BBSRC Consultation: Future Directions in Research Relating To Food Security

Response by GM Freeze

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GM Freeze
GM Freeze is an alliance of 55 organisations calling for a moratorium on GM foods, the growing of GM crops for any purpose and on patents on genetic resources in agriculture, food production and forestry until the need for and safety of GM technology has been established and alternative approaches have been fully evaluated.

Our members include consumer groups, farming organisations, environmental groups, development agencies, religious groups, animal welfare groups and food companies.

This response is submitted on behalf of GM Freeze.

Summary

GM Freeze is concerned that the BBSRC consultation makes no reference to the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), a process over 4 years by 400 scientists which – after analysing contributions of different agricultural systems towards sustainable food production and food security - set out a clear vision for developing agriculture and land management along agroecological lines. Although many of the proposals for research from BBSRC fit the model proposed by IAASTD, the consultation documents does not suggest that there has been a significant change in the approach adopted to R&D in agriculture. IAASTD made it clear that "business as usual" is not an option for agriculture. The conservatism shown by the BBSRC's proposals does not encourage us to believe that it is the right organisation to oversee the urgent research that is required to meet future challenges and secure food supply whilst protecting the ecosystems needed to maintain the planet in something like equilibrium.

The consultation document's failure to even mention participative plant breeding, the role of farmers in shaping and guiding research and the need for the involvement of women in these processes is further evidence that the BBSRC has not grasped the modern requirements for successful research programmes.

Overall GM Freeze is extremely disappointed by the lack of vision and inclusiveness in the proposals.

1. Introduction

Our comments of the above consultation are of two types: general comments, and specific comments on the questions posed by the BBSRC (where appropriate).

2. General Comments

2.1 IAASTD

We were surprised and disappointed that the BBSRC consultation document made no reference to the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) report published in April 2008. The IAASTD report had 22 key findings, which we summarise below. These findings clearly set out the need for agriculture to be multifunctional in the future if it is the meet the necessary demands being placed upon land managers by environmental change, the need to substantially reduce/eliminate environmental contamination, increased levels of consumption, and the need to enhance biodiversity and ecosystem services as well as providing a balanced and wholesome diet for people.

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SUMMARY of the 22 KEY FINDINGS OF IAASTD

1. PRODUCTION INCREASES: Agricultural Knowledge, Science and Technology (AKST) has contributed to substantial increases in agricultural production over time, contributing to food security.
2. UNEVEN BENEFITS: People have benefited unevenly from these yield increases
3. NEGATIVE CONSEQUENCES: Emphasis on increasing yields and productivity has in some cases had negative consequences on environmental sustainability.
4. ENVIRONMENTAL DEGRADATION: The environmental shortcomings of agricultural practice [is] increasing deforestation and overall degradation.
5. INCREASED DEMAND EXPECTED: Global cereal demand is projected to increase by 75% between

