BIS consultation on
shaping a UK strategy for agri-tech

UK Food Group submission
(13 Nov 2012)

3. Please describe the organisation that you represent

Charity or social enterprise

4. Name and contact details

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5. Outline your reasons for responding to this call for evidence

The UK Food Group is the main network of NGOs in the UK working on global food, agriculture and hunger issues, including development, environment, farmer, consumer and academic groups. Our interest in this call for evidence is the role that agricultural knowledge, science and technology can have in contributing to the eradication of hunger, depending on the policies and practices chosen.

Key points that we wish to emphasise are:

- importance of implementing the findings of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)
- any UK strategy that seeks to meet international development objectives, such as achieving food security, must be led by the needs and objectives of developing countries rather than being driven by UK commercial interests
- any UK strategy around global food security needs to take into account in a meaningful way the voices of those most affected by food insecurity
- the food sovereignty framework development by networks of smallscale food producers provides objectives that a UK strategy on agricultural knowledge, science and technology could support
- agroecological approaches should be the basis of a UK strategy for agricultural knowledge, science and technology around production
- urge the UK Government to not solely focus on private sector business investment but rather focus on supporting countries to increase public investment in agriculture
- outcomes for a UK strategy for agricultural knowledge, science and technology and should also include:
    - Investing in rebuilding extension services to scale up uptake of agroecological practices.

- Championing reform of global agricultural research and development
- Strengthening the rights and address the specific needs and constraints of women small-scale food producers
- Channelling investments to support the needs outlined in country and regional agricultural investment plans

- indicators of success for a UK strategy for agricultural knowledge, science and technology can be based in questions for the objectives and outcomes including:
  - Are they reducing poverty?
  - Are they based on rights and social equity?
  - Do they regenerate and conserve soil, and increase soil fertility?
  - Do they conserve and encourage agrobiodiversity?
  - Do they reduce greenhouse gas emissions?
  - Do they increase income opportunities and employment?

The aims and objectives of the agri-tech strategy are outlined in the introduction to this call. Please give:

6. Your views on the need for and potential benefits of having such a strategy.

In 2008 the groundbreaking International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) reported. Its first three findings were that agricultural knowledge, science and technology have contributed to substantial increases in agricultural production over time, contributing to food security, but that people have benefitted unevenly from this across regions and that the emphasis on productivity has in some cases had negative consequences on environmental sustainability.[1] This, as noted in the introduction to the call for evidence, was echoed by the *Foresight project on Global Food and Farming Futures*. It expresses a clear need for change, as the Taylor Report also recognised in referring to "A new age". A strategy that sought to achieve this change would be of great benefit.

As the IAASTD report also notes:

> "AKST arrangements involve ethical choices and value judgments. In some cases they have excluded or marginalized key actors, such as small-scale farmers, with preference being given to short-term over longer term considerations. Some judgments have been privileged over others in AKST decision making. They have helped push formal AKST along certain pathways to the neglect of other well-evidenced options"[2]

A well judged strategy can help to counter this historical trend, while a poor one will perpetuate it.

Change requires new thinking both for agriculture in the UK and globally. What will "efficiency" mean in the age of climate change? What research issues will arise? Should science and technology carry on, on the trajectory of the last 50 years? Will this address such questions as the climate change implications of nitrogen fertilizer manufacture as well as its use? What are the obstacles of once again feeding pigs on food waste? What is the role of permanent pasture in carbon retention, and how can this be enhanced? What will be

[1] IAASTD, *Global Summary for Decision Makers*, Washington DC: Island Press, 2009, p5. http://www.agassessment.org/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Global%20Summary%20for%20Decision%20Makers%20(English).pdf

[2] IAASTD, *op cit*, p19

the place of ruminants in the future? How can UK agriculture escape from the dependence of soya linked to climate damage?

