Journal of Agricultural and Environmental Ethics (2007) 20:65–80
DOI 10.1007/s10806-006-9023-8

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DEVELOPING THE ETHICAL MATRIX AS A DECISION SUPPORT FRAMEWORK: GM FISH AS A CASE STUDY

(Accepted in revised form October 25, 2006)

ABSTRACT. The Ethical Matrix was developed to help decision-makers explore the ethical issues raised by agri-food biotechnologies. Over the decade since its inception the Ethical Matrix has been used by a number of organizations and the philosophical basis of the framework has been discussed and analyzed extensively. The role of tools such as the Ethical Matrix in public policy decision-making has received increasing attention. In order to further develop the methodological aspects of the Ethical Matrix method, work was carried out to study the potential role of the Ethical Matrix as a decision support framework. When considering which frameworks to apply when analyzing the ethical dimensions of the application of agri-food biotechnologies, it is important to clarify the substantive nature of any prospective framework. In order to further investigate this issue, reflections on the neologism "ethical soundness" of an ethical framework are presented here. This concept is introduced in order to provide more structured evaluations of a range of ethical tools, including ethical frameworks such as the Ethical Matrix. As well as examining the philosophical dimensions of the method, theoretical analysis and literature studies were combined with stakeholder engagement exercises and consultations in order to review the Ethical Matrix from a user perspective. This work resulted in the development of an Ethical Matrix Manual, which is intended to act as a guide for potential user groups.

KEY WORDS: biotechnology, decision support, Ethical frameworks, Ethical Matrix, GM fish

1. INTRODUCTION

One of the first decision-support frameworks to be developed to explore the ethical issues raised by agri-food biotechnologies was the Ethical Matrix, proposed by Mepham of the University of Nottingham in the mid 1990s. Since then, the Matrix has been applied to a number of case studies, such as bST, xenotransplantation and bioremediation, by Mepham and his colleagues at the University of Nottingham (e.g., Mepham, 1996, 2000, 2001; Mepham and Tomkins, 2003; Moore, 1996; Millar, 2002) and in the Food

Ethics Council, and by others working at several different institutions (e.g., Kaiser and Forsberg, 2001; Kaiser, 2004; Schroeder and Palmer, 2003; FAO/WHO, 2003; Chadwick et al., 2003). Over the decade since its inception, the Ethical Matrix has attracted considerable attention from specialists in the field of bioethics, and the philosophical and methodological basis of the framework has been discussed and analyzed extensively. Therefore, we shall not attempt to survey and present all pertinent aspects and justifications of the Ethical Matrix in this paper (refer to Mepham et al., 2006 and cf. also Forsberg, 2007).

The role of tools such as the Ethical Matrix in public policy decision-making has received increasing attention over the last few years, with a number of practitioners exploring the use of new and novel frameworks and tools, in particular in regard to applied ethics. In order to further develop the methodological aspects of the Ethical Matrix method, the authors have studied the potential role of the Ethical Matrix *as a decision support framework* in the field of biotechnology and food regulation. Theoretical analysis and literature studies were combined with stakeholder engagement exercises and consultations in order to study various aspects of the Ethical Matrix from a user perspective. This work resulted in the development of an Ethical Matrix Manual (Mepham et al., 2006). The aim of the paper is to clarify some general evaluation criteria for the uses of the Ethical Matrix as a decision support framework, and to exemplify briefly two participatory approaches.

2. ETHICAL SOUNDNESS OF THE FRAMEWORKS

When considering which frameworks are appropriate for use when analyzing the ethical dimensions of agri-food biotechnologies, it is important to clarify the substantive nature of any prospective framework. In order to investigate this, we have attempted to present some reflections on the neologism "ethical soundness" of an ethical framework. This concept is introduced in order to provide more structured evaluations of a wider range of ethical frameworks.[1]

The term "soundness" in this context is adapted from the philosophical work on logic. An inference is normally termed "sound" if, and only if, the logical form of the argument is valid (i.e., truth preserving) and all its premises are true. An axiom system is sound if, and only if, all the axioms and theorems are true under all interpretations. Accordingly, one would say that an ethical argument is sound if, and only if, the logical form of the normative argument is valid (e.g., in a version of deontic logic, namely, a

[1] For a list of several such frameworks see the website of the project Ethical Bio TA Tools: http://www.ethicaltools.info/.

logic of normative concepts) and all its premises are either true or valid (here in the sense of the German term ''gültig''; ''normative rightness''). It could then be said that a normative system (theory) is sound if, and only if, all its axioms and derived theorems are valid under all normative interpretations.

