GMO Research in Perspective

Report of a workshop
held by
External Advisory Groups
Quality of Life and Management of Living Resources

EU Fifth Framework Programme

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WORKSHOP SUMMARY

The EU's Quality of Life and Management of Living Resources research programme reflects in its activities the routine and widespread use of the techniques of modern biotechnology and potential applications of GM technologies. Although these appear to offer many potential benefits there is growing public concern and resistance to their use, in particular in the areas of agriculture and food. This situation led the External Advisory Groups of the programme to convene a workshop in order to canvass a wide range of opinions on GMO research, and to examine the questions and concerns, as a preparation to providing the Commission with advice on programme planning. The workshop thus brought together personalities from many different backgrounds and perspectives, including representatives of consumers' organisations, ecologists and industry.

The workshop identified a series of practical research lines where the Quality of Life Programme could clarify issues where GMOs appear to cause public concern. It also drew attention to the way in which research is carried out, how it is planned, who participates and who finances it, and stressed the overarching need for research activities to be better tuned to the needs and perceptions of society. Lastly, it called for closer contact and communication between the research community and society at large in order to establish mutual trust and to enable the best use to be made of scientific advance.

Such was the satisfaction with the constructive atmosphere generated that it was suggested to develop the workshop into a continuing informal forum in which to maintain and expand the dialogue, thereby ensuring that public interests and concerns continue to be clearly identified and addressed by EU research.

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INTRODUCTION

The Key Actions of the Quality of Life and Management of Living Resources programme are oriented to practical problem solving and socio-economic needs, reflecting the overall philosophy of the EU's 5th Framework Programme for Research and Technological Development. They aim to enhance the quality of life of European citizens and improve the competitiveness of European industry. It is in this context that the programme reflects in its research activities the routine and widespread use of the techniques of modern biotechnology, and potential applications of GM technologies. Although these appear to offer many potential benefits, there is growing public concern and resistance to the use of GM techniques and the resulting GM products, particularly in the areas of agriculture and food.

The workshop was convened at the request of the External Advisory Groups for the Quality of Life Programme. The objective of the workshop was to provide material for the EAGs to consider when formulating advice to the Commission on updating the Work Programme, and thus to ensure that the programme adequately addressed public concerns in the area of GM technologies. The workshop enabled EAG representatives to discuss the issues with external experts, who attended in a personal capacity, to canvass a wide range of opinions on GMO research and to consider the questions and concerns of the public.

The programme consisted of short background papers presented by invited experts and EAG representatives, and discussion. It concentrated initially on information and exchange on the current situation, the technology, benefits, risks and concerns, and then on research needs and how to deliver them. The workshop focused particularly on GM crops and foods since most debate surrounds this area; this is in contrast to the health sector, where many products, including diagnostic tests, therapeutics such as insulin, growth hormone and interferon, and a series of vaccines for humans and animals, offer direct health benefits and appear to be well accepted.

This report highlights the main points of the presentations and, particularly, the discussion. Although the workshop covered a wide range of topics and time for discussion was limited, the meeting analysed the build-up to the current situation, provided possible pointers to the way forward and identified specific research needs that might be considered for inclusion in Community programmes.

BUILD-UP TO THE CURRENT SITUATION

Consumer confidence in the safety of the food supply and in the commitment and competence of industry and the regulatory agencies to protect that supply has been damaged by a series of events, notably the BSE crisis. Consumer trust and confidence in the advice of scientists and government officials has also been reduced. It is in this context that the controversy about GMOs has emerged. An initial reluctance to label foods containing GM ingredients added to the decline in trust. European consumer associations have expressed reservations and many environmental groups are more fundamentally opposed to the use of the technology in food production.

Following the EU Environment Council in June 1999, ministers have committed themselves to a rigorously precautionary approach to authorisation of new

GMO applications, pending approval of the revised Directive 90/220/EEC on GMOs.

Many scientists and industry tend to see GM techniques as elegant, useful and essentially neutral or value-free, offering great potential benefits to mankind. Such views are not always shared by those who are expected to accept the consequences or to purchase the products of the technology. The public's perception of risk may differ substantially from the scientists' view. The former is unwilling to accept what it perceives as an imposed risk.

Consumers' questions and objections can be categorised under a range of headings including: effects on health, effects on the environment, socio-economic effect on rural communities, impact on developing countries, overall risk/benefit ratio, consumer choice, pro-organic/anti-intensive farming and ethical/moral issues. Other reasons for concern are mistrust of multinationals and EU-US trade policy, mis-information via the media, and perceived lack of transparency in and sometimes contradictory nature of scientific information.

It was recognised that, while many approaches need to be taken to clarify these issues, research had a vital role, particularly in tackling specific technical issues. Moreover, it was also noted that the practitioners of research, the scientists, had a special responsibility for communication and dialogue, and that factors such as the way research is carried out, who pays for it and who carries it out can influence the acceptability of results.

