THE ORGANIC RESEARCH CENTRE

ELM FARM

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ORC's Dominic Amos and Sally Westaway help planting daffodil bulbs in the agroforestry understorey at Tolhurst Organic (p8)

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Organic Research Centre

Bulletin

No. 119 – Autumn/Winter 2015

News in brief

Organic farm incomes in England and Wales 2013/14

The latest organic farm incomes report, partly funded by the Welsh Government, presents results of research on the financial performance of organic farms in the 2013/14 financial year. There were no statistical differences in the farm business income per farm or per hectare of organic and comparable conventional farms (Figure 1). At the enterprise level, organic and conventional dairying net margins were very similar. Organic net margins were positive for suckler beef whereas conventional were negative, whilst conventional margins were more negative than organic for sheep and finishing beef. Cropping enterprises also showed a positive position for organic activities. Overall, the analysis concludes that organic farms are continuing to perform at least as well as comparable conventional farms.

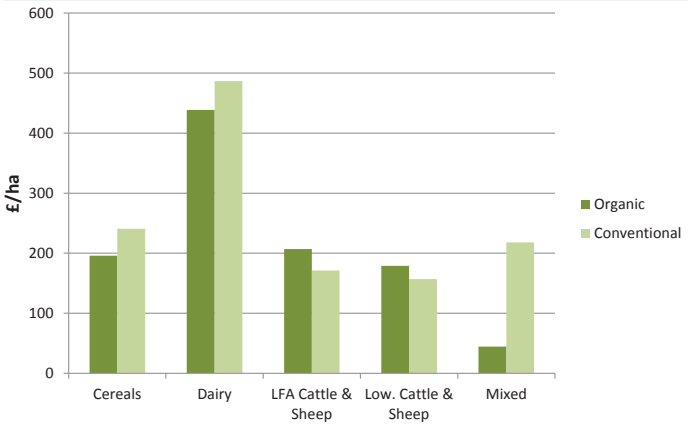

Figure 1: Organic and conventional Farm Business Income (£/ha, full samples, 2013/14)

Impact of pesticides on invertebrates

A new study by the Game & Wildlife Conservation Trust (GWCT), funded by Natural England, suggests that the use of pesticides on cereal fields could be having a greater impact than previously thought and that this impact may increase in the face of climate change. The study, using over 40 years of data collected on farmland on the Sussex Downs, considers the effect on arable insects and spiders of factors including changes in extreme weather events and pesticide use.

Of the 26 most commonly identified invertebrate groups, 11 were found to be sensitive to extreme weather events, although only two (gall midges *Cecidomyiidae* and fungus gnats *Mycetophilidae*) took longer than a year to recover. Longer-term trends in invertebrate abundance correlated with temperature and rainfall data obtained from the UK Met Office, consistent with an impact of climate change. Results suggest that increasing pesticide use has had more of a direct effect on abundance of some invertebrates than temperature change, with the main driver of change in an agricultural environment being human behaviour. Climate change will, in the long term, cause changes in certain groups of organisms, some of which are cereal pests whose abundance may increase. Any subsequent increase in the use of insecticides will negatively affect the abundance of all invertebrate groups, many of which are beneficial.

Soil Farmer of the Year

As the International Year of the Soil draws to an end, the Farm Carbon Cutting Toolkit and Innovation for Agriculture are launching a competition to find the UK's Soil Farmer of the Year. This competition, which opened on World Soils Day on the 4th December, aims to find farmers and growers who are engaged with, and passionate about, managing their soils in a way which supports productive agriculture and biodiversity, reduces greenhouse gas emissions and builds soils organic matter and carbon. The competition is open to any UK farmers or growers who are managing their soils in a way which optimises soil health and quality. Applications are being taken online at www.farmcarbontoolkit.org.uk/toolkