



Organic Centre Wales
Canolfan Organig Cymru

Response from the Welsh Agri-food Partnership Organic Strategy Group
to the Welsh Assembly Government consultation on

Farming, Food & Countryside - Building a secure future

<http://new.wales.gov.uk/consultation/drah/environmentandcountryside/2008/080616farmingconsultation/consultationdocument/farmingconsultationdoce.rtf?lang=en>

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The contribution of organic farming to future Welsh agriculture

“The strongest feature of organic agriculture is its reliance on fossil-fuel independent and locally-available production assets; working with natural processes increases cost-effectiveness and resilience of agro-ecosystems to climatic stress,”

FAO paper *Organic Agriculture and Food Security*, presented at an International Conference on Organic Agriculture and Food Security (3-5 May 2007) See Annex 2.

Organic farming delivers on many of the challenges outlined in the document. It offers a win-win solution, addressing market demand and farm profitability whilst being environmentally beneficial, with high standards of animal-welfare, and less dependent on fossil fuels.

In particular organic farming makes a positive contribution to mitigating climate change and protecting the environment through reducing non-renewable resource use, reducing pollution and supporting biodiversity, as direct and indirect effects of organic farming rules and practices. A detailed explanation of the contribution of organic farming to climate change and agricultural sustainability is outlined in Annex 2.

Organic crop rotations include a fertility building phase designed to restore soil fertility and organic matter, which compensates for carbon losses due to cultivation and in the longer term increases carbon storage in the soil.

Organic farms, by not using synthetic fertilisers, pesticides and herbicides, significantly reduce fossil energy inputs per hectare compared with standard farm practice. This outweighs increases in fuel use due to mechanical weed control operations. In most cases, energy use per tonne of food produced is also lower, despite lower yields.

¹ Organic Centre Wales (OCW) was established in 2000 as a focal point for the dissemination of information on organic food and farming to producers and other interested parties in Wales. In 2003, it was agreed that it should extend its focus to public education, public procurement, policy and strategy development, thus providing support to the whole of the organic community in Wales. .

OCW is based at Aberystwyth University and is run by a partnership of three organizations actively involved in organic farming research and knowledge transfer in Wales: ADAS, The Organic Research Centre Elm Farm and Institute of Biological, Environmental and Rural Sciences at Aberystwyth University.

The funding for OCW comes from the Welsh Assembly Government (WAG) and Farming Connect (with additional support from the European Union EAGGF Objective 1 funds) to carry out the co-ordination functions, with additional funding for delivery through a separate WAG Organic Conversion Information Service contract and the Farming Connect Organic Development Programme.

The restrictions on synthetic fertilisers and biocides also reduce greenhouse gas emissions, in particular from nitrous oxides associated with their manufacture.

Organic standards emphasise concepts of self-sufficiency, closed cycles and low external inputs, which contribute to the sustainable use of non-renewable resources.

Organic livestock are mainly grass fed from the farm's own resources, with reduced reliance on feeds produced elsewhere. As a result, stocking rates are lower on organic farms, balancing the greater prevalence of animals in arable organic farming systems.

While methane emissions per unit food produced may be higher on organic farms, due to lower yields/stocking rates, these are typically more than offset by the reduction in other greenhouse gas emissions, notably carbon dioxide and nitrous oxides, resulting in reduced overall global warming potential.

Many research studies have identified the positive impact of organic farming on biodiversity, ranging from soil organisms to plants, insects, birds and wild mammals. This is due to the reduced or non-use of fertilisers and pesticides, the diverse cropping systems and positive approach to hedge and field margin management in lowland systems. In the uplands, lower stocking rates, mixed stocking of cattle and sheep and feed/fodder production on-farm all contribute to enhanced biodiversity.

While organic farming is often associated with lower yields compared with intensively produced crops, the FAO and others have recognised the potential of organic farming to increase yields in subsistence agriculture where access to external resources is limited, and to provide a premium export market to assist economic development. In more industrialised contexts, the productivity 'gap' between organic and conventional systems is significantly reduced if total system productivity is compared, rather than yields of individual crops, due to the benefits that can be derived from integrating crop and livestock production and emphasising livestock production from forage not cereals.

Organic farming in Wales reached 6.4% of total agricultural land area at the end of 2007, and over 9% of arable area, including horticulture and temporary leys, where the environmental and climate change impacts are greatest.

There has been a recent surge in the uptake of organic management by cattle and sheep farmers in Wales. With close to 10% of Welsh land area likely to be under organic management by the end of 2008, Wales is among the leaders in the EU, and well ahead of other parts of the UK.

This high organic profile is of potential benefit to Wales in terms of its consumer image both in Wales, the abroad. Further, for those not opting for the organic route, organic systems can act as a role model from which specific techniques can be adopted.

Current economic conditions mean that organic market prospects are an issue of concern and that we need both to ensure that the market focus of FMDD and the Agri-Food partnership, and the public good requirements represented by Axis 2 are kept in balance.

The Gothenburg agenda requires that future development should contribute to achieving sustainable development by increasing emphasis on encouraging healthy, high-quality products, environmentally sustainable production methods, including organic production, renewable raw materials and protecting biodiversity. The Wales RDP recognises the cross-cutting nature of organic farming, and there is a need to ensure integration and complementarity of strategies, and to ensure that in the development of sub-strategies there is a conscious effort to gain complementarity between organic and other strategies.

In summary, we would like to see greater recognition in the document of the potential contribution of organic farming as well as the challenges that the organic sector faces. We have detailed specific instances later in the text and appended grid (Annex 1).

General comments on the document

We have prepared a grid commenting individually on the challenges and actions (Annex 1).

In addition to the specific concerns regarding the missed opportunity offered by the organic sector, outlined above, we offer the following further comments:

Overall, this is a difficult document on which to comment. Responding is also not helped because the individual challenges are not numbered or titled. It states that it will be supported by more detailed strategies, which should provide actions, in which case it could be hoped that this document would provide a more clear direction. The actions outlined are frequently already in place, and whilst it may be useful to document them, they do not serve to provide additional direction.

1. The introduction

The introduction states that sustainability is at core of the strategy, but it actually lists profitability first and then uses ‘safeguarding’ and ‘maintaining’ relating to the environment and rural communities. More positive terms could have been used, such as aiming to ‘enhance’ the environment and ensure ‘flourishing’ rural communities. The statement also implies that profitable farming will sustain farming families and ensure the prosperity of our rural communities, yet increasing profitability often goes with increased size and economies of scale which are likely to lose family farms. Although the introduction states that the vision in Farming for the Future emphasizes the importance of the family farms, the issue is not tackled in the strategy.