2000 and 2050 and global meat demand is expected to double.
6. MULTIFUNCTIONALITY OF AGRICULTURE: Agriculture operates within complex systems and is multifunctional in its nature.
7. STRENGTHEN AGROECOLOGICAL SCIENCES: An increase and strengthening of AKST towards agroecological sciences will contribute to addressing environmental issues while maintaining and increasing productivity.
8. REDIRECT AKST: Strengthening and redirecting the generation and delivery of AKST will contribute to addressing a range of persistent socioeconomic inequities,
9. INVOLVE WOMEN: Greater and more effective involvement of women and use of their knowledge, skills and experience will advance progress towards sustainability and development goals and a strengthening and redirection of AKST to address gender issues will help achieve this.
10. BUILD ON EXISITING KNOWLEDGE: [using] more innovative and integrated applications of existing knowledge, science and technology (formal, traditional and community-based).
11. USE NEW AKST APPROPRIATELY: Some challenges will be resolved primarily by development and appropriate application of new and emerging AKST.
12. RESEARCH FOCUS ON SMALL-SCALE: Targeting small-scale agricultural systems helps realize *existing* opportunities.
13. CREATE OPPORTUNITIES FOR POOR FARMERS: Significant pro-poor progress requires creating opportunities for innovation and entrepreneurship, which explicitly target resource poor farmers and rural labourers.
14. DIFFICULT POLICY CHOICES: Decisions around small-scale farm sustainability pose difficult policy choices.
15. PUBLIC POLICY AND REGULATION CRITICAL: Public policy, regulatory frameworks and international agreements are critical to implementing more sustainable agricultural practices.
16. NEW INSTITUTIONAL ARRANGEMENTS REQUIRED: Innovative institutional arrangements are essential to the successful design and adoption of ecologically and socially sustainable agricultural systems.
17. NEGATIVE IMPACT OF INTERNATIONAL TRADE: Opening national agricultural markets to international competition can lead to long term negative effects on poverty alleviation, food security and the environment.
18. EXPORT AGRICULTURE UNSUSTAINABLE: Intensive export oriented agriculture has adverse consequences such as exportation of soil nutrients and water, unsustainable soil or water management, or exploitative labour conditions, in some cases.
19. CRUCIAL CHOICES: The choice of relevant approaches to adoption and implementation of agricultural innovation is crucial for achieving development and sustainability goals.
20. MORE INVESTMENT IN MULTIFUNCTIONALITY: More and better-targeted AKST investments, explicitly taking into account the multifunctionality of agriculture.
21. CODES OF CONDUCT NEEDED: Codes of conduct by universities and research institutes can help avoid conflicts of interest and maintain focus when private funding complements public sector funds.
22. MULTIDISCIPLINARY APPROACHES REQUIRED: Diverse voices and perspectives and a multiplicity of scientifically well-founded options, through, for example, the inclusion of social scientists in policy and practice of AKST.
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The BBSRC consultation touches on many of the issues raised by the IAASTD's panel of 400 scientists, social scientists and economists, but fails to then paint a convincing picture of how UK research should be organised and integrated to meet the challenge of multifunctional land management. This requires more attention to be paid to monitoring and managing land use **systems** that deliver the mutlfunctionality IAASTD identified as necessary and steps back from the genetics of particular crops. In this respect, we find it extraordinary that the BBSRC consultation paper does not mention forestry, agro forestry, permaculture or tree crops, despite the real potential for such systems to perform better than the existing annual crop cycle in many circumstances as part of agroecological land management system planned to provide many outcomes.

We are disappointed by the BBSRC's lack of vision and the over emphasis on annual crops and genetics.

2.2 Farmer Involvement
IAASTD made much of the importance of harnessing local and indigenous knowledge in developing and guiding research into appropriate solutions to land management. There is no clear sign in the BBSRC's consultation paper that this finding has been taken on board. The specific needs of small farmers in the Global South are not mentioned at all, and this represents a major weakness in the BBSRC's whole approach.

2.3 Women
The IAASTD specifically recommended that women farmers be involved in research and plant breeding. Sadly the consultation paper does not even mention the crucial role women play in farming in the Global South and the need to ensure that research meets their needs (which are vastly differently from those of subsidised arable farmers in North America and the EU).

2.4 Genetic Modification
We are concerned that the BBRSC consultation makes frequent reference to the genetic modification of crops for tackling problems in crops (eg drought stress, salinity and nutrient deficient diets). These and other stress tolerant traits of GM crops have been promised for over 15 years, yet none have so far produced a commercial crop – not even in the USA, where GMO test sites have been encouraged by less rigorous regulations.

There are alternative approaches to drought stress available, such as improving soil moisture holding capacity by increasing the organic content and the utilization of deep rooting tree crops and drip irrigation systems, all of which would benefit from further R&D to develop sustainable and practical applications. Salinity is also being tackled in a number of ways including: controlled leaching; seed priming and conventional plant breeding. Again there is no suggestion that the full range of solutions will be proposed for research by the BBRSC. Many may be far more appropriate for the social, economic and political conditions that many poor farmers are forced to operate in.