However, an ethical *framework* is not to be confused with a particular ethical *theory*. An ethical theory would, ideally, distinguish all morally right from all morally wrong or morally neutral actions. A framework on the other hand only *assists* us in reaching a reflected ethical insight or normative conclusion. A framework is not composed of statements that together make up a normative theory; rather it is a tool on a meta-level, since it makes use of a variety of ethical theories and normative arguments. Given this variety, the above description of ethical soundness cannot apply to such a framework, since viewpoints might be included that arise from very different theoretical conceptions and that may collide with each other. Thus, ethical soundness of a framework cannot mean normative validity under all interpretations. But a framework is also a practical and pragmatic tool, since it should allow us to extract all relevant information for decision-making involving ethical issues, without necessarily implying a unique answer to all issues. Ethical frameworks are not material objects, or even sets of statements; rather, they are conceptual or procedural devices, which are designed to facilitate explicit ethical decision-making, typically by a body consisting of several individuals with varying viewpoints. They are tools that are dependent on the competency of users, i.e., as moral individuals. Given this definition of an ethical framework, the use of ethical soundness in this context is therefore conjectural and non-traditional, and requires further analysis. This analysis should take account of the essential function of ethical frameworks to assist public bodies in making ethically justified decisions.

The question then arises, what should be preserved and accentuated if one transposes ethical soundness from normative ethical theory to ethical frameworks that are developed to aid decision-making. The intuitive notion is that a decision support framework works well, i.e., is ethically sound, if it allows competent access to all relevant normative considerations and facts of an issue, and leaves the users free to draw conclusions based upon their own priorities, but informed by insights into alternative viewpoints. Frameworks that have an inbuilt bias towards a particular ethical position should not be regarded as ''ethically sound.'' Similarly, frameworks used within a given knowledge base that systematically neglect information that is crucial for certain normative viewpoints, are also not ethically sound. All frameworks should ensure that the normative reasoning put forward by potential users is transparent to all external reviewers and evaluators.

Therefore it is proposed that *an ethical framework is ethically sound, if and only if, its application produces understanding of ethically relevant considerations in such a way that within a given body of knowledge and on condition of its competent use no further considerations would decisively alter the normative conclusions drawn from the framework by the users.*

Such a definition of soundness of an ethical framework in some way parallels proposed definitions of, e.g., scientific objectivity (cf. Føllesdal et al., 1986, pp. 354–360).[2] It is clear that a definition of this kind with an inbuilt counterfactual clause cannot be checked in any direct manner as to whether it applies or not. However, a test of ethical soundness is to ask whether certain ideal criteria are sufficiently respected in a competent use of a framework, such as the Ethical Matrix. These criteria could then be seen as *indicators* of ethical soundness, in much the same way as one talks of indicators of sustainability etc. The indicators would be such that neglecting them would weaken the value of the framework as a decision support tool and typically lead to different normative conclusions or different reasons for given conclusions. It should also be recognized that these indicators could be used to evaluate the performance of several alternative ethical frameworks (of which the Ethical Matrix is just one).

Thus, in the decision-making context addressed here, i.e., a context where a decision-maker is faced with competing value claims in society and a plurality of ethical theories appealed to by various groups, several considerations enter the picture that may indicate the ethical soundness of frameworks. The main properties of ethically sound frameworks, as we tentatively see them, are the following:

(1) Inclusion of values at stake
(2) Transparency
(3) Multiplicity of viewpoints
(4) Exposition of case-relevant ethically-relevant aspects
(5) Inclusion of ethical arguments

2.1. *Inclusion of Values at Stake*

Moral decisions represent choices between different moral impacts or assessments. Therefore, an explicit listing of all the values that are at stake in a decision is instrumental for the ethical soundness of the framework. If a relevant value is overlooked, the outcome of the moral evaluation will typically be different.

[2] Føllesdal et al. (1986) characterizes scientific objectivity as the ideal that is reached when a given scientific claim would not be evaluated differently by adding more pertinent facts in its justification.