The 2020 report is mentioned, but there is no feeling that this document sets out a long term vision, in response and has rather more a ‘here and now’ feeling. The report reminds us of the 2020 three tools to be developed, yet these issues are hardly addressed in the remainder of the document. Achieving collaboration is mentioned but with no clear methodology except through Farming Connect. There is also very little discussion of how innovation through rejuvenation might be achieved.

It is striking that there is no case made for the importance of land managers’ vital role in the well-being of the nation. The contribution farmers and land managers make to public goods, such as landscape, biodiversity, clean air and clean water is insufficiently promoted. The text following Table 2 regards only production enterprises as agricultural activity whereas income from AE schemes must be recognized by all as a legitimate return for enterprise. This is not recognized by farmers, let alone the general public, so there is a great need to promote wider recognition by both land managers and the public of these services, why they are valuable and that they should be paid for.

It is disappointing that the overall strategy objective doesn’t mention food security or achieving a better balance of production in Wales. Further, there is no mention of health or quality of produce in the objective. There are mentions of food quality within the text, in reference to Farming for the Future, and on page 12, but no challenge or actions are outlined to address this, either to improve the quality of produce, or even work towards a useful definition of food quality. Annex A outlines strategies and proposed consultations relating to the Rural Affairs portfolio: it would be beneficial to document the links to other relevant portfolios and departments, such as Education and Health, to ensure these links are thoroughly integrated during development of the actions.

2. Global perspective

Global food security: at the International Conference on Organic Agriculture and Food Security organized by FAO in 2007, they concluded: "These models suggest that organic agriculture has the potential to secure a global food supply, just as conventional agriculture is today, but with reduced environmental impact," (See Annex 2)

The projected average global price (figure 2) indicates a 10% increase in the price of beef. For finished beef enterprises, the average enterprise net margin with a 10% increase in price, using 2006/07 data, would still be negative at -16.5p/kg on organic farms, and on comparable conventional farms -38.8p/kg. These figures for the 33% best enterprises are 195p/kg and 30p/kg for organic and conventional respectively. The average conventional enterprise net margin including the cost of the farms' resources and support payments, and including a 10% increase in enterprise outputs, would be -15p/kg, and at a 15% increase in price and maintenance of support payments, the enterprises would still not quite break even. Clearly if input costs increase, which is almost inevitable, the sector is under severe pressure with only the best performers able to survive. This raises issues of social, environmental and economic concern which should not be avoided in a strategy document such as this.

The comments on implications of increased cereal prices and the increase in mixed farming with livestock farmers growing their own animal feed are reflected by organic farms in Wales. Organic cereals are significantly more expensive than conventional, so the price pressure has been operating on organic farms for longer, added to which organic principles require a focus on feed from the farms resources.

Page 11 of the consultation document refers to the impacts on diet from 'mass produced' '...highly processed' food. The 'implications for Wales' also notes the patterns of deprivation in Wales and associated poor diet and ill-health where solving the difficulty in providing adequate fresh fruit and vegetables is key. As stated on page 6, around 10% of Wales has potential for arable cultivation. Data from 2006/07 indicate only 4.7% of Wales' land area was devoted to arable crops and fruit and vegetables (fruit and vegetables account for less than 0.15% of land area) indicating a potential for doubling of arable land use, much of which could be devoted to vegetable crops, providing fresh and local produce which could feed into the very successful food cooperative initiatives thereby reaching deprived areas.

Finally in this section, the conclusion that the Welsh farming and food industry is reasonably well placed to respond to global challenges is highly optimistic in that it doesn't mention Wales' dependence on ruminants and their role in GHG emissions.

3. Wales overview

Table 2 in the document usefully distinguishes separate sources of income, and the commentary discusses 'loss from agricultural activities'. In our view, agri-environment scheme income should be included in the calculation of agricultural activity, as it is increasingly important that farmers are rewarded for public goods, and agri-environment schemes are currently the only way this is achieved. The Axis 2 review will hopefully produce schemes better fit for purpose in rewarding public goods, but it is important this source of income is recognized as resulting from agricultural activity, not a subsidy. In this review it is vital that those already contributing considerably to public goods, such as those many farmers in both Tir Gofal and the Organic Farming Scheme, have further opportunity to access support to compensate for the reduction in Pillar 1 support.

Table 2 in the document doesn't include organic farming data, and we were unable to replicate the calculations shown in Table 2 from the 2006/07 FBS report, but using Net Farm Income

figures from the recent report on Organic Farm Incomes (Jackson et al 2008), the following results for organic and comparable conventional farms are derived:

Table 1.

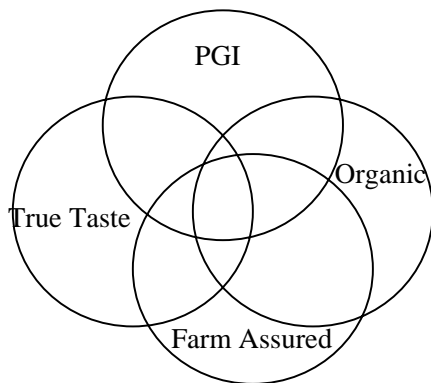
	Lowland dairy		LFA cattle and sheep farms		Lowland grazing livestock		Mixed	
	Organic	Conv.	organic	Conv.	Organic	Conv.	Organic	Conv.
Enterprise income	800	-26600	-41200	-37900	-26000	-27400	-21000	-26900
Tir Mynydd and AE schemes	10100	2700	19400	11200	9600	3700	7800	6500
Income from Agricultural activities	10900	-24000	-21700	-26800	-16400	-23700	-13200	-20500
SFP	28900	27700	25900	28800	15700	16800	26700	23500
Diversified activities	17200	22500	14500	6100	9600	12600	11300	15200
Net Farm Income	57000	26000	18800	8200	8900	5700	24900	18100

Note: This table uses data from Jackson et al (2008). All input costs are ascribed to Enterprise income, although Tir Mynydd and agri-environmental schemes will have incurred some input costs. In this table, the data for 'diversified activities' are derived from the 'miscellaneous income' section of the tables, although in reality not all this income will be from diversified enterprises.

Using these data, where conventional cluster groups are used to identify comparable conventional farms to match the organic sample, only the organic dairy farms achieve positive income from enterprise and agri-environment scheme incomes. It is worth noting that for both organic and conventional lowland livestock farms, even with the Single Farm Payment incomes would be negative without the diversified activities. The data highlight that LFA organic farmers are considerably dependent on agri-environment scheme income as their income (loss) from livestock enterprises is even lower (greater) than conventional, and reductions in the SFP could have catastrophic impacts on the businesses, with knock on effects on rural communities.