Globally, 70% of the world's people are currently fed by small-scale food producers.[3] Small scale agroecological and other forms of sustainable agriculture and food production, developed in a framework of social equity and justice, have the potential to:[4]

- eliminate most hunger and poverty,
- drastically mitigate both the level and impact of climate change,
- restore agricultural biodiversity, soil fertility and water resources,
- improve livelihoods & provide rewarding employment for 100s of millions of people,
- produce enough, high quality, diverse and nutritious food for 9 billion people or more
- keep farm animals in ways that respect their natural behaviour.

The question for a UK strategy on agricultural knowledge, science and technology is how the UK can support this.

7. Your views on the appropriateness of the objectives proposed.

The objectives proposed are within a vision of "*unlocking the full potential of the UK's world leading research*", and of "*effective exploitation of the science base in the UK to increase the competitiveness of domestic agriculture and contribute to global challenge of food security*". The conflation of aims around UK competitiveness with justification on grounds of global development contains potential conflict between commercial interests and development effectiveness, including environmental sustainability.

OECD processes on aid effectiveness are based in the principle of developing country-led, developing country-owned. Development is something that must be done by developing countries themselves, not to them. External assistance from developed countries such as the UK must be tailored towards helping developing countries achieve their own development objectives, with developed countries in a supporting role. Thus an agri-tech strategy for the UK that seeks to contribute to global food security must be shaped and driven by the objectives of developing countries, not by British commercial interests.

The UN Committee on World Food Security recognises that in policy discussions on food security it is particularly important that the voices of those most affected by food insecurity are part of the discussion,[5] namely smallholder family farmers, artisanal fisherfolk, herders/pastoralists, landless, urban poor, agricultural and food workers, women, youth, consumers and Indigenous Peoples.[6] This also applies in this case.

Global networks and social movements of small-scale food producers, including farmers, pastoralists, fisherfolk and indigenous people, have defined their own vision for the food system through the framework of food sovereignty. Food sovereignty is rooted in the need for communities to be able to define and control their own food systems and it rejects the imposition of unwanted technologies. Thus both from the grassroots and from the intergovernmental levels there is rejection of externally defined agendas.

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[3] ETC Group, *Who will feed us? Questions for the food and climate crises*. Ottawa: ETC Group, 2009, pp4-5 www.etcgroup.org/upload/publication/pdf_file/ETC_Who_Will_Feed_Us.pdf

[4] Human Rights Council, *Report submitted by the Special Rapporteur on the right to food, Olivier De Schutter*. A/HRC/16/49. UN, 2010, p6. http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G10/178/49/PDF/G1017849.pdf

[5] Committee on World Food Security, *Reform of the Committee on World Food Security*. CFS:2009/2 Rev.2. Rome: FAO, 2009, p2. www.fao.org/fileadmin/templates/cfs/Docs0910/ReformDoc/CFS_2009_2_Rev_2_E_K7197.pdf

[6] Committee on World Food Security, *op cit*, p4. www.fao.org/fileadmin/templates/cfs/Docs0910/ReformDoc/CFS_2009_2_Rev_2_E_K7197.pdf

One of the pillars of the food sovereignty framework[7] is building on the skills and local knowledge of small-scale food producers and their local organisations that conserve, develop and manage localised food production and harvesting systems, developing appropriate research systems to support this and passing on this wisdom to future generations. The food sovereignty framework rejects privatisation of natural resources through laws, commercial contracts and intellectual property rights regimes and technologies that undermine, threaten or contaminate these systems, eg genetic engineering.

Food sovereignty also uses the contributions of nature in diverse, low external input agroecological production and harvesting methods that maximise the contribution of ecosystems and improve resilience and adaptation, especially in the face of climate change. It rejects methods that harm beneficial ecosystem functions, that depend on energy intensive monocultures and livestock factories, destructive fishing practices and other industrialised production methods, which damage the environment and contribute to global warming.

These are two areas particularly relevant to agricultural knowledge, science and technology of the food sovereignty framework, defined by smallscale food producers, which the UK could chose to support.