2.2. *Transparency*

One of the main challenges of ethical frameworks is to overcome the opaqueness of moral decision-making. The challenge is thus that the process of decision-making becomes transparent. Transparency is a precondition for (a) allowing a wide and inclusive social debate on the issue, and (b) making decisions that are socially robust and not immediately challenged by public voices on the basis of information gaps. All too often political actors and decision-makers seem to assume that ethical positions are simply taken, without clarification of why and how they are reached and how they could be challenged. This opacity leads to instability in moral evaluation.[3]

2.3. *Multiplicity of Viewpoints*

Democratic societies are by definition pluralist societies, and this extends naturally to the sphere of ethics. Any given or automatic dominance of a particular ethical viewpoint, be it a utilitarian viewpoint or Kantian ethics, etc., would infringe on the rights of those who adhere to alternative ethical viewpoints. Not seriously considering other ethical viewpoints would also be deeply unjust and run counter to ideals of equity. An ethical framework should, therefore, take account of this multiplicity of known ethical viewpoints. To the extent that this is not guaranteed by the competent use of a framework, the ethical soundness of the framework is threatened, since consideration of alternative conceptions may alter the outcome.

2.4. *Exposition of Case-specific Ethically Relevant Aspects*

Ethical decision-making presupposes that all ethically relevant aspects of the issue are adequately accounted for. As well as appropriately specified ethical principles, ethically relevant aspects include factual information, the inclusion of which potentially contributes to strengthening or weakening a particular moral outcome or judgment.

2.5. *Inclusion of Ethical Arguments*

Frameworks seem to differ in regard to the extent to which they aspire to represent ethical argumentation. In ethical theory, the ideal is that an ethical position is reached through a reflective argument, based on the available

[3] Even transparent decisions may of course be challenged, but then disagreements may either point to a lack of specific information that was not duly considered, or to a simple disagreement on the weighing of values. Currently we see that a number of decisions are challenged simply on the basis of being "unethical" or for presenting the wrong ethical position. Ethical frameworks aspire to extend beyond this rhetoric by ensuring the transparency of the ethical reasoning behind any given decision.

information and the ethical principles of the theory. This applies in particular to situations where different principles run into conflict and one has to weigh and balance them. Knowledge of the arguments behind particular decisions enables rational critique and debate. Thus, we might see this aspect as instrumental for the ethical soundness of a framework.

The concept of ethical soundness was applied to evaluate the suitability of different candidates to operate as ethical tools in democratic decision-making processes. For instance, a committee approach (that might be ranked as a procedural decision support framework) might not easily, or necessarily, satisfy all requirements for transparency, e.g., in terms of how the final recommendation was reached and who discussed what. However, it is clearly very difficult to provide a definite characterization of all possible frameworks.

Examining the Ethical Matrix, and the process for translating the principles for such a matrix, reveals that the criterion of transparency seems optimally to be realized. A judgment formed on the basis of a Matrix shows clearly what information was available and which considerations were judged to be dominant and how they were weighed. Similarly, one can say that the multiplicity of viewpoints is optimally accounted for by the explicit listing of stakeholder viewpoints. In principle, there is also a good chance that an Ethical Matrix will account for all ethically relevant information and all ethical arguments. Yet, there are some caveats: these features are dependent on the information that is available and included in the analysis. Typically, this will depend on the scientific training and ethical competence of the users of the framework, such as organizers of a workshop and the participants or a committee secretariat. To the extent that all users are challenged by information overload, it may be difficult to be at the cutting edge of all issues. This may be reflected, for example, in the quality of the information included in the Matrix. In spite of this caveat, it seems that the probability of including all relevant values at stake would be high, since this is a criterion for compiling a list of interest groups. In summary, the Ethical Matrix would appear to score relatively highly on the indicators of ethical soundness.

One of the purposes of conducting an exercise to determine ethical soundness is to recognize that not all frameworks score alike under the five specified criteria. It appears that no framework could easily fulfill all the ethical soundness criteria. This may be due to the following factors: (i) the list of conditions may not really be comprehensive for this purpose; (ii) some frameworks may consciously be built upon leaving out certain aspects in order to optimize other aspects, e.g., playing down ethical argument in favor of transparency and multiplicity of viewpoints; (iii) the nature of ethical decision-making may be such that one in effect has to choose between a

broad and inclusive framework and an in-depth framework with detailed expert arguments; and (iv) different frameworks may be intended for different stages of the decision making process. In view of such limitations, one should be careful to consider the five properties as tentative indicators for reviewing the ethical soundness of a framework, and not as conditions that together define ethical soundness.