4. Stronger Connections to the Market

Generally, it is debatable whether such a hierarchy of added value is helpful, given the multiple overlaps, and it is not clear what the diagram achieves. We are concerned that Figure 11 only includes organic produce in the middle tier, whereas in reality organic products are available in commodity multiple retailer level right up to the artisan so if the diagram is retained, we would like to see organic shown as a band up the side of the pyramid bridging all sectors. It is also probably true that True Taste products are not always the highest added value. We note that butchers are not included. Again, we are not clear of the message from Figure 12 but it may be better presented as a Venn diagram, with the marketing options overlapping, in which case for illustration organic should also be included.



It seems peculiar that organic products are not separately illustrated in Figure 13 illustrating the demand for differentiated products. It would be useful to know the source of the data or intelligence for the 2020 projections. It seems likely there has been some work on this area either elsewhere in the UK or in Europe.

5. Sustainable and Profitable production

The need for awareness of costs of production has been part of the Organic Development programme and Farming Connect for some years, but has proved very difficult to maintain due to erratic funding, so losing the confidence of farmers we have attempted to support. A degree of 'hand-holding' is necessary to start the process, probably for at least two years per farmer, which is expensive, but up-skilling our land managers will be worth the effort.

It may be that there is a generation of farmers that will never embrace this tool: it may be better to target scarce resources to those farmers willing to engage with the business aspects of their operations, and restrict some services to those engaging in benchmarking.

6. Animal Health and Welfare, Plant Health and Food Safety

Organic farming focuses on these areas, in particular by requiring the use of animal health plans, and the basic approach of organic systems is to develop soil health, which supports plant and animal health.

7 Sustainable Land management

Given the current and future context of climate change, fuel shortages, threats to biodiversity, a recognition of the benefits of mixed farming, and increasing focus on animal welfare, it is somewhat surprising that the statement on the role of organic farming was seen to need to be conditional. We argue that it is unquestionable that organic farming has a role to play as an example of a sustainable form of land management.

The statement that 40% of rural Wales is farmed sustainably is highly questionable, however. We presume this is based on 40% of rural Wales being in agri-environment schemes. Agri-environment schemes do not lead to sustainable farming, and were not designed to do so. As is stated in the document, they were mainly focused on support of individual habitats. The only scheme not so focused is the Organic Farming Scheme, which promotes within field as well as boundary habitats and biodiversity, and is complementary with schemes focussed on habitats, such as Tir Gofal.

So much of future land management depends on the outcome of the Axis 2 review, it is doubtful that this section is very useful. We would comment that although we participated in the Axis 2 review group, there has been no contact or feedback for over one year, therefore extreme concern over how the review has developed, such that the stakeholders do not feel involved.

8. Innovation

It is somewhat misleading to say that research is conducted through Farming Connect and its development farms: the farms may serve in technology transfer and limited development work, but this is rarely true research.

Response to questions asked.

Challenges

1. *What are your views on the challenges, identified in this document, facing farming, environment and rural communities in Wales?*

There is no case made for the importance of land managers' vital role in the well-being of the nation.

The overall context of CAP reform is mentioned, but no vision or direction is evident to indicate if Wales will lead or follow.

There is scant mention of 'peak oil' or the resultant increased fuel prices and the link with food prices and implications for the future.

2. *Which challenges are the most important?*

Food security and climate change.

3. *What other challenges, that have not been included in this document, should be addressed?*

1. Getting the balance right between policy-driven and market-driven changes.
2. Food security.
3. The challenge of diversifying agricultural enterprises on beef and sheep farms.
4. The real challenge of reducing farming's dependence on fossil fuels.
5. The challenge of raising the profile and respect for farmers from the general public.
6. Encouraging acceptance of delivery of public goods as a valuable and legitimate activity for farmers that must be paid for by society.

4. *How can the farming industry show its leadership in tackling the challenges facing the industry independent from governmental support and assistance?*

The organic sector has done this through the development of standards and specialist markets, initially in the absence of governmental support and assistance.

It is necessary that the farming industry recognises their role and responsibility to achieve sustainability and profitability less dependent on the public purse. Working together, which remains a challenge for the sector, must become acceptable.

Proposed Actions

5. *How should the challenges be addressed?*

Diversifying enterprises and supporting horticulture will need investment in support networks, technical assistance, helplines, and close liaison with the public procurement programme and food co-ops.

For other comments see attached grid.

6. *Which of the proposed actions in this document should be prioritised?*

Developing Wales' image as a source of clean green high quality foods, linking consumer education and Food Tourism and the promotion of sustainable farming through revised Axis 2 schemes.

Support for uptake of business approaches to farming, particularly through benchmarking.

Support for public procurement of organic and local produce through a programme with targets.

7. *What other actions should be undertaken?*

There is a lack of reference to examples and policies outside Wales. There is much good practice elsewhere in Europe which should be drawn on.

Shared Responsibility

8. *Which actions should the Assembly Government take lead responsibility for?*

It is important that the Welsh Assembly Government sets out a clearer direction than is delivered by this document, and that it plays a strong role in facilitation and leadership.

Most actions will need a partnership approach but the direction, leadership and facilitation will have to come from the Welsh Assembly Government. Many of the issues are unappealing and need tough decisions which businesses are unlikely to tackle voluntarily.

9. *Which actions should be delivered by farmers and their representatives; by the supply industry/agri-business; by the food industry; by environmental bodies; and by the voluntary sector?*

Most actions will need a partnership approach but the direction, leadership and facilitation will have to come from the Welsh Assembly Government. Many of the issues are unappealing and need tough decisions which businesses are unlikely to tackle voluntarily.

10. How should local farming, environment and community challenges be addressed and actions delivered?

Local government must be engaged in the strategy, and increased engagement and communication with communities should be required.

Success

11. How will you know when the objectives (profitable farming; safeguarded environment; prosperous communities) have been met?

Profitable farming could be deemed achieved when farm businesses achieve incomes at or above the national average wage for all labour units employed or engaged in the business. The other objectives are unlikely to be met but this should not deter effort in that direction. The circumstances are constantly changing and new objectives will be needed as time goes on.

12. How can they be measured in a meaningful way?

Profitability can be monitored through the Farm Business Survey. Data from surveys and monitoring are needed for the environment, including data on the increase in the land area under organic management, and the prosperity of communities can be measured by monitoring rural population numbers, the number of new businesses, the age of rural populations. Other objectives such as the procurement of organic and local produce, the improvement of water quality, the reduction in veterinary drugs bills.