2.5 Peak Oil and Phosphate
A ready and cheap supply of fossil fuels and phosphates has enabled intensive farming systems to develop over the last 50 years. However, nowadays the costs of both are challenging even for comparatively wealthy farmers in the North (let alone impoverished farmers in the South), who are already thinking twice about what fertilizers and other agro chemicals they buy. Much of the narrative in the BBSRC's consultation is focused on improving crop efficiency through some form of plant breeding. There is little analysis of farming and food systems themselves in terms of making the best use of natural resources and minimising losses to the system and the potential for addressing other important issues such as the management of organic wastes and the production of renewable energy, for instance from anaerobic digesters. Once again we are disappointed by the BBSRC's failure to grasp the need for a multifunctional approach and look at land use systems.

2.6 A Balanced Diet
We were pleased to see that the consultation paper raised the health problems associated with a poorly balanced diet in Northern countries leading to serious obesity problems in many populations due to excessive intake of fats and sugar. Indeed, obesity is now a major health concern in richer developing countries, such as India. We felt the health and environment arguments to reduce overall meat consumption should have been given greater prominence in the research needs. In particular, how to make better multifunctional use of livestock and poultry in agroecological forms of production so that they deliver more than one output (eg, soil improvement, and pest and disease control). Instead, the research requirements listed in the document seem to assume that the only reason for livestock and poultry farming would remain the production of meat, milk and eggs (with the exception of upland grazing systems).

The provision of a balanced diet for people suffering malnutrition is only briefly touched upon by the BBSRC's consultation. Instead the emphasis is on altering the nutritional composition of crops. This approach is not likely to succeed because shortage of one nutrient is often an indicator of deeper deficiencies in the diet. People in the north do not generally suffer from nutrient deficiency because they have access to a balanced diet without the need of a technical fix of modifying crops. This should also be the aim in the South. Indeed the provision of a balanced diet is acknowledged even by those engaged in developing GM Golden Rice as a superior approach:

> *"Dietary diversification is generally considered the most desirable and sustainable solution in the long run, because it improves overall dietary quality instead of addressing single micronutrient deficiencies only."*[i]

2. 7 Extension
The consultation paper acknowledges the urgent need for research to be translated into commercial practice. The failure to convert knowledge gained through research into good practice on the land applies to the North and South**.** Thus many fine ideas for sustainable management of the land may never reach the farmers who should be applying them. Research into agroecological approaches of land management will require fully functioning extension services if they are to achieve results on the ground. We would urge the BBSRC to work with others to ensure that best practice is adopted and every research grant addressing

agroecological farming includes a requirement to address how extension will be dealt with from the start. Clearly the involvement of farmers in shaping and steering research from its inception will greatly help in this process as will their direct participation in extension services. The BBSRC need to set out how they intend to involved farmers to escape from the very strong impression that they remain locked in a top down process.

3. Responses to Specific Questions

Q1. Are the challenges outlined in paragraphs 8 to 20 the most important drivers and wider considerations as the background to food security? What other considerations or drivers should be taken into account?
One of the issues not dealt with directly in this section is the wasteful use of vegetable protein to produce animal products, particularly in intensive systems of production where the animal product is the main output and even manure is seen as a problem rather than a natural resource.

Soil science also deserves far greater attention than is afforded in the current document. If climate change progresses as predicted, the maintenance of a high organic matter in the world's soil will be an essential means to lock up carbon, conserve soil moisture and protect soils from erosion. Attention also needs to be paid to ensuring that peaty soils are not allowed to dry out and release their stored carbon.

Q2. What, if any, additional overarching issues need to be taken into account when formulating priorities for research relating to food security?
Access to genetic resources for all plant breeders regardless of wealth is essential to ensure that the best varieties can be produced and agricultural biodiversity maintained.