The objectives proposed consist of:

- *improved agricultural production efficiencies (for both food and non-food manufacturing) whilst avoiding environmental harm*

  The IAASTD report recommends that:

  > "An increase and strengthening of AKST towards agroecological sciences will contribute to addressing environmental issues while maintaining and increasing productivity"[8]

  Agroecological approaches should be the basis of a UK strategy for agricultural knowledge, science and technology around production. Agroecology is outline by the UN Special Rapporteur on the Right to Food as:

  > "Agroecology is both a science and a set of practices. It was created by the convergence of two scientific disciplines: agronomy and ecology. As a science, agroecology is the "application of ecological science to the study, design and management of sustainable agroecosystems." As a set of agricultural practices, agroecology seeks ways to enhance agricultural systems by mimicking natural processes, thus creating beneficial biological interactions and synergies among the components of the agroecosystem. It provides the most favourable soil conditions for plant growth, particularly by managing organic matter and by raising soil biotic activity. The core principles of agroecology include recycling nutrients and energy on the farm, rather than introducing external inputs; integrating crops and livestock; diversifying species and genetic resources in agroecosystems over time and space; and focusing on interactions and productivity across the agricultural system, rather than focusing on individual species. Agroecology is highly knowledge-intensive, based on techniques that are not delivered top-down but developed on the basis of farmers' knowledge and experimentation."[9]

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[7] *Nyéléni 2007 – Forum for Food Sovereignty: synthesis report*. Sélingué, Mali, February 2007. www.nyeleni.org/IMG/pdf/31Mar2007NyeleniSynthesisReport-en.pdf

[8] IAASTD, *op cit*, p6

[9] Human Rights Council, *Report submitted by the Special Rapporteur on the right to food, Olivier De Schutter*. A/HRC/16/49. UN, 2010, p6. http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G10/178/49/PDF/G1017849.pdf

There is a need to redefine the methods by which productivity is measured both at the production end and consumption end of the food chain. Agroecological methods have the potential to hugely increase productivity per hectare land especially by producing multiple outputs from the same hectare of land. This includes products for the market but also agricultural biodiversity which has been identified as key to facing future challenges to food production. Agroecological techniques are also more efficient by reducing the units of inputs such as fossil fuels and chemicals required. At the consumption end, a productive food system should be measured as one that provides improved nutrition rather than just increased calorie intake.

We strongly concur that the elimination of negative environmental impacts of agricultural technologies is essential.

Over the last half-century, industrial breeders have produced about 80,000 plant varieties of which, almost 60% have been ornamentals.[10] Small-scale food producers have contributed close to 2.1 million food and feed varieties through their on-farm conservation and development of seeds and other plant genetic resources for food and agriculture. It would therefore be effective to support organisations and networks of small-scale food producers to develop and continue this work through research undertaken with and for small-scale food providers. This would include providing peasant networks with copies of plant genetic material stored in government and inter-governmental *ex situ* genebanks, for the networks own use in plant breeding and inter-farm exchange initiatives, and eliminating monopolistic regulations (including patents) that inhibit innovation.

Finally we note that while there is scope for continued work on productivity, there is also a big role for agricultural knowledge, science and technology around waste within the food system, and policies and strategies to reduce this.

In passing, we note that the figure of 70% increase in demand for food given in the introduction to the call for evidence based on the OECD-FAO Agricultural Outlook has now been revised downward to 60% by the OECD-FAO Agricultural Outloook.[11] The figure itself has been critiqued by members of the UK Food Group.[12]

- *solutions to global food security whilst maintaining natural resources and preserving biodiversity*

  We welcome a focus on biodiversity. This should include not only the agricultural biodiversity upon which we depend for our food, but also wild plant varieties closely related to crop plants. It is vital to enable *in situ* conservation through international protection of centres of diversity and the habitats of wild relatives of crops. Although the importance of crop wild relatives is widely recognized, the industrial research system is only collecting 700 species. The research systems of small-scale food producers works with 50-60,000 species of wild relatives through *in situ* conservation and community breeding activities.[13] Habitats with rich biodiversity are living genebanks, every bit as valuable as *ex situ* genebanks and very vulnerable.