Annex 1: Detailed comments on proposed actions

<i>Page</i>	<i>Action</i>	<i>Actors</i>	<i>New Action?</i>	<i>Comments</i>
Section 4. Connectons to the market				
24	Collective actions	FC Development Centres	?	It would be good to have some mechanism outlined to make this seeding of ideas (page 24) happen as it is not clear what underlying strategy would develop this. The work done by Andersons' on joint ventures for the DDC, contains useful guidance.
24	Adding value	FC, FNW, RDP	No	
25	Supply Chains Forum	AFP, WAG	No	Need to change culture and support young entrepreneurs. Unlikely to have sufficient weight within Wales alone to achieve much as retailing on UK/international basis. Work on the Dairy Roadmap struggled to get cooperation from multiple retailers. There is very little will for such openness within the red meat sector.
25	Positioning Welsh products as environmentally friendly	HCC, WAG	No	The organic market is an obvious route for such positioning, particularly as there is so much interest in conversion. We may be approaching 10% of beef & sheep farmers being organic, so this would be a major route to promote clean green Wales. There is a need to develop a dual quality brand of organic PGI produce, which the organic sector SCE bid is hoping to progress. Strategic Action plan for food tourism should build on the progress towards the Organic Action Plan targets of 10-15% of land managed organically. Organic food is a legally enforceable label that gives consumers reassurance, and this should be promoted. A definition of local must be achieved or defined in individual circumstances - if consumer awareness and good-will is not to be jeopardised.
25	Keep identity of Welsh meat in food service sector	HCC, WAG, (Visit Wales [not identified])	?	As noted the development of supply for Public procurement will take time, and will need careful handling. As many local suppliers will need support to supply, and time to build experience, developing the market gradually using targets would provide a clear lead. An example of aspirational targets that may be suitable is that used by the Soil Association Food for Life campaign which aims to provide a proportion of the food from local sources, a proportion organic, and a proportion unprocessed. This can be used to set realistic expectations which can be supportive of a change of supply chain. Further reference: Chapter 9, Reinventing the supply chain. Food for Life. Soil Association (undated)
26	Increasing the role of public procurement	WAG, HCC, AFP.	Yes	OCW has had a remit to educate the public since 2003. Support for Farmers Markets and Food Coops will help, along with cookery demonstrations and dietary advice at Farmers Markets. Part of the work must be to inform the public of the value of food, and to move away from the 'cheaper food is better' mentality.
27	Build a Welsh food culture	DELLS (not specified), OCW	No	
27	Eliminate waste from food supply chains	WAG/AFP, HCC.	Part	See comment on Supply Chains Forum. Vital Wales works within a GB context, in practice this will usually mean working with England.

<i>Page</i>	<i>Action</i>	<i>Actors</i>	<i>New Action?</i>	<i>Comments</i>
Section 5. Sustainable and Profitable production				
28	Support Bench-marking	FC Development Centres	No	We already know uptake is poor, and why. Previous experience indicates the need for expensive hand-holding to start benchmarking. This will need to be costed in and resources provided to achieve the desired results. The top third farmers probably already engage in gathering information and will benefit from the FC programme. Unfortunately the farmers that really need advice are the ones unlikely to engage in Farming Connect services, especially when they are required to pay. Support for benchmarking should be free and a pre-requisite for access to further services. There should be a support programme to support farmers wishing to retire, such as supporting partnerships with new entrants.
29	Improve technical performance Business planning for farms	FC and FC Development Centres	No	
29		FC	No	See comment above.
29	Collective sourcing of inputs	None listed.	No	This action must be part of a greater support for collaboration which will spawn collective buying groups. Such arrangements need trust, which will require effort to build. See comments on 'Collective Actions' pg 24 Bureacracy is inevitable in modern farming, therefore effort should be made to train the farmers in the skill necessary to manage. A specific programme of training is necessary for new entrants to farming. If the FLS is to achieve the necessary one-to-one advice for CAP scheme payments, it will need far more staff and resources. There is a need for advice and information on how to organise records to avoid duplication and make information available for the various different needs, from farm management, to Organic or Farm Assurance Inspections, to energy or resource monitoring, or Health and Safety.
30	Reducing bureacracy	FAS, FLOs	No	
6. Animal Health and Welfare, Plant Health and Food Safety				
31	Promote food safety	All	No	
32	Managing exotic diseases	WAG, Livestock industry	No	
32	Eradicate bovine TB	WAG, Livestock industry	No	Eradication seems unlikely. Working with colleges is important, but short courses should also be provided to promote Animal health planning. Benchmarking to focus attention on veterinary bills is helpful, but records should separate veterinary interventions and medications, and veterinary advice.
32	Combat endemic diseases	WAG, Livestock industry	Some	
33	Improving traceability	WAG/HCC	No	This is a familiar concept in organic farming. Increasing amounts of organic farming will help improve traceability.

Page	Action	Actors	New Action?	Comments
33	Improve standards of animal welfare	None	No	Bristol veterinary school has devised animal welfare assessment tools. The service could be provided free for FC demonstration farms as long as results are made available to visitors. Consideration of making such process compulsory for SFP recipients over a certain value. Animal Health planning is compulsory for UK organic farms, therefore the increasing numbers of organic farmers is improving uptake.
34	Sharing costs and responsibilities	WAG consultation	No	
35	Controlling pest and disease outbreaks	None specified	No	
7 Sustainable Land management				
36	Promote catchment schemes	Axis 2 review	No	The proposal to influence stocking densities through land management schemes should be re-considered. Density of stock is not so much the issue as the absolute quantity in Wales as a whole, and if limitations on enterprises are enforced within Land Management Schemes, this may be a barrier to the farmers entering into the schemes. It may be more cost effective to support FWAG directly rather than provide support for actions for wildlife through Farming Connect. Targetting LMS resources will be necessary but will require a clearer statement of intent than this proposed strategy provides.
37	Modify practices to mitigate climate change	WAG, FC, IBERS	Yes	
38	Protect ecological networks	WAG. FC.	?	
8. Innovation				
39	Research focus	WAG. FC. 'Educators'	?	To achieve the improved uptake of technology by increasing emphasis on KT, FC needs to make sure that the "in depth advice tailored to farm needs" keeps the link to leading research institutes in Wales. There should be a clear mechanism to link all providers with these institutes across sectors (beef sheep dairy organic and alternative land uses) particularly to commercial consultants whose responsibility it will be to deliver (paid for by the farmer) advice that incorporates any new technology. The challenge with research is to ADAPT its application on farm in the relevant context- best facilitated by dedicated technical extension officers embedded in Research Institutes working in a coordinated common approach across sectors. Sharing information by detailed discussion in small groups, facilitated by specialist technical staff is an important activity to promote change and progress. There is currently wide regional coverage with broad but shallow expertise and services available.
40	Farming Connect	FC	No	