The involvement of farmers in shaping and guiding research (especially women farmers) needs to be promoted.

Q3. Please comment on the research targets for crop production – which are the most important and/or most urgent priorities, and what other important topics should be added (including wider social and economic considerations)? For the top priorities, please indicate time scales if possible.
GM Freeze recommends that the top priorities are:

- Providing a balanced diet for all.
- Participative plant breeding where genetic resources are freely available.
- Agroecology to develop healthy and carbon rich soil more capable of withstanding unpredictable weather conditions.
- Mixed variety planting of annual crops to enable crops to withstand unpredictable weather and pest outbreaks.
- Trees and tree crops as part of agroecosytems.
- A wide genetic base for any annual crop, as uniformity creates vulnerability to pests, diseases and unpredictable weather conditions and thus enhances food insecurity.

Q4. Please comment on the research targets for livestock and fish production – which are the most important and/or most urgent priorities, and what other important topics should be added (including wider social and economic considerations)? For the top priorities, please indicate time scales if possible.
The priority for all forms of production is for low input, vegetarian systems integrated into the agroecosystems. Systems based on high protein feed are inherently unsustainable and environmentally damaging. We would like to have more emphasis placed on the integration of livestock, poultry and fish into agroecological systems where animals produce several outputs. For instance free range poultry can be multifunctional producing eggs/meat, controlling pests, improving soil fertility, improving pasture and grass land productivity. Furthermore, it strikes us as important to increase the genetic basis of livestock and to stop the trend to highly specialised breeds that cannot adapt to changing conditions or different feeds.

Q5. Please comment on the research targets for agricultural practice – which are the most important and/or most urgent priorities, and what other important topics should be added (including wider social and economic considerations)? For the top priorities, please indicate time scales if possible.
The targets listed seem appropriate and sensible. We would add:

- Management of organic matter should be given higher priority including animal and human waste, crops residues, processing residues and food waste. This needs to be prioritised to build soil organic matter fairly rapidly over the next 2 decades to increase soil carbon, improve soil moisture retention,

reduce erosion and maintain and enhance soil biodiversity. There will be opportunities to combine different sources of organic waste for renewable energy production (eg, anaerobic digestion, before incorporating the remaining materials into the soil). This area of work needs to be given high priority so that the full potential for increasing soil carbon and improving productivity can be achieved within a decade.

- Maintaining agricultural biodiversity should given high priority in both crops and livestock by supporting active and diverse breeding programmes carried out by farmers.

Q6. Please comment on the research targets for food safety – which are the most important and/or most urgent priorities, and what other important topics should be added (including wider social and economic considerations)? For the top priorities, please indicate time scales if possible.
Food safety is an important global issue because of the international nature of present day markets. Thus the capacity for harm to be caused by unsafe food has greatly increased in the past few decades because so many more people are exposed to the same foods and animals to the same feeds and recall has become a major difficulty.

This is one reason why GMO safety assessment needs to be improved, for instance by developing better allergenicity tests, and analysing the food for the presence of novel or unexpected events.

Toxins, including pesticide residues, need to be addressed.

We would not support the use of irradiation to improve food safety. Firstly, it would only hide underlying problems in production and processing methods. Secondly, it unnecessarily increases the risk of exposure to harmful radiation. Thirdly it will not solve the problem as effectively as good hygiene at all stage of the supply chain. Fourthly, radiolytic by-products and nutritional changes introduce new risks. It will also breed complacency and sloppy hygiene further down the supply and consumption chain.

The provision of safe means to protect harvested crops from pests and disease should be a priority.