The aim of the above characterization was to clarify further the needs of decision-makers with regards to ethical frameworks. While one may easily agree that an ethical framework should facilitate the decision-making process, one also needs to pay closer attention to the variety of possible uses to which these frameworks can be put.

3. DEVELOPING A USER MANUAL FOR THE ETHICAL MATRIX

When considering the conceptual basis of the Ethical Matrix, as articulated by Mepham et al. (2006), it is at its simplest level a checklist of concerns, structured around established ethical theory. However, it can also be used as a means of promoting structured discussion. The interest groups, the weighting of each cell, and even the appropriateness of the principles may all be challenged or modified by those using it. At best, it helps those involved in making a decision to put themselves in the shoes of others. At the very least, it ensures that more than the usual narrow range of concerns are raised and considered.

In order to review the needs of potential users of the Ethical Matrix and to develop a user manual for the Ethical Matrix, two workshops were convened, in each of which the potential use of GM fish was chosen as the case study. This case was chosen in order that the exercises could relate directly to the decision-making process involving the Norwegian Ethical Board on the Ethics of Patents. However, it is not the intention of this article to present a detailed ethical discussion of the chosen case study. The main focus of this article is to discuss a number of structural features of the Ethical Matrix approach that are of interest when evaluating it as a decision support framework. One workshop was conducted in Edinburgh with a group of experts, while a second workshop was conducted in Oslo with ''lay'' participants. One of the previously reported strengths of the Ethical Matrix is that it can be used by numerous groups and does not presuppose that participants should all be knowledgeable stakeholders.

The research team reviewed aspects of the operation of an expert group with a group of lay people when using the Ethical Matrix. However, within a European context there are notable differences in scientific and political culture. While some countries seek ethical advice from broadly composed

and highly qualified expert groups (which can include lay members), other countries, notably in Northern Europe, seek to further include members of the lay public, in the processes that lead to such advice. The research team worked on the assumption that there may not be any general or *a priori* arguments for or against either of these approaches, but that both require transparent justification of their ethical assessments.

Building on published material on the Ethical Matrix and the practical experiences of the research team, a provisional protocol was devised as a basis for the development of a Manual for the framework (see the diagram in Figure 1 for a summary). This protocol set out a clear methodology for potential users. The protocol gave guidance on the application of the method and both Research Groups used this protocol in two workshop trials. The protocol was then evaluated to determine its applicability and was further developed. In order to explore the two methodological approaches to the Ethical Matrix that have emerged, the two research groups independently applied a top-down approach (TDA), or the classical form of the method, and a bottom up approach (BUA) that are described below.

The Ethical Matrix may be used in several ways and by different groups of people, or even by individuals. So organizational requirements are likely to be quite different in different circumstances, and to be critically influenced by factors that are not directly related to the nature of the Ethical Matrix as an ethical tool. Such factors not only include financial and time limitations but also the degree to which participants in a group exercise are encouraged to set the agenda themselves rather than follow a prescribed step-by-step procedure. With reference to the latter point, the different ways in which the Ethical Matrix may be used will be greatly influenced by whether its use conforms more to a ''top-down'' approach than to a ''bottom-up'' approach.

4. ETHICAL MATRIX TOP DOWN APPROACH (TDA)

In a TDA, the specifications of the Ethical Matrix principles are largely set by the organizers of the workshop, who have acknowledged expertise in facilitating bioethical deliberation, and play a prominent role in structuring the exercise.

In order to examine whether expert participants found the TDA Ethical Matrix approach useful when applied in a participatory setting, a workshop was organized in September 2005 in the UK. Using the potential use of GM salmon in aquaculture as a case study, nine ''expert'' participants applied the Ethical Matrix to discuss key issues raised by the use of the GM technology. The notion of ''expert status'' was designated to the participants on the basis that they are actively involved with the aquaculture industry, or biotech-