<i>Page</i>	<i>Action</i>	<i>Actors</i>	<i>New Action?</i>	<i>Comments</i>
40	Encourage and support young entrants	WAG. Ag colleges. [Universities not mentioned]	Some	There would also be a use for 'refresher' short-courses for farming family members returning to the family farm after years away in other professions. Many children return to the farm after having families and successful careers elsewhere. They will have basic farming knowledge but will need support in areas such as environmental care, animal health and welfare planning, SAF and cross compliance.
41	Promote energy efficiency	WAG, FC, IBERS, Carbon Trust, SEN, DDC	Some	The first step to progress on this is awareness. Our experience with environmental benchmarking is that most farmers do not regularly monitor their energy consumption. Benchmarking can help with this, but also, some guidance on 'record keeping for farming' would be useful.
41	Restrictive approach to GM	WAG	No	The Organic sector fully supports the restrictive approach. It is peculiar that there is no mention of the Food Tourism Action Plan. Tying tourism with the clean and green image of Wales and supporting green agriculture must be the long term aim.
42	Engage with tourism	WAG	Some	

Annex 2: Meeting the food security challenge through organic agriculture

States should integrate organic agriculture objectives within national priorities, FAO says

3 May 2007, Rome – “Organic agriculture is no longer a phenomenon in developed countries only, as it is commercially practiced in 120 countries, representing 31 million hectares and a market of US\$40 billion in 2006,” FAO underlines in a paper, *Organic Agriculture and Food Security*, presented here at an International Conference on Organic Agriculture and Food Security (3-5 May 2007).

The paper identifies the strengths and weaknesses of organic agriculture with regards to its contribution to food security, analyzes attributes of organic supply chains against the Right to Food framework and proposes policy and research actions for improving the performance of organic agriculture at the national, international and institutional levels.

“The strongest feature of organic agriculture is its reliance on fossil-fuel independent and locally-available production assets; working with natural processes increases cost-effectiveness and resilience of agro-ecosystems to climatic stress,” the paper says.

“By managing biodiversity in time (rotations) and space (mixed cropping), organic farmers use their labour and environmental services to intensify production in a sustainable way. Organic agriculture also breaks the vicious circle of indebtedness for agricultural inputs which causes an alarming rate of farmers’ suicides.”

The paper recognizes that “most certified organic food production in developing countries goes to export” and adds that “when certified cash crops are linked with agro-ecological improvements and accrued income for poor farmers, this leads to improved food self-reliance and revitalization of small holder agriculture.”

Knowledge and labour intensive

The paper underlines that some requirements should be met when converting to organic agriculture, mainly agro-ecological knowledge and labour availability. “Organic management is a knowledge-based approach requiring understanding of agro-ecological processes and it remains a constraint where labour is scarce, such as in populations decimated by HIV/AIDS.”

However, labour requirements on organic farms, and the better return on labour, provide employment opportunities where this resource is most abundant, thus safeguarding rural livelihoods, according to FAO expert Nadia Scialabba.

The paper also quotes recent models of a global food supply grown organically which indicate that organic agriculture could produce enough food on a global per capita basis

for the current world population.

“These models suggest that organic agriculture has the potential to secure a global food supply, just as conventional agriculture is today, but with reduced environmental impact,” according to FAO.

The paper calls on governments to “allocate resources for organic agriculture and to integrate its objectives and actions within their national agricultural development and poverty reduction strategies, with particular emphasis on the needs of vulnerable groups.”

It also insists on investment in human resource development and skill training in organic agriculture as part of sustainable development strategies.

Definition of organic agriculture

According to the Codex Alimentarius Commission and all existing national regulations, “organic agriculture is a holistic production management system that avoids use of synthetic fertilizers, pesticides and genetically modified organisms, minimizes pollution of air, soil and water, and optimizes the health and productivity of interdependent communities of plants, animals and people.”

The International Conference on Organic Agriculture and Food Security is organized by FAO in partnership with Associazione Italiana per l’Agricoltura Biologica, le Centre international de hautes études agronomiques méditerranéennes, the International Federation of Organic Agriculture Movements, the Rural Advancement Foundation International, the World Wildlife Fund, the Third World Network, the Research Institute for Organic Agriculture and the Worldwatch Institute.

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Annex 3

Organic farming's contribution to climate change and agricultural sustainability

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Introduction

Climate change and sustainability have risen rapidly up the political agenda. The twin challenges of global warming and peak oil present stark choices for the future development – and even survival - of civilisation. The supply of food and water are central to this survival: we need to ensure that farming systems are sustainable in terms of their resource use and impacts, and capable of adapting to future challenges.

It is often claimed that organic farming is sustainable farming, but the claims are not universally or even widely accepted. Indeed, many forms of 'sustainable agriculture' are promoted by governments and large corporations, such as Unilever, that do not even recognise the relevance of organic farming. So what is the real relevance of organic farming in this context? What does it currently achieve and where does it have potential to do more? This paper aims to examine these issues.

What is agricultural sustainability?

The idea of sustainability is often presented as consisting of three dimensions: economic, environmental and social, but for agriculture these dimensions cover a wide range of issues, including: resource use sustainability (including soil, water, energy, minerals and genetic resources); environmental pollution (including greenhouse gas emissions, nitrate leaching, pesticides etc.); biodiversity and ecosystem services; food security (including quantity, quality and safety); social impacts (including occupational health and safety, employment and working conditions, rural communities and culture) and financial viability (to provide appropriate returns to the people who do the work).

Once one starts to look at all these issues, it becomes clear that sustainability is about a complex mix of objectives, where the achievement of all simultaneously is

unlikely, if not impossible. There will at some point have to be trade-offs between objectives, and different people will prioritise the individual objectives differently. So it is not surprising that there is no agreement on what sustainable agriculture is. The idea of a perfectly sustainable agriculture is therefore an illusion, unachievable. All forms of agriculture, including organic farming, will have some negative impacts somewhere. The existence of weak points, however, doesn't invalidate their contribution to agricultural sustainability. What matters is their *relative* overall sustainability – how do the contributions of different farming systems to all of the objectives compare?

The hypothetical radar or web diagram below illustrates the point – one system may perform very well with respect to one objective, but relatively poorly on others, while another system may not score so well on that one objective, but the higher score on others gives a better sustainability rating overall. No system is likely to score a perfect 10 out of 10 on all points.

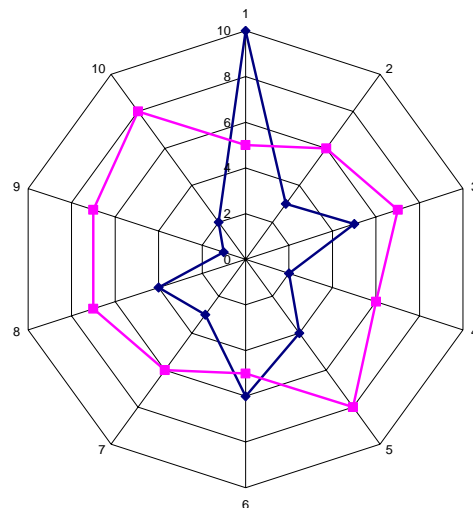


Fig. 1: Hypothetical comparison of outputs by different systems

Why is organic farming relevant?