POINTERS TO THE WAY FORWARD

GM technologies are used for crops and food to improve two categories of characteristics: first, production characteristics, for example, sustainability, growth versatility, yield, biodiversity or environmental/ecological effects; and second, use characteristics, such as, utility/desirability, nutritional value, health products, taste/flavour or processing qualities. Both of these are underpinned by control mechanisms, such as EU and national legislation, regulatory practice and monitoring. While consideration of any production chain must be made on an overall basis and include socio-economic aspects, it is nevertheless important to distinguish the implications of modifying characteristics of one category from the other. For example, in Europe, increased yield or growth versatility at the crop level is perceived as a benefit to the producer but not to the consumer.

If the public is to be satisfied that the potential benefits of GM technology outweigh the potential risks, real advantages for the consumer of GM foods over and above conventional foods must be demonstrated. Factors that may influence consumer acceptance in the EU include better taste, texture, keeping quality, health benefits, such as, reduced allergenicity or increased availability of minerals and vitamins, or environmental benefits. The public must also be satisfied that the regulatory mechanisms in place have a solid and trustworthy scientific basis.

The public perceives biosafety research as lagging behind GM technology development. This indicates that the results of the large amount of biosafety research and the extensive field testing that have been undertaken over the last decade are not well enough known. Existing evidence and research results from the EU, where projects worth over €40 million have been financed, from the Member States and globally, in particular from the US, should be

systematically analysed and widely disseminated to consumers in an understandable form.

There is a socio-economic component to many of the questions raised and a multidisciplinary approach to research is required. Researchers with expertise in social sciences need to be invited, along with laboratory-based scientists, ecologists, toxicologists and epidemiologists to address the issues. Where appropriate, non-governmental organisations or consumer bodies should be included in project consortia to ensure that public interests are considered from the design stage.

It was also pointed out that the source of research funding may affect acceptability of results, for example, it was considered that public funding of GMO risk/benefit research is crucial and that research in sensitive areas may be less acceptable if funded by industry.

RESEARCH NEEDS AND HOW TO DELIVER THEM

Areas where additional research would contribute to clarify specific issues or respond to public concern were identified as follows:

Food/health

- Development of rapid, reliable detection methods for GM foods and their derivatives to allow traceability throughout the production, processing and distribution chain. This will facilitate segregation, determination of the level of compliance with threshold values, labelling and consumer choice.
- Development of quantitative hazard assessment methods, for humans and animals, similar to those used for food additives. Development of criteria and recommendations for selected feeding studies.
- Examination of the adequacy of the existing classification scheme for food constituents, conventional and novel. This has particular relevance in the area of nutritional genomics for the production of functional foods, i.e. foods with health enhancing effects, additional micronutrients, etc.
- Development of criteria for operational decisions on 'substantial equivalence' and their applicability to the next generation of GM products.
- Identification of effective biomarkers to monitor possible adverse post-approval health effects, in humans and animals, akin to existing systems for pharmaceuticals.
- Epidemiological studies linking consumption patterns to medical records in order to compare and contrast the health status of EU and US consumers.

Environment/agriculture

- Development of Life Cycle Assessment as a tool to allow comparative evaluation of resource use and environmental impact of different approaches in agriculture, for example, to compare the impact of modern intensive agriculture on the environment with the impact of genetically modified crops as a way of identifying the more environmentally compatible and economically viable, hence sustainable, agricultural practices.

- Comparisons between the use of agrochemicals in the cultivation of GM, conventional and organic crops, and between the non-target effects of genetically engineered crop use and conventional agrochemical use. This type of work would clarify issues, such as, whether the often-cited generation of superweeds as a possible consequence of GM crop use would be any different to the range of weeds resistant to herbicides already selected by current crop production systems and the widespread use of herbicides.
- Comparison of gene transfer from genetically engineered crops or micro-organisms with that from non-genetically engineered crops or micro-organisms, in particular under conditions of selective pressure. Measurement of the extent of gene transfer into feral populations and the impact of these hybrids.
- Measurement of the persistence of DNA in the soil, in particular under various selection pressures. Field and farm trials will be needed in order to get meaningful results.
- Development of marker genes as an alternative to antibiotic resistance, removal of markers and selection without the use of markers.
- Establishment of a definition of long-term desirable and undesirable traits. Producers and consumers may have different definitions.
- Development of technical approaches to avoid the spread of genes in the environment, for example, male sterility, construction of inherently unstable genes or ensuring that added genes are expressed only in some parts of the plant. Techniques are also needed for reversing unforeseen effects, such as, promoter genes switching on silent genes with unpredictable additional consequences, beneficial or harmful, or plant genetic modification activating dormant viruses.
- Development of uniform practical methods of pre-release testing and post-release monitoring. This could greatly facilitate both the authorisation of GM products and public confidence in the safety requirements they must meet. At present, authorisation of GMO field releases requires an environmental risk assessment as defined in EU legislation (Directive 90/220 or sectoral legislation containing similar demands), however operational implementation of this in different countries may reflect significantly different standards and interpretation.
- Development of effective biomarkers to allow a monitoring mechanism for possible unforeseen environmental effects post-approval