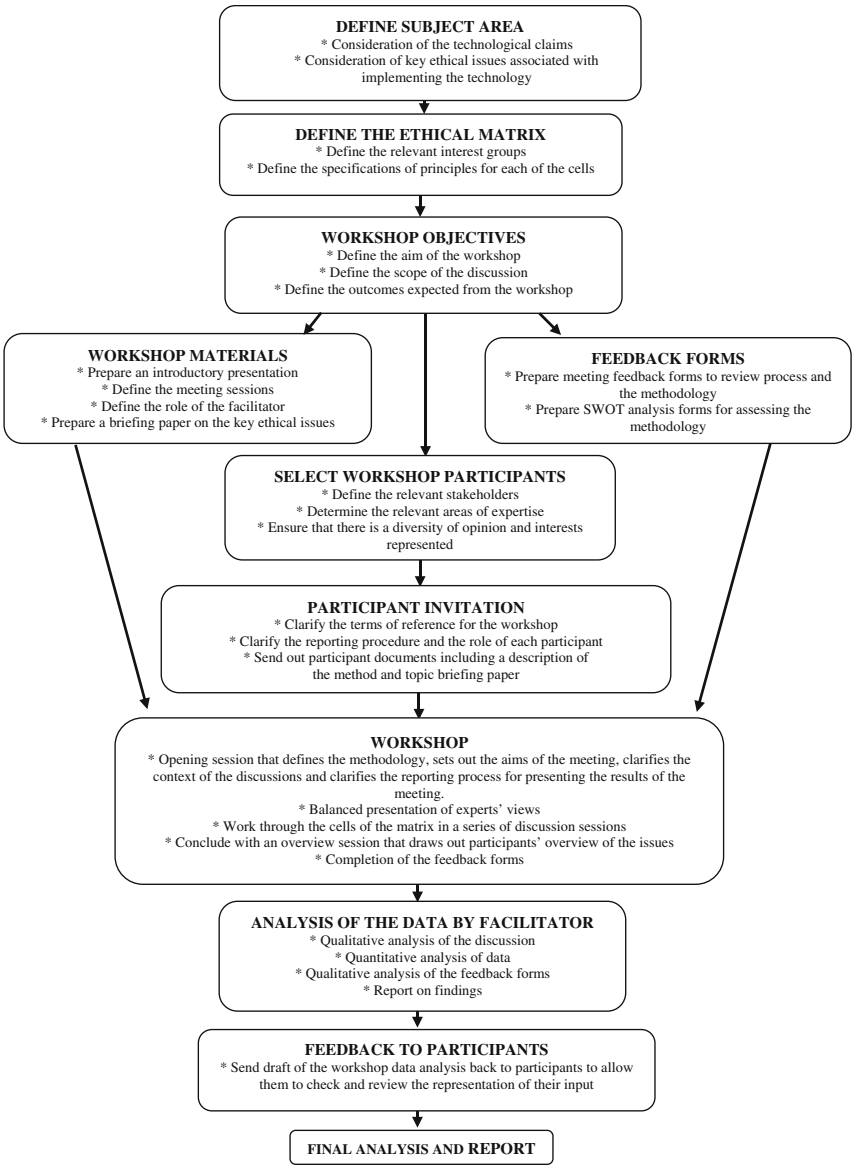

Figure 1. Summary of a generic protocol of the Ethical Matrix.

nology research and development. The group's expertise covered areas such as marine biology; aquaculture industry; fish welfare; regulation; and molecular biology, etc. The final selection of participating experts was done by the workshop organizers. The final list of participants was determined by a combination of considerations, such as interest and willingness to participate, area of expertise, recognized standing in the profession, etc.

Participants were sent briefing documents prior to the meeting, including a copy of the Ethical Matrix methodology. The workshop was held over one day and at the start of the event, participants were given an introduction to the Ethical Matrix and the potential issues raised by the case study. During this process, the classic TDA Ethical Matrix was used, where the principles are pre-specified for each of the interest groups (cf. Table 1). One justification for using the "classic" Ethical Matrix approach was that it had proven useful in many earlier settings, and that its form and content are well documented (cf. Mepham, 2005).

The participants used the Ethical Matrix to map out the key issued raised. As part of their assessment, they were asked to comment on the use of the Ethical Matrix and its potential value. When examining participants' views of the Ethical Matrix in relation to the notion of ethical soundness, many felt that the strengths of the framework were its inclusion of a multiplicity of viewpoints and the discussion of the key (ethical) arguments. Participants commented on the value of working through the pre-defined Ethical Matrix as it facilitated a structured debate amongst the group.