Organic farming aims to be more sustainable by adopting principles of organism and system health, ecology, fairness and care (IFOAM, 2005). These include ideas of mixed farming, resource self-sufficiency, self-regulation of pest and diseases within agro-ecosystems, and waste minimisation. Organic standards and regulations have been developed to help realise these ideas in practice, with guidance on specific permitted or restricted practices that may be used. In particular, restrictions on the use of fertilisers, pesticides and other external inputs, and encouragement to use rotations and organic manures to build soil fertility, form part of these guidelines.

It is clear that any of the practices adopted by organic producers, taken individually, could be (and are) practiced by any farmer. What makes a difference is that specific practices are typically rather than occasionally adopted by organic producers, as well as the particular combination of practices that is promoted in organic farming.

What is the role of standards?

Organic production standards in the European Union are legally defined, currently by EC Reg. 2092/91. They specify prohibited and permitted practices that organic producers may adopt. They have been developed to define a distinct production process in order to support the specialist market for organic products, protecting consumers and *bona fide* producers. The existence of a premium market helps to maintain the financial sustainability of organic farms, by compensating for the lower output that often results from restricting practices in pursuit of broader health and sustainability goals.

However, because standards are targeted at the market, they may emphasise issues that are of greater priority to consumers, such as non-use of pesticides, and may be less focused on specific environmental outputs. In fact, organic farming standards have been criticised because they do not contain specific environmental conditions that might be expected in agri-environment schemes. Despite this, it is important to acknowledge that many of the environmental and sustainability benefits that organic farming

delivers may be an indirect result of the standards, rather than specifically provided for by them. For example, organic farming may support more farmland birds, because the prohibition of herbicides leads to a higher proportion of spring cereals in the rotation to help with weed control, which in turn provides over-wintering stubbles to support birdlife.

It may also be that the premium market and strict regulations are not essential to the delivery of environmental benefits from organic farming. Few other agri-environmental schemes, such as Tir Gofal, connect to the marketplace, and some countries such as Sweden operate agri-environment schemes for organic farming without any link to certification and marketing of organic products. This could help resolve some of the tensions between the different expectations of policy makers interested in environmental outputs, and consumers with specific food quality and safety concerns. Despite this, the strong links to the consumer are seen as a significant advantage of organic farming by both producers and policy makers (WAG, 2007).

Assessing the evidence

While organic standards set out principles and practices that are believed to contribute to achieving the overall health and sustainability goals of organic farming, they do not necessarily guarantee delivery of the outcomes. Organic farming, like agriculture in general, is not homogeneous. There are many different types and intensities of organic farming systems (ranging from hill farms to intensive market gardens) and there are many different individuals involved with differing skills, experience and priorities. This diversity will of course result in widely differing impacts on the environment and sustainability, with the benefits in some cases much lower than in others, and even negative impacts in some situations.

It is important therefore to take a close look at the evidence of actual impacts as well the theoretical outcomes. However, it is impossible in a review of this type to cover every eventuality, so a generalised overview of the evidence is unavoidable. Where possible, however, issues specific to particular types of organic farming are highlighted.

Impacts on climate change

Organic farming, by using less fossil energy and building soil organic carbon levels can make a direct contribution to mitigating climate change.

Fossil energy use and CO2 emissions

The issues of fossil energy use, in the context of the sustainability and Peak Oil debates, and climate change, resulting from greenhouse gas emissions, are closely linked as fossil energy is the major source of carbon released into the atmosphere. They are two sides of the same coin: evidence on energy use can also be used to draw conclusions on climate change impacts.

Overall organic farming uses less fossil energy on a per hectare and a per unit food produced basis than intensive, conventional farming systems. This has been demonstrated in a wide range of research projects since the 1970s. The 1973 oil crisis made energy use in agriculture an important topic for the first time (e.g. Leach, 1976; Lockeretz, 1977 and Pimentel, 1980). More recently, reviews by Stolze et al. (2000), Scialabba and Hattam (2002), Shepherd et al. (2003) and Pimentel (2006) have reinforced the findings of the early studies.

The main reasons for the reduced fossil energy inputs in organic farming on a per hectare basis are the restrictions on the use of synthetic nitrogen fertilisers, herbicides and pesticides, all of which require significant fossil energy inputs for their manufacture and distribution although in some countries such as Norway, hydro power is also used for fertiliser manufacture.

These lower energy inputs may be offset by increased energy needed for cultivations, particularly for weed control. Leake (1995), for example, illustrates the impact that intensive cultivations can have on energy in organic crop production (Table 2). Research comparing organic with integrated and conventional farming systems in long term trials (Alfoeldi et al., 1995, see Fig. 2) has shown that energy inputs for other production practices are very similar between the systems, even taking account of increased mechanical cultivations for weed control.

Table 1: Relative energy use in organic and conventional farming

Study	Country	Product	Energy use (org. as % of conv.)	
			per ha	per unit
Mercier (1978)	France	Wheat	50	55-60
Klepper et al. (1977)	United States	All crops	-	40
USDA (1980)	United States	Cereals	42-85	50-87
Vine & Bateman (1981)	England/Wales	Farm	25-100	50-100
Pimentel et al. (1983)	United States	Maize	58	59
		Wheat	68	72
		Potatoes	57	114
Kaffka (1984)	Germany	Wheat	20	26
Harwood (1985)	United States	All crops	50-90	50-80
Haas & Koepke (1994)	Germany	All crops	36	-
		Wheat	35	57
		Potatoes	54	81
Alfoeldi et al. (1995a)	Switzerland	Wheat	59	67
		Potatoes	72	107
Reitmayr (1995)	Germany	Wheat	49	79
		Potatoes	73	129
Barbera & La Mantia (1995)	Italy	Citrus	57	67
		Olives	45	55
Kalk et al. (1996)	Germany	Farm	66.5-89	-
Edwards-Jones & Howells (1997)	Scotland	Potatoes	29	24
		Wheat	51	70
		Barley	48	65
Lampkin (1997)	Wales	Milk	70	87
Refsgaard et al. (1998)	Denmark	Cereals	-	87
		Forage	-	32
		Milk	-	84
Cederberg & Mattson (1998)	Sweden	Milk	77	85
Wetterich & Haas (1999)	Germany	Milk	31	46
Cormack & Metcalfe (2000)	England	Wheat	40	70
		Potatoes	55	86
		Carrots	41	127
		Cabbage	53	65
		Onion	69	93
		Calabrese	30	60
		Leeks	40	-
Geier (2001)	Germany	Apples	91.5	123
Williams et al. (2006)	England	Wheat	-	71
		Oilseed	-	75
		Potatoes	-	102
		Beef	-	65
		Sheep	-	80
		Milk	-	62
		Pigs	-	87
		Eggs	-	114
Poultry	-	132		

Table 2: Comparison of energy inputs (kWh/t) for machinery and fertiliser manufacture for wheat production from different systems (Leake, 1997)

	<i>Machinery</i>	<i>Fertiliser</i>	<i>Total</i>
Organic	200	0	200
Integrated	67	211	278
Conventional	78	296	374

Lower levels of fossil energy use per hectare may also be offset by lower yields, potentially resulting in higher energy inputs per kg of food produced. Many of the studies reported in Table 1, however, show that the improved energy efficiency of organic farming can be maintained despite lower yields. For some crops such as potatoes, the yield differences are sufficiently large to result in higher energy inputs per kg for organic crops. This can also apply in the case of crops like carrots if flame weeding is used extensively.