GM TECHNOLOGY AND THE DEVELOPING WORLD

It is often claimed that GM technology has great potential to improve the quality of life in the developing world. For example, rice with enhanced availability of iron and ß-carotene, which could alleviate iron deficiency anaemia and vitamin A deficiency in populations dependent on rice-based diets, has recently been developed with EU research support. Unlike the situation in Europe, production issues in developing countries are often of as much importance to the consumer as to the producer. Increased yield in these countries can mean the difference between life and death. Nevertheless there is legitimate concern that, if used irresponsibly, the technology could have devastating economic consequences in these

countries with, for example, farmers being exploited by multinational companies who own the seeds and sell the chemicals, technology tying producers to multinationals, etc. Furthermore, risk assessments carried out in the EU cannot be extrapolated to developing countries since conditions differ; for example, an undernourished population may be more sensitive to side effects of consuming certain functional foods, and gene flow in a tropical ecosystem will differ from that in the temperate zone.

Dialogue with developing countries and the research community would help ensure the appropriate use of GM technology as a tool, among others, to tackle their specific problems and needs in the pursuit of sustainable development. Developing country scientists should be involved in the research. If the technology genuinely contributes to alleviating hunger and poverty in developing countries the public may view it more favourably. EU resources could also be used for capacity building in developing countries and for raising awareness of biosafety issues.

EDUCATION, COMMUNICATION AND THE NEED FOR DIALOGUE

At many points during the workshop it was noted that debate on GM issues often lacked balance and failed to place the issues in their proper perspective. To remedy this, the need for education, communication and dialogue between interested parties was stressed.

Consumers indicate that they want to be able to make informed choices on whether or not they consume GM food. On the other hand, some are afraid that any information is one-sided. The interface between technical aspects of biotechnology and the communication of results needs to be improved. Scientists need to appear in and to stay in dialogue with the public. However, many will require training if they are to communicate effectively in a manner that the public can understand. Risk communication strategies should be examined and systems for informing the public need to be established.

Further socio-economic research is required to establish how public opinion on GMOs is formed and the degree of importance attached to the various questions raised by the use of GM technology (see Section 'Build-up to the Current Situation'). It is also important to determine what factors govern the public's risk acceptance.

It would also be useful to compare different scenarios regarding the regulation of GMOs. For example, the impact of a moratorium on new GM approvals needs to be examined, as does the impact of the level of rigour in the application of the precautionary principle or, indeed, the free market approach.

Technology trajectories also need to be carefully observed. Communication on the types of research being undertaken and funded under different headings is important as one line of research may make another redundant or less important, for example, development of 'self-destructing' genes might resolve the gene transfer issue.

WORKSHOP CONCLUSIONS

Practical measures were identified where the Quality of Life programme could help address issues regarding GMOs which cause public concern, notably:

- funding new research in areas identified during the workshop and detailed above (see Section 'Research Needs and how to Deliver Them')
- linking innovative research more closely to potential societal benefits
- encouraging more effective integration of socio-economic research into technical programmes and more interdisciplinary integration among the natural sciences
- making certain parts of the work programme more explicit with respect to the research required to address these concerns
- reviewing risk/benefit analysis methods with a view to their possible improvement
- building on and monitoring existing knowledge and experience in the EU and elsewhere, particularly the US
- encouraging networking of researchers involved in all aspects of GM biosafety research, including media studies, to add value to their work
- improving communication of research results to the public in order to promote informed public debate
- encouraging participation of consumers' associations or similar bodies in research projects and in evaluation of proposals to help acceptance of results.

It was further concluded that while GMO crops and foods could provide many benefits to society, these will only be achieved if a culture of openness and continuous dialogue between scientists, industry and consumer bodies can be developed. Even then it was recognised that society or individuals might oppose the use of the technology for perceived safety or other reasons. Hence, while GM technology may offer potential solutions to certain problems, research into non-GM solutions must continue in parallel and results be compared. Complete openness is required in decision making and in setting the research agenda. Workshop participants also noted that the correct balance needed to be found between industry-funded and public-funded research, particularly in sensitive areas. The task of the EAGs will be to advise the Commission which research is best undertaken on a European level.

The Workshop was considered very successful, and in some ways an important milestone, by the participants. In particular, the event allowed key personalities from different backgrounds and perspectives (including representatives of consumers' organisations, ecologists and industry) to discuss GMO research in a constructive, frank and open-minded way. It allowed the consumers' organisations and others who presented the public's concerns as well as ecologists to identify specific research needs and to have an input to the definition and focus of the Quality of Life Work Programme. The EAG representatives, for their part, expressed willingness to include these needs in their advice to the Commission on the updating of the Work Programme. Such was the satisfaction at the constructive atmosphere in the workshop that it was suggested that an informal forum could be established, including representatives from the different backgrounds, in order to maintain the dialogue, thereby ensuring that public concerns continue to be clearly identified and addressed.

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