When asked to complete a SWOT-analysis (setting out strengths, weaknesses, opportunities, and threats) of the method, common weaknesses were described as: the lack of time to discuss each issue and the potential limitations of the knowledge of the participants. Participants noted the need to ensure that a broader range of stakeholders are involved in the discussion, therefore, the involvement of additional participants with complementary backgrounds would have been welcomed by the group. These potential limitations should be further explored within the context of other participatory methods, since many of the limitations identified can relate to these methods *per se*. As part of the written feedback, all participants believed the use of the Ethical Matrix helped the process. Although this was a limited exercise conducted in a UK setting, the findings from this workshop appeared to reinforce the perception that expert groups prefer to work with a TDA.

5. ETHICAL MATRIX BOTTOM UP APPROACH (BUA)

In a bottom-up approach, the organizers provide less explicit guidance, and defer to the majority views of the (usually) lay participants in specifying the principles and conducting ethical deliberation.

In order to further analyze and develop the BUA Ethical Matrix method, a workshop was organized in Oslo (November 2004). The use of GM salmon in aquaculture was again chosen as the case for study. Ten lay participants were chosen from a sample of 70 (standardized demographic balancing was applied) self selecting citizens who had responded to an advertisement placed in a public newspaper. The ten participants were

Table 1. Specification of the Ethical Matrix used by the Edinburgh workshop participants.

Ethical Matrix for GM salmon (Generic definitions of principles for the corresponding interest groups)			
	Wellbeing	Autonomy	Justice
Treated salmon	Welfare of the organism	Behavioral freedom	Intrinsic value
Fish producers	Efficacy, safety and remuneration	Freedom to adopt or not adopt	Fair treatment in trade and law
Affected citizens (including consumers)	Safety and quality of life	Democratic decision-making	Individual and regional justice
Technologist and fish breeders	Commercial viability and working conditions	Ability to innovate	Equitable trading (market) system
Environment	Protection of the environment	Biodiversity of biotic populations	Sustainability of the environment

chosen on the basis of criteria such as gender, age, variety in educational background, and apparent motivation in application. Participants were sent briefing documents on the potential use of GM salmon and the workshop was conducted in two sessions on two separate days. On the first day, the participants were introduced to the case study and during the second day the group worked through the issues using the Ethical Matrix.

For this BUA approach, the research group applied a BUA Ethical Matrix based on the four principles – with well-being specified separately as increased benefits and reduced harm, autonomy, and fairness. The participants translated these ethical principles into specifications for the interest groups and as a result of discussions the principle Autonomy was modified and the term Dignity was subsequently used in the Matrix. The participants also added additional stakeholders to the original list. Some participants argued for the inclusion of ''future generations'' as a stakeholder group, but it was agreed that these considerations could be included under the Consumer group. Others perceived ''Research and Knowledge Production'' to be an important issue. As a result of this discussion, an additional stakeholder group, ''Research Community,'' was added to the Matrix. Five interest groups were, therefore, used in this BUA Matrix. The Ethical Matrix articulated and agreed to by workshop participants is set out in Table 2.

It should be noted that the Ethical Matrix method was introduced to the participants at the beginning of the discussion. Although, participants appreciated the organizers initial presentation of an Ethical Matrix as a starting point for their discussions, they claimed that if given more time, they might have proposed further changes, both in the list of ethical principles and in the list of stakeholders. Participants stated that the Matrix applied during the workshop should be seen as a first approximation to the problem, but they also highlighted that it would not necessarily rank as a ''natural'' classification scheme. The organizers interpreted this view as indicating a level of abstraction in the Ethical Matrix method that requires some familiarity with, and knowledge of, ethical assessment procedures.

In terms of outcomes from the workshop, much discussion centered on what the principles ''Increased benefits'' and ''Reduced harm'' actually referred to. It was, for instance, not obvious to the participants that ''Food safety'' was a correct specification of reduced harm for consumers.

On the second day, the participants discussed the potential ethical impacts for the defined stakeholders (interest groups). This was referred to as specifying the consequence matrix. The organizers proposed a completed consequence matrix, but the participants wished to propose their own analysis of the issues without assistance.

In terms of feedback from the participants and in view of the notion of ethical soundness, some individuals were of the opinion that the ethical

Table 2. Specification of the Ethical Principles by the Oslo workshop participants.