Similar issues can be identified in ruminant livestock production, due to the energy savings associated with reliance on clover-grass leys and high forage/low cereal diets, as the results in Table 1 illustrate. Energy inputs per litre milk or kg meat produced, however, are also affected by stocking rates, which depend on the extent to which farms rely on purchased feed: the energy required to produce this feed on 'borrowed acres' should also be taken into account.

Pigs and poultry comparisons are more complex due to reliance on cereals, longer finishing periods and free range production, but few direct studies have been carried out. Williams et al. (2006) estimate that organic poultry production is more energy intensive than conventional (Table 1), but when compared with free range, the energy input is more similar (5-9% higher).

Energy output/input ratios are an important indicator of the net effectiveness of agriculture in capturing solar energy to feed human populations (Table 3). The higher the ratio the better – tropical subsistence farming typically achieves ratios between 10 and 40, 70 for crops like cassava. Any value less than one indicates that more energy is consumed than produced.

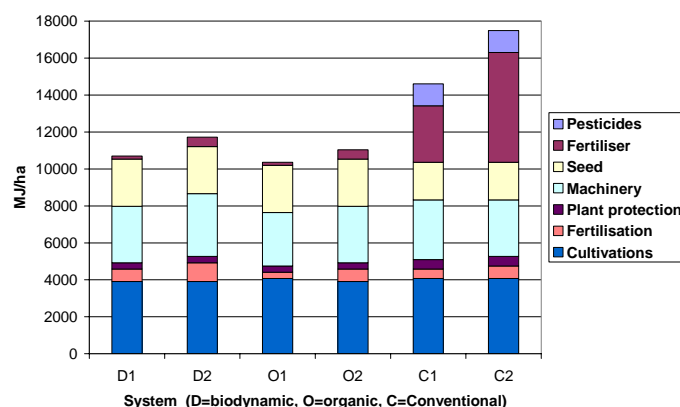


Fig. 2: Direct and indirect energy use for different systems at two fertiliser levels in the DOC long-term comparison trial (average of 6 years; Alfoeldi et al., 1995b)

This is particularly the case for fishing fleets, but UK agriculture overall achieved less than 0.5 already in the 1960s, and caged birds and poultry were around 0.1 (Leach, 1976). The low values for livestock products, particularly those reared intensively with high cereal inputs, illustrates the need to consider low meat diets and producing livestock in a manner more complementary to human food requirements, as part of any strategy to reduce fossil energy use.

Table 3: Energy output/input ratios for selected crops

Source	Product	Conv.	Org.
Leach (1976)	Wheat	3.5	-
	Maize	2.8	-
	Potatoes	2.6	-
	Milk	0.4	-
	Poultry	0.1	-
Pimentel (2006)	Wheat	2.1	-
	Maize	5.1	7.7
	Soya	3.2	3.8

Soil organic matter

Arable/mixed organic farms restore soil organic matter levels and store carbon.

Soil organic matter is particularly important for organic farming, soil conservation and climate change. Soil organic matter helps retain moisture and nutrients, maintain soil structure, reduce erosion and acts as a carbon sink. Soil organic matter also provides an energy source for the soil eco-

system. This is essential for the release of nutrients for plant growth, in particular the mineralisation of nitrogen and release of phosphate bound to soil particles. Organic management practices emphasise careful mechanical cultivation, rotations incorporating fertility building phases and the return of organic crop residues, green manures and livestock manures. These practices are particularly important in the context of climate change.

The addition of mineral fertilisers, especially nitrogen, to the soil not only provides nutrients for crop growth, but also for soil microbes and other organisms. These organisms can then grow and reproduce, but need an energy source to do this, which is typically derived from the breakdown of plant residues and soil organic matter, releasing CO₂ in the process. Without the replenishment of organic matter, this will lead to a decline in organic matter levels and net CO₂ loss into the atmosphere. Organic standards significantly restrict the use of synthetic nitrogen fertiliser and other high-solubility mineral fertilisers. They also encourage the use of organic manures to recycle nutrients. With organic manures, the energy source for the soil microbes is supplied with the nutrients, so that soil reserves do not need to be utilised.

While the production of crops with mineral fertilisers will generate some crop residues (straw, roots etc.) to compensate for organic matter losses, the effect is relatively small for most annual arable crops such as wheat, barley and oilseed rape. Organic farmers have to rely on a fertility building phase in their crop rotations. Not only does this provide the nitrogen crops need, as well as weed, pest and disease control benefits, but it also replenishes soil organic matter potentially leading to long term increases in carbon storage in soils under organic management. For comparison, the residual root biomass is 5-8 t dry matter per hectare from clover leys, compared with 0.5-1.5 t DM/ha from annual arable crops (Lampkin, 1990). Some long term comparisons of different farming systems (e.g. the Rodale experiment in the US: Pimentel et al., 2005) have shown significant increase in soil organic carbon. However, not all studies support this. In particular, the Swiss DOC comparison (Maeder et al., 2002; Fliessbach et al., 2007) shows a decline in soil organic

carbon over a 21 year period, with few significant differences between systems. A key limitation of this comparison, however, is that the same rotation features in each system.

There is an argument that the increased requirement for mechanical cultivation for weed control in organic farming can be a negative influence on soil organic matter levels. Mechanical cultivation has the effect of aerating the soil, increasing the oxygen supply to microbes, stimulating soil organic matter mineralisation and CO₂ release. Some authors argue that this makes minimum tillage systems relying on herbicides to kill off remaining plant vegetation before reseeding more sustainable and climate friendly. It is possible to reduce the need for mechanical weed control in organic farming through rotation design and through adapted minimum tillage systems without herbicides. More importantly, there is now research evidence from long term comparison trials in the US (Teasdale et al., 2007), that the combination of restrictions on mineral fertilisers, increased use of organic manures and the fertility building phase in organic rotations actually outweighs the effect of mechanical cultivation and generates a better overall effect on soil organic carbon than conventional no-till systems.