  There is also a need to protect species diversity in livestock and to promote resilient breeds. An important focus for this is the conservation and breeding of these animals by small-scale food providers. Industrial livestock farming has only five key animal

[10] ETC Group, *op cit* p16-17, www.etcgroup.org/upload/publication/pdf_file/ETC_Who_Will_Feed_Us.pdf

[11] See www.oecd.org/site/oecd-faoagriculturaloutlook/ and www.fao.org/fileadmin/user_upload/FAODG/docs/2012-02-08-DG_Economist_Conference-FINAL.pdf

[12] Tomlinson, "Doubling food production to feed the 9 billion: A critical perspective on a key discourse of food security in the UK" *Journal of Rural Studies*. 2011, www.fcrn.org.uk/sites/default/files/tomlinson...pdf.pdf

[13] Maxted & Kell (2009), *Establishment of a global network for the in situ conservation of crop wild relatives: status and needs*. Rome: FAO, www.cwrsg.org/Publications/Reports/Global_in_situ_CWR_conservation_network.pdf

species[14] and about 100 breeds account for almost all commercial meat and dairy production. Breeding for extremely high levels of productivity has had adverse impacts on the health and welfare of farm animals in industrial systems. Small-scale farmers and pastoralist maintain 40 livestock species and around 7,600 breeds that contribute to biodiversity and resilience as well as jobs and food production.[15]

With regard to natural resources, it is key to support agricultural techniques that renew, recycle and preserve natural resources rather than just maintain them. For example desertification and depletion of soils is a serious limiting factor to increasing food production especially in the industrialised world. A broken nitrogen cycle is leading to massive climate emissions from fertilizer use, pollution from nitrogen overload in intensive systems and soil depletion. Agroecological techniques such as fertilizer trees and crop rotations are available now and can help rebuild soils, recycle nitrogen on farms and reduce climate emissions.

- *sustainable international development and wider international collaborations*

  The UN Committee on World Food Security is the foremost international platform for governance of work toward the elimination of hunger, and should be a central focus for international collaborations as part of the UK strategy on agricultural knowledge, science and technology.

  As previously noted, it is important that international development collaboration be driven by developing country objectives and meaningful engagement with those most affected by hunger.

  In considering the contribution of agricultural knowledge, science and technology, it is important to recognise that they do not operate in a vacuum, but within our social, economic and cultural structures, and that they affect and are affected by power structures and inequalities. Among other points, the IAASTD report notes that:

  > "AKST alone cannot overcome gender and ethnic biases and inequities in agriculture, but insufficient attention to these issues by AKST actors can lead to unintentional increases in inequity. …
  >
  > …the distribution of AKST benefits has accrued unequally to those who already hold agricultural assets – land, water, energy resources, markets, inputs and finance, training, information and communications."[16]

  It is thus important to take explicit account of social, economic and cultural factors in developing a strategy, in order to ensure the strategy contributes toward equitable and sustainable development that supports human rights.

- *increased engagement with the business sector including through inward investment to further stimulate enterprise and accelerate the translation of research into practical applications*

  Engagement with the business sector to achieve global food security must reflect and balance the intrinsic potential for conflict of interest between the goal of private profit and public and environment welfare. Private firms have a legal duty to put shareholder interests above all other interests. While noting that private firms make major contributions, the IAASTD report observes:

[14] Cattle, chickens, pigs, sheep and goats.

[15] FAO Commission on Genetic Resources for Food and Agriculture (2009) *The roles of small-scale livestock keepers in the development, use and conservation of livestock resources*. Rome: FAO, ftp.fao.org/docrep/fao/meeting/017/ak525e.pdf and (2007), *The state of the world's animal genetic resources for food and agriculture*. Rome: FAO ftp.fao.org/docrep/fao/010/a1250e/a1250e.pdf

[16] IAASTD, *op cit*, pp19-20

> "They will rarely provide public goods or supply goods and services for which there is no market but evidence shows that there are considerable spillovers from private suppliers of technology to farmers and consumers. To make the best use of private investments in AKST, government regulations are needed to address negative externalities and monopolistic behavior and to support good environmental practices, while at the same time providing firms with incentives to invest in pro-poor AKST"[17]

The UN Committee on World Food Security has recognised that the majority of investments in agriculture are made by small scale farmers themselves and therefore the best route to improving agriculture is for States to support these farmers in making their own investments.

