMO

Evaluation Form for the ESGEMO Projects

Years 2004–2007

Description of the project:

Project title:

Consortium (if appropriate):

Person in charge (name, institution and position):

Original funding period of the project
(and possible elongation of the funding period):

Self-evaluation of the project:

Objectives

Please describe the main objectives of your project.

Achievement of objectives and the main results of the project

Please describe the main scientific results and achievements, including the innovativeness (novelty) in comparison to other research in your field.

Alterations made to the original research plan. Objectives not achieved.

What factors, if any, hindered the planned progress of the project? How did the project follow the research plan and why the plan had to be changed? How the changes made served the objectives of the original research plan?

Additional results beyond objectives, and other products. Interactions with research outside of Finland.

Other outcomes

Multi- and interdisciplinarity of the project

How did multi- and interdisciplinarity become concrete?

The applicability of the research results/contribution to practice and decision-making. Lessons learnt, experience that can be transmitted.

How could your results be utilized? Who could benefit of your results? What would be the best long-term impact indicators of your results? When do you think your results could start showing impact? Do your results contribute to the competitiveness of Finland? Kindly consider also societal aspects and informing risk assessment, risk management, risk communication.

Communication of the results

How did/does the project communicate with the end users? Has your research results of ESGEMO been presented or published in any media outside the scientific community? **If yes**, what media and when? Who initiated the publicity? What efforts have you made to disseminate information about the project results, besides normal scientific publications?

Contribution to other ESGEMO projects and the programme interactions as a whole compared to the objectives set for it?
The objectives of ESGEMO were to

- create new knowledge on environmental and health effects and potential risks of GMOs used in agriculture, aquaculture, forestry, and environmental applications, particularly in boreal conditions; basic knowledge on related ecology and population genetics is emphasised
- develop novel tools for research and assessment of the potential impacts of GMOs on nature and its complex processes, and
- evaluate the socio-economic and technological impacts of the use of GMOs, including ethical considerations and public acceptance of novel biotechnology.

a) Coordination and programme administration

How did the coordination manage its task in trying to achieve the objectives? Did your project benefit from the coordination? If so, how? Did it create any collaboration beyond your own group? Did you find the arranged events useful? Would the project have required more support from the coordination or from some other agency? Which? What did the coordination fail to achieve?

b) Project funding

How essential the ESGEMO funding was for your research? Has the funding affected the type of academic position you and the researchers of your group have today? Other effects of the grant that you have noted (positive/negative)? Was the funding sufficient compared to the research plan?

Did the research field gain any added value for having a programme compared to normal research grants? Did your project?

Did the programme enhance the development of the research area? Was the participation in the ESGEMO programme beneficial to your research? Did you achieve or arrange something that could not have been done without the ESGEMO funding?

What are the future possibilities and plans of the team after ESGEMO?

On terms of funding, completion of studies, employment of the personnel, etc. Did any new important research topics rise up? How do you see your possible expert role in related to political decision-making in the area?

What kind of major need for research in the area of ESGEMO programme related to Finland/Europe/world you can see in the future?

Other comments

Appendices:

1. A full list of publications and other outcomes of the project from the years 2004–2007. Underline those publications and other outcomes which have arisen from the ESGEMO funding. Kindly use the following classification:
   Articles (1. Articles in refereed scientific journals, 2. Articles in refereed scientific edited volumes and conference proceedings, 3. Submitted manuscripts – indicate status: submitted/accepted/in press)
   - Monographs, academic theses
   - Other scientific publications
   - Textbooks or other research-related books (or book chapters)
   - Articles as well as radio and television programmes popularising science
   - Patents
   - Scientific awards
   - Other professional documented activities
2. An electronic version of max. three most important publications arising from the ESGEMO funding.

Annex 6. Agenda for the ESGEMO Panel Meeting

Monday 25 Feb

19.00	Get together dinner, Hotel Arthur

Tuesday 26 Feb

08.20	Meeting in the lobby of Hotel Arthur and going together to the Academy of Finland
09.00	An introduction of the Academy of Finland and the research programme evaluation (Director, Ritva Dammert, Programme Unit of the Academy of Finland) – Organisation of the panel work (Chair) – Discussion on evaluation methods and approaches – Discussion on the interviews
11.30	Lunch Interviews (30 min. interview + 15 min. discussion)
12.15	Coordinators
13.00	Steering Committee
13.45	Project leaders I
14.30	Researchers I
15.15	Panel working
-18.00	Discussion and summary of the day (Chair) Drafting

Wednesday 27 Feb

08.00	Meeting in the lobby of Hotel Arthur and going together to the Academy of Finland
08.30	Planning the interviews (Chair) Interviews
08.45	Project leaders II
10.15	Researchers II Lunch + interview Researchers III
13.00	Researchers IV
13.45	Panel working
-18.00	Discussion and summary of the day (Chair) Drafting
19.00	Dinner, Restaurant Savotta

Thursday 28 Feb

09.00	Meeting in the lobby of Hotel Arthur and going together to the Academy of Finland
09.30	Panel working (Chair)
12.30	Lunch
13.00	Panel working Discussion and summary of the panel (Chair) Follow-up plan and homework
-14.30	Departure

Annex 7. Call for Proposals

Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms

Research within the Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms (ESGEMO) is focused on the direct and indirect environmental, societal and health effects arising from use of genetically modified organisms (GMOs). The knowledge achieved through the programme is necessary for strengthening the scientific base of risk assessment and risk management of the GMOs. This will also generate needed expertise in and knowledge of the impacts of GMOs to ensure the safe and generally accepted use of GMOs in the future. Thus the programme also contributes to ongoing debate on the safety and ethics of new technology.