In much of Wales, particularly in the hills and uplands, high rainfall, poor drainage and relatively low temperatures have combined to slow the rate at which organic matter breaks down, so that soils typically have high organic matter levels. They are referred to as organic soils if they have more than 12-18% organic matter depending on clay content (e.g. peaty soils). Organic soils should not be confused with organically certified or managed soils. These soils represent a huge reserve of CO₂ that could potentially be released into the atmosphere. Drainage and cultivation are important triggers for this, which should be avoided. Organic standards and Environmental Impact Assessment requirements for cultivation of permanent grassland place some restrictions on what may be done, but there is a case for further action (WAG, 2007). Reduction in organic matter levels in organic soils might also be encouraged by nitrogen deposits from atmospheric pollution as well as lower rainfall and higher

temperatures resulting from climate change, which all have the potential to increase microbial activity.

Methane

Although significant attention is focused on carbon dioxide as the greenhouse gas emitted in largest quantities, methane has much bigger climate change impacts and is particularly associated with livestock production. About 75% of methane on farms is emitted directly from ruminant animals, (Shepherd et al., 2003).

There have been few direct comparisons of methane generation between organic and conventional production (Stolze et al., 2000). Two recent studies from Switzerland (Nemecek, 2006) and the UK (Williams et al. 2006) have used life cycle analysis methods to estimate the global warming potential (GWP) from organic and conventional systems. This approach converts the more damaging methane and other emissions into CO₂ equivalents. Williams et al. (2006) found that global warming potential was similar for both organic and conventional crops, with a slight tendency for organic to be lower. Organic milk and beef enterprises, however, were estimated to be about 20% higher, although organic sheep were much lower. As with energy inputs, poultry GWP values were higher for organic.

One recent study of conventional and organic milk production (Table 4) has shown more potential to reduce overall greenhouse gas emissions. Though still showing the tendency for higher methane emissions, these are offset by lower nitrous oxide emissions (see next section).

These results indicate a need for further research to get a better understanding of the methane problem. To do this, it is necessary to consider effects at several levels, including the individual animal, individual farm and whole sector.

Table 4: Combined greenhouse gas emissions from organic & conventional milk production (Allen et al., 2007)

<i>System</i>	<i>Conv. average</i>	<i>Conv. top 25%</i>	<i>Org. average</i>	<i>Org. top 25%</i>
g CO ₂ equivalent per litre milk	907	745	828	705
% from CO ₂	23	25	21	22
% from CH ₄	52	55	69	68
% from N ₂ O	25	20	10	10

As far as the individual animal is concerned, there is evidence that diets that are high in roughage will result in higher rates of methane emission than diets high in starch, e.g. cereals. It has been argued (e.g. Shepherd et al., 2003) that this means emissions from organic animals will be higher than others, because of the emphasis in organic management on high-forage, low-cereal diets for ruminants. However, there is some discussion that diets high in tannins, which may be derived from clovers and trefoils for example, produce less methane than grass-only diets. Given the central role of clovers in organic grassland (because of the prohibition on synthetic nitrogen fertilizer), it may be that the methane emissions are actually lower from organic farms. In fact, clover may represent a triple gain for climate change: reducing methane emissions from animals, building soil organic matter and reducing reliance on synthetic nitrogen fertilizers.

Methane and CO₂ emissions are also relatively constant on a per animal basis so that, in principle, animals producing high yields will produce fewer emissions per litre than animals producing low yields. Again this would appear to count against organic farming. However, the average yield per cow on organic dairy farms is typically only about 10% lower than conventional, and there is no significant difference in the meat output per animal between organic and conventional systems, so this effect may be outweighed by other, farm or sector level, considerations such as stocking rates and reliance on bought in feeds from off the farm.

At the whole sector level, more account needs to be taken of balancing effect of

reduced stocking rates in grassland areas compensating for increased livestock in organic arable and mixed farming systems.

Nitrous oxides

As indicated above, carbon containing gases such as CO₂ and methane are not the only greenhouse gases. Nitrogen containing gases, in particular ammonia and nitrous oxides, are also important. These may be generated from livestock manures (with implications for manure management practices) as well as soil biological processes involved in the nitrogen cycle, particular where there are large quantities of surplus nitrate and ammonium nitrogen in the soil available to be broken down by denitrifying microbes. However, a key source of nitrous oxides is the manufacture of fertilisers, as the data in Table 4 illustrate. Research has also demonstrated that grassland systems which rely on clover to fix nitrogen rather than high inputs of synthetic nitrogen fertilisers, typical of organic farming, have significantly lower levels of nitrogen losses to the environment in the form of nitrate leaching, ammonia volatilisation and denitrification as nitrogen or nitrous oxides.

Other sustainability issues

The research featured in this review covers several other sustainability issues where organic farming can make a contribution, but it is not possible to go into detail here.

Soil conservation

In addition to maintaining soil carbon levels, organic farming has been shown to reduce soil erosion, increase soil aggregate stability and stimulate soil biological activity.

Water resources

Organic management practices have been shown to help reduce nitrate leaching and phosphate run-off from soil erosion, leading to reduced eutrophication. They also reduce the potential for pesticide contamination, although some permitted products such as sheep dips may still represent a risk. Cropping practices such as mulching crop residues and maintaining ground cover in orchards and vineyards may also reduce irrigation requirements and help alleviate flood risks through improve soil water infiltration.

Biodiversity

Organic practices, and in particular the limitations on pesticide use, have been shown to have significant biodiversity benefits ranging from soil ecosystems, plants and insects to birds and mammals (Stolze et al., 2000; Shepherd et al., 2003; Hole et al., 2005).

Land and food security

Organic farming may provide these benefits, but it is argued by some that if this is at the expense of lower yields, more land will need to be brought into production, which will negate the benefits and put food security at risk. This is a complex question which involves consideration of role of meat in the diet, the benefits of integrating meat and crop production to achieve complementary use of resources, as well as organic farming helping increase self-reliance and productivity in resource poor countries. But perhaps this is insignificant compared with the changes in land use coming about through the increased production of biofuels.

Conclusions

Resource use self-sufficiency is a key organic principle, and nitrogen self-sufficiency is part of organic standards. Should energy use self-sufficiency and carbon-neutrality be given similar status? What is the role of renewable energies and organic biomass/fuels production in this context? What scope is there to improve everyday practices?

It is also important to consider the whole food system including processing, packaging, distribution, retailing and consumption (Foster et al., 2006). Much of the current debate is focused on local products, but local doesn't necessarily mean more sustainable if the production methods needed are inefficient. An even bigger challenge is the urbanisation of the population, which makes it difficult to localise production without fundamentally altering land use patterns.

Many of these issues will be addressed in today's conference and developed in a future version of this paper.

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