Q7. Please comment on the research targets for nutrition, food quality, processing and manufacture – which are the most important and/or most urgent priorities, and what other important topics should be added (including wider social and economic considerations)? For the top priorities, please indicate time scales if possible.
The clear priority has to be the provision of a safe, healthy balanced diet to everyone on the planet. The component parts of a balanced diet are extremely well documented and in wealthy households can be achieved without recourse to high tech solutions. Education is a key element of ensuring that diets meet the requirements of providing a balance of fats, proteins and carbohydrates along with mineral and vitamins. In the Global South the challenges are far greater. However, where diet diversification with adequate calorific intake has been prioritised, good results have been achieved (eg, the Sodo project in Ethiopia[ii] and home gardens project in Cambodia, Nepal and Bangladesh[iii]).

Many such projects are small scale and efficient in use of land and natural resources. The BBSRC consultation makes no reference to the contribution small or even micro food productions systems can make to the overall supply of food and to achieving the objective of providing everyone with a balanced diet.

Q8. Overall priorities for research Considering all the research targets outlined:
(a) Which should be the most important overall priorities?
(b) What (if any) additional research targets would make a real difference?
(c) Does the UK have sufficient facilities/ infrastructure to deliver the research, and if not, what are the additional needs? (for example, see para 35 and 38)
(d) In which topics could UK research make the greatest impact in improving food security for developing countries?
GM freeze believes that the priority for research has to be agroecology, and in particular soil treatment and management and crop diversification. Concentrating on single crops will not deliver the multifunctional solutions that are required of the land and farmers. That is not to say that plant breeding should be ignored, but it has to work with natural ecosystems and resources. Integrating the management of organic wastes (on and off farm sources) into the agroecological system will require new skills and technology for all the world's farmers, but particularly those used to intensive production systems.

We feel that in most areas the UK is well placed to develop a very strong agroecological research base and, indeed, we are surprised that there is no apparent attempt to bring this together.

However, we are concerned that we may lack capacity in soil science and mycology in particular and urge the BBSRC to address this as a matter of urgency given the vital role soil will play in the future in addressing all the challenges outlined in the consultation paper.

Q9. Knowledge transfer
(a) How should the translation of research into practical application for food security be best supported? (you may wish to consider separately the needs of the UK and those of developing countries)
(b) What new funding mechanisms for knowledge transfer and translational research would be beneficial?
(c) How can relevant industries be encouraged to invest more in R&D?
If the BBSRC were to adopt a research programmes aimed at management of argoecological systems, then the requirement for knowledge transfer in the UK and the Global South would be considerable. Defra and DFID would both be required to look at extension services provision. The model provided by ADAS in the 1950s and 1960s (albeit promoting an unsustainable set of changes in UK farming) needs to be looked at, as well as the use of farmers to train farmers. The direct involvement of farmers in research programmes (see above) will help in knowledge transfer to others.

10. Training, skills and career paths
(a) What important areas of expertise and what levels of skills related to food security are in short supply (please provide evidence if possible), what are the causes of the shortages and how best should these needs be met?
(b) What areas are most urgent to address, and on what basis should investment in training and skills be prioritised?
We need a new generation of people with knowledge and skills in natural resource management, pests/pest control and integration of systems within the agroecological system.

The enhancement of plant breeding skills in the Global South will enable local communities to develop crop varieties that fit their climate, environment and systems best. There is little point in producing high yielding hybrids designed to respond to artificial nitrogen for farmers who cannot afford either at present and introduce them into an environment that is highly vulnerable to pollution and contamination of vital water supplies.

Q11. Coordination across funders
(a) How should coordination of research related to food security be improved (in the UK and internationally)?
(b) What overseas models for funding and coordination should the UK consider adopting?
(c) What will be the most important opportunities to maximise the effectiveness of UK research spending through coordination with activities overseas?
GM Freeze believes that there is an overriding need to improve research co-ordination across institutions and across disciplines. There is also a need to coordinate practical and theoretical research, as this will enable extension of new techniques to farmers more easily.

The IAASTD report should be used as a model to build the strongest possible agroecology research base in the UK. The knowledge and skills that already exist can be developed to be valuable not only in the Global South but to European and North American farmers as well.