In order to enable positive engagement with the private sector legally binding mechanisms are needed which put people and environment at the centre and make it possible to hold private firms accountable. Private investment on research and technologies should respond to risk assessments that are transparent and public and that take into account the precautionary principle.

There are many areas where there is an urgent need for agricultural knowledge, science and technology to contribute to the public good, for instance on issues such as carbon retention in pasture, but where there may not be scope for profit.

We strongly urge the UK Government to not solely focus on private sector business investment but rather focus on supporting countries to increase public investment in agriculture. This includes support for measure that ensure that multinational companies pay appropriate taxes in developing countries, thus increasing revenue available for investment in agriculture.

- *increased UK exports of knowledge, products, systems services and technology*

  An export oriented policy on technologies, knowledge and services overrides the principle of respect to local knowledge and technologies, and will not necessarily support developing countries in enhancing their agricultural sector or improving food security.

  Moreover, exporting expensive technologies to developing countries has the potential to benefit only those who already have the means to access it, leaving behind the majority of small and medium small scale food producers.

- *a well networked, professional, highly skilled and technology-aware agricultural sector with improved access to advice for the farming community on best practice and new technologies*

  Valuing small-scale food producers and supporting them in building their networks and their knowledge and skills is essential.

  There is a need to integrate all DEFRA agencies that interact with farmers and ensure that they have effective relationships with levy boards and independent consultants, so that advice and discussion occurs in the real arena where farmers must integrate following the regulations, nurturing their land and environment, and earning a living in their own particular circumstances. At present, what they receive comes in bits and pieces down different disconnected channels. The basis of this needs to be strengthening the relationship between farmers and government, not simply a compliance mechanism.

  The IAASTD report recommends the following in order to develop and retain knowledge in the farming sector:

[17] IAASTD, *op cit*, p27

"(1) reforming curricula at all levels to improve the attractiveness and societal relevance of agricultural studies; (2) increasing access to technology education and science-informed farm and agroecosystem management knowledge to all those working in the agricultural sector; (3) improving collaboration between ministries (agriculture, water, environment, education) and universities; (4) developing infrastructure to facilitate the use of information and communications technology (ICT) in informal and formal education systems; (5) mobilizing funds from a variety of sources to support agricultural education reform; and (6) encouraging university participation in recovering and recognizing traditional and local knowledge and including the participation of traditional knowledge actors in curricula design"[18]

8. Your views on the desired outcomes and indicators of success of the strategy, and the role for Government in enabling delivery of these.

We recommend that the Government derive the outcomes and indicators for a strategy on agricultural knowledge, science and technology from the findings of the IAASTD report. An 'at a glance' summary of its findings is given below. We also recommend the checklists from a recent paper, Koohafkan et al, 2011 "Green agriculture: Foundations for biodiverse, resilient and productive agricultural systems"[20], also given below.

In addition to these we recommend the following as outcomes for such a strategy:

- *Invest in rebuilding extension services to scale up uptake of agroecological practices*. Work with developing country governments to rebuild extension services by dramatically increasing the number of public extensionists, ensuring training for all extensionists on agro-ecological practices, and supporting farmer-to-farmer training models (such as farmer field schools).
- *Champion reform of global agricultural research and development*. Emphasise technologies of practice over products, agroecological approaches that address environmental sustainability, approaches that are adapted to the specific needs and constraints of women food producers, building the adaptive capacity of small-scale producers, and the crops most important to poor people.
- *Strengthen the rights and address the specific needs and constraints of women small-scale food producers*, ensuring women's and men's equal access to productive resources including land ownership and inheritance, access to financial services, agricultural technology and information, business registration and operation, and employment opportunities; and ensure that women have meaningful participation in all decision making processes related to achieving women's rights.
- *Channel investments to support the needs outlined in country and regional agricultural investment plans*. In countries without country investment plans, donors should support partner country efforts to develop new plans that address both food security and nutrition through multi-stakeholder processes with full civil society participation.