GM salmon (fast growth + sterility)	Increased benefits	Reduced harm	Dignity	Fairness
Fish producers	Income and working conditions	Dependence on natural resources, place and supplies	Freedom to chose	Fair trade conditions
Consumers (present and future)	Nutritional quality	Food safety	Respect for the consumer (food labeling)	Affordable products and general availability
Treated fish	Resistance to diseases	Animal welfare	Freedom to move	Respect for natural properties
Environment	Protection	Pollution	Sustainability of biological diversity	Regional sustainability
Research community	New themes and funds	Dependence of industrial funding	Choosing one's own research	"Undefined"

arguments were not fully clarified. This may be a limitation of the BUA, where principles are not predefined. Since this workshop was conducted with lay participants, it was felt that there should be sufficient time for a learning process to occur, in terms of the process and the subject. Giving more time for participants to reflect upon their own judgments could improve the process. The evolution of specification of the different cells and their contents are dependent upon interpretation, and this interpretation depends on the participants' background and preparation. This may be seen as a limitation for the use of the BUA approach with lay participants. However, the completed cells create compartmentalized data on the participants' views of the issues. The completion of the cells demanded a focused debate over how one perceives a decision to affect the interested parties. This leads to a debate over values and potential ethical impacts.

In addition to the comments on the methodology, several participants reported that some of their views changed as a result of conducting the process. For instance, while they raised ethical concerns with regards to commercial use of growth enhanced GM salmon, they also felt that the development of sterile GM salmon might reduce the significance of some of the major concerns, since it might address current concerns relating to wild stock levels. Thus they found that they did not fundamentally object to the use of GM technology in animal production, but options were dependent on the distribution of implied benefits.

According to the participants, many of the advantages demonstrated in this study were procedural. There is room for further development of the methodology as a tool relevant for engaging with lay participants. Some of these developments are interrelated, e.g., time and clarity. It is conceivable that some more time – or stretching the exercise over a longer period – could lead to more reflection on ethical arguments.

CONCLUSIONS

Applying both the TDA and BUA approaches to the case of GM salmon provided valuable insights that allowed further development of the Ethical Manual. The workshops highlighted the fact that, although the Ethical Matrix does not emerge as a very simple tool to use as a participatory ethical framework, it does show its potential to structure ethical concerns under varying conditions.

It is not possible to conduct a direct comparison of the outcomes from the two workshops, since the participant sample is too small and the methodological approach differed, in terms of preconditions and type of participant. However, even with these varying conditions, the two applications of the method, TDA and BUA, have allowed the analysis of some crucial indicators relating to the ethical soundness of decision support frameworks.

Examining the discourse from the workshops, the participants were able to present their ethical reasoning in relation to the technology that allowed their evaluations to be more transparent, the reference to ethical values and argument was made explicit. The use of both methodologies, TDA and BUA, allowed individuals to present varying ethical viewpoints, even to the extent that they may not have coincided with participants original viewpoints. Conducting further participatory events would establish how comprehensive the recorded considered ethical viewpoints were in this study. With regards to ethically relevant factual information, both groups seemed to endorse the view that a broad range of expertise should be involved in the preparation of technology evaluation of this nature. This represents a significant challenge and responsibility for the organizers of this type of consultation process.

These trial workshops highlighted that there are further opportunities to explore and develop the Ethical Matrix for use as a participatory tool. However, some interesting outcomes were observed from these exercises. The expert group felt that the use of the Ethical Matrix provided a needed structure for the discussion, allowing all participants to contribute and participate. It was interesting to note that the lay panel, which at the start of the process had voiced some skepticism towards biotechnology, ended up with a more positive evaluation of the potential use of GM salmon by the end of the process. No inherent technophobia seemed dominant in their evaluation and it seemed as if the close examination of this case study on the basis of an Ethical Matrix approach provided an overview that allowed participants to distance themselves from preconceived ideas and judge on the basis of information and principles that are designed to serve the common good. Thus, it is hoped that for both applications, lay and expert, that the Ethical Matrix may actively contribute to what one may call ethical discourses.

ACKNOWLEDGMENTS

This work was conducted as part of the EC funded project under DG Research, FP5, Quality of Life program, ''Ethical Bio TA tools,'' (QLG6-CT-2002-02594). The funding and the inspiring collaboration of all other consortium members are gratefully acknowledged.

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