Q12. Regulatory framework In what ways does the regulatory framework in relation to food production and supply present barriers to improving food security, and how best might any such barriers be overcome?
GM Freeze believes that the need for good regulation based on the precautionary principle should not be compromised in the present and future circumstances. The global nature of many markets means that inadequately test and potentially harmful products can be very rapidly traded around the world with huge implications for people, farm animals and the environment. Recall becomes more of a problem if global markets develop even more than at present.

Q13. Public engagement
How can we best capture the views, aspirations and concerns of stakeholders, including different interest groups across society, and ensure that these contribute to developing a food security strategy?
One of the biggest mistakes of the past has been a failure to talk to the public about changes and new development from the earliest possible time. The public are more than capable of judging whether there are any benefits from new technologies and weighing the risks against these. A variety of methods are available

for public engagement (for example, citizens' panels and juries, focus groups, public meetings and questionnaires), and in most cases the use of several approaches will help clarify public concerns or support. However, we are still learning what methods work best and in what circumstances.

It is important that the public is treated with respect and that there is a clear and transparent means to show how public engagement has change priorities for research. Token public engagement will lead to further erosion of people's trust in science, the scientific process and regulations. The history of public engagement in the UK is poor and consequently the standing of science and scientists has fallen. Listening is something the science community has to learn.

Q14. What additional barriers (beyond those outlined) may prevent the successful implementation of a strategy for research to improve food security, and how might such additional barriers be overcome?
We can envisage several barriers that could prevent progress in agroecological research:

- Failure to convince politicians to fund research to the level required.
- Failure of the scientific community and institutions to whole-heartedly adopt this approach by refusing to let go of outdated ideas.
- Failure to engage farmers and the public in the research.
- Failure to work with farmers.
- Failure to fully understand how systems work and the interaction within and between them.

These can only be overcome if there is clear and transparent communication about the direction of research, the funding of the research and the objectives.

Q15. Please provide any further comments on any issues that are relevant to this consultation.
The BBSRC has important decisions to make about the future direction of food and farming research. In our view it is important that there is a shift in emphasis toward agroecology and management of agroecosystems. There is no doubt that specific research into plant physiology, pests and diseases, genomics and marker assisted breeding still goes on, but with an eye on how land use systems can be improved to deliver all the functions that we are asking of them.

The future productivity of the world's agriculture depends on how the land is managed within the limits imposed by natural systems and not on technical fixes. Technology will have a role to play, but only if it is affordable and does not bring excessive risk or uncertainty in the eyes of the public. Technological development needs to be designed to work within natural systems and not seek to dominate. The current breed of Holstein Friesian dairy cows have been selectively bred to produce milk and the industry is fast moving towards zero grazing systems based on rye grass monocultures and high protein (often soya based from recently cleared forests in S America) with cows kept indoors producing large amounts of greenhouse gases and slurry. As breeding has progressed, welfare and genetic problems have emerged (eg, poor fertility and lameness). It is hard to imagine a system less integrated with the agroecosystem and is a good example of exactly why the BBSRC need to switch their approach research and look at whole systems.

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[i] SteinAJ etal, 2006. Supplementary Discussion Potential Impact and Cost Effectiveness of golden rice". See *Nature Biotechnology* www.nature.com/nbt/journal/v24/n10/extref/nbt1006-1200b-S1.pdf .

[ii] Wardle, C. "Community Area Based Development Approach (CABDA) Programme: An alternative way to address the current African food crisis?" *Natural Resource Perspectives 119,* November 2008, Overseas Development Institute.

[iii] Helen Keller International. *Integration of Animal husbandry into Home gardening Programs to Increase the Vitamin A Intake from Foods: Bangladesh, Cambodia and Nepal* Special Issue January 2003. See www.hki.org/research/pdf_zip_docs/APRO%20Special%20issue%20Jan%202003.pdf