[18] IAASTD, *op cit*, p20

22 key findings of IAASTD – at a glance[19]

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 existing 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.

[19] Summarised by Patrick Mulvany, in *Food ethics: the magazine of the Food Ethics Council*. 3(2) Summer 2008, p27 from IAASTD, *Global Summary for Decision Makers*, Washington DC: Island Press, 2009. http://www.agassessment.org/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Global%20Summary%20for%20Decision%20Makers%20(English).pdf

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.

From Koohafkan et al, 2011 "Green agriculture: Foundations for biodiverse, resilient and productive agricultural systems"[20]

Requirements of agroecologically based agricultural systems

1. Use local and improved crop varieties and livestock breeds so as to enhance genetic diversity and adaptation to changing biotic and environmental conditions.
2. Avoid the unnecessary use of agrochemical and other technologies that adversely impact the environment and human health (e.g. heavy machineries, transgenic crops, etc.).
3. Ensure efficient use of resources (nutrients, water, energy, etc.), reduced use of non-renewable energy and reduced farmer dependence on external inputs.
4. Harness agroecological principles and processes such as nutrient cycling, biological nitrogen fixation, allelopathy (the effect of one plant on another through its release of biochemicals), biological control via promotion of diversified farming systems and harnessing functional biodiversity.
5. Make productive use of human capital in the form of traditional and modern scientific knowledge and skills to innovate and use social capital through recognition of cultural identity, participatory methods and farmer networks to enhance solidarity and exchange of innovations and technologies to resolve problems.
6. Reduce the ecological footprint of production, distribution and consumption practices, thereby minimizing greenhouse gas (GHG) emissions and soil and water pollution.
7. Promote practices that enhance clean water availability, carbon sequestration, and conservation of biodiversity, soil and water conservation, etc.
8. Develop capacity to cope with rapid and unforeseeable change based on the need to sustain a balance between long- term adaptability and short-term efficiency.

[20] P Koohafkan, MA Altieri and EH Gimenez, "Green agriculture: Foundations for biodiverse, resilient and productive agricultural systems." *International Journal of Agricultural Sustainability* 10 (1) 2012, pp61-75. http://dx.doi.org/10.1080/14735903.2011.610206

9. Strengthen adaptive capacity and resilience of the farming system by maintaining agroecosystem diversity, which not only allows various responses to change, but also secures key farming functions.
10. Recognize the dynamic conservation of agricultural heritage systems that supports social cohesion and a sense of pride and reduces migration.

A set of guiding questions to assess if proposed agricultural systems are contributing to sustainable livelihoods

1. Are they reducing poverty?
2. Are they based on rights and social equity?
3. Do they reduce social exclusion, particularly for women, minorities and indigenous people?
4. Do they protect access and rights to land, water and other natural resources?
5. Do they favour the redistribution (rather than the concentration) of productive resources?
6. Do they substantially increase food production and contribute to household food security and improved nutrition?
7. Do they enhance families' water access and availability?
8. Do they regenerate and conserve soil, and increase (maintain) soil fertility?
9. Do they reduce soil loss/degradation and enhance soil regeneration and conservation?
10. Do practices maintain or enhance organic matter and the biological life and biodiversity of the soil?
11. Do they prevent pest and disease outbreaks?
12. Do they conserve and encourage agrobiodiversity?
13. Do they reduce greenhouse gas emissions?
14. Do they increase income opportunities and employment?
15. Do they reduce variation in agricultural production under climatic stress conditions?
16. Do they enhance farm diversification and resilience?
17. Do they reduce investment costs and farmers dependence on external inputs?
18. Do they increase the degree and effectiveness of farmer organizations?
19. Do they increase human capital formation?
20. Do they contribute to local/regional food sovereignty?

9. Your views on any potential drawbacks / unintended consequences associated with these outcomes and how these could be mitigated.