The objectives of the programme are to

- create new knowledge on environmental and health effects and potential risks of GMOs used in agriculture, aquaculture, forestry, and environmental applications, particularly in boreal conditions;
- develop novel tools for research and assessment of the potential impacts of GMOs on nature and its complex processes, and
- evaluate the socio-economic and technological impacts of the use of GMOs, including ethical considerations and public acceptance of novel biotechnology.

The Academy strongly encourages the applicants to create projects that combine natural science, economic and social aspects. As the developments of new GMOs and their effects are so far-reaching, the programme is also addressed to researchers for health, well-being and life issues. However, the programme will not cover biomedical research or direct health effects of novel food or feed.

Research themes within the programme include:

- Ecological and health impacts of the use of GMOs
- Gene flows and interactions
- Ethical and socio-economic aspects connected with the development and application of GMOs
- Risk assessment and management of GMOs

The programme is funded jointly by the Academy of Finland, the Ministry of Agriculture and Forestry, the Ministry of the Environment and the Ministry of Social Affairs and Health. The Academy has allocated 3.5 million euros for the programme, and Academy funding can be granted to projects for four years. The funding of the projects within the programme will start as of 1 January 2004 at the earliest and end on 31 December 2007 at the latest.

Application

The application procedure involves two stages. First-round applications shall be prepared online at www.aka.fi/eng > Electronic services or using the paper version of the Academy application form SA 1.2003E, with the programme acronym 'ESGEMO' marked on the application. After submitting the application online, the applicant shall send by mail to the Academy of Finland one print-out application form including the signatures. When the paper version of the application form is used, all application documents with appendices shall be submitted in 20 copies (original and 19 sets of copies) to the Academy of Finland Registrar's Office by 15 May 2003. All documentation shall be in English.

The form shall be completed according to the instructions given, with the exception that only the following documents are to be appended:

1. a plan of intent of no more than three pages in length
2. a curriculum vitae of the project leader with maximum length of two pages
3. a list of at maximum 20 key publications or other scientific output, most directly relevant to this project, by the researcher in charge of the project and possible other senior researchers responsible for the project

The plan of intent shall state the objectives and description of the research, the links of the research to the themes of the programme and to other research, the main methods, the timetable of the research, possible national and international collaboration, the results to be expected and the dissemination and utilisation of these results, researcher training involved, and a tentative budget.

In the case of a consortium, the project leader shall prepare a joint application form with an appendix including a three-page plan of intent of the consortium. This plan shall, in addition to what is said above, indicate the added value obtained from the consortium. Each project in the consortium shall also complete its own application form and append to it the above mentioned appendices 2 and 3. The complete application of the consortium shall be submitted as one entity.

A programme steering group composed of representatives of the Academy of Finland, the Ministry of Agriculture and Forestry, the Ministry of Social Affairs and Health and the Ministry of the Environment as well as of expert members will submit in June a proposal on projects that will be invited to file full applications with research plans. The decision on projects which will go to the second phase rests with a programme subcommittee. Projects selected to the second phase of applications shall submit their full application by 15 September 2003 at the latest.

The background, objectives and research themes of the programme are described in more detail in a programme memorandum. The programme memorandum, application forms and the Academy of Finland Guide for Applicants are available on the Academy's web site at www.aka.fi/eng > Research programmes > Research programmes open for application in 2003 as well as at the Academy of Finland Registrar's Office.

For further information, please contact:

- Programme Coordinator Reetta Kettunen (University of Helsinki, Department of Applied Biology), tel. (09) 1915 9666, reetta.kettunen@helsinki.fi
- Scientific Secretary Sirpa Huuskonen (Bioscience and Environmental Research Unit), tel. (09) 7748 8370, sirpa.huuskonen@aka.fi
- Scientific Secretary Jan Bäckman (Natural Science and Engineering Research Unit), tel. (09) 7748 8394, jan.backman@aka.fi
- Scientific Secretary Riitta Launonen (Cultures and Social Science Research Unit), tel. (09) 7748 8229, riitta.launonen@aka.fi
- Scientific Secretary Jukka Reivinen (Health Research Unit), tel. (09) 7748 8332, jukka.reivinen@aka.fi

The Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms (ESGEMO) was launched by the Academy of Finland with the aim of increasing basic knowledge of the gene flow between GMOs and natural populations in and between different organisms. The programme was also to develop tools for risk assessment and to enhance multidisciplinary collaboration.

The ESGEMO research programme and the success of the programme in fulfilling the objectives set for it in the programme memorandum were evaluated by an international panel. This report includes the results of the evaluation and the recommendations of the panel.

ACADEMY OF FINLAND

Vilhonvuorenkatu 6 • PO Box 99, 00501 Helsinki
Tel. +358 9 774 881 • Fax +358 9 7748 8299
www.aka.fi/eng • viestinta@aka.fi