The outcomes outlined above, based in agroecological practices, have the potential to be transformative. Possible problems lie if these outcomes are interpreted, or other outcomes are selected, in order to allow the continuation of business as usual. If business as usual is allowed, then a 'greenwash' of sustainability can be a cover for the continuation of environmentally destructive practices as well as corporate concentration of food production, inputs and distribution.

10. What in your view are the current strengths and weaknesses of the UK agricultural technology sector?
Please provide evidence in support of your responses.

There is a lack of an effective, objective listening and advisory network, as the Taylor Report recognizes. For example, where does a farmer moving into unfamiliar areas of technology in renewable energy get sound advice to guide him or her and to convince the bank manager? There is often also a lack of participatory farmer groups to link into the advice currently available and provide feedback to government research workers and others about the application of technology and farmers own skills and adaptation.

Internationally, in the policies and programmes supported by the UK government, the emphasis is on the use of industrial production technologies, and the conversion of other food systems to comply with an industrial approach. There is a dearth of actions that will help sustain and develop small-scale, biodiverse, ecological, resilient and locally-controlled food systems.

11. How do you think the ability of the agri-tech sector to bring growth to the UK economy could best be facilitated or supported by Government working with the industry?

There is a real conflict between this objective and the needs of the majority of food producers in the world, as described above.

12. What is the potential and what should be the role of technology in addressing the needs of UK farmers, and meeting the challenges of global food security and the increasing demand for non-food bio-renewable products and resources?
This would include new technologies (such as nanotechnologies, robotics, remote sensing), modern biotechnology techniques (such as genomics analysis, cloning, GM) and engineering solutions. Please provide examples where technologies may be particularly transformative in their impact, and how research skills in these may be enhanced.

Agroecological practices have the potential to double production by small-scale food producers in regions where the majority of the people most affected by hunger live, while reducing poverty and improving nutrition.[21]

High tech biotechnology techniques are high risk and have not contributed to achieving food security or reducing poverty. Outwith concerns over the human health and environmental implications of these 'new' technologies, by their provenance and nature, 'new' technologies are proprietary and favour the capture of bio-resources and the development and use of practices that reduce biodiversity, local control and equity. As described above, these technologies are rejected by the food sovereignty framework developed by the majority food providers. We believe that global food security, livelihoods and the environment will be harmed by the use of these technologies and that the diversion of R&D resources towards the development of these technologies reduces the amount available for supporting the proven technological approaches developed by small-scale food producers themselves.

[21] OHCHR, *Eco-farming can double food production in 10 years, says new UN report*, www.srfood.org/images/stories/pdf/press_releases/20110308_agroecology-report-pr_en.pdf and Human Rights Council, *Report submitted by the Special Rapporteur on the right to food, Olivier De Schutter*. A/HRC/16/49. UN, 2010, p6. http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G10/178/49/PDF/G1017849.pdf

The European Group on Ethics in Science and New Technologies to the European Commission (EGE) has said that:

> "Considering the current level of suffering and health problems of surrogate dams and animal clones, the EGE has doubts as to whether cloning animals for food supply is ethically justified. … At present, the EGE does not see convincing arguments to justify the production of food from clones and their offspring."[22]

13. What do you think are the main barriers to the achievement of the proposed strategic objectives and how do you think they might be overcome?

14. Please let us know if you/your organisation would like to be considered to take part in future activities that may arise as a result of the implementation of this strategy.

We would be happy to be considered, particularly if we can help facilitate engagement with organisations of small-scale food producers in developing countries, for their input on any aspects of the strategy relating to global food security.

The UK Food Group briefing, *Securing future food*[23] provides further useful evidence and information, as do publications by UK Food Group members. If you should want to have further information, please let us know.

[22] European Group on Ethics in Science and New Technologies to the European Commission, *Opinion no. 23: Ethical aspects of animal cloning for food supply*. Brussels: EGE, 2008. http://ec.europa.eu/bepa/european-group-ethics/docs/publications/opinion23_en.pdf

[23] UK Food Group, *Securing future food: towards ecological food provision*. London: UK Food Group, 2010. www.ukfg.org.uk/pdfs/Securing_future_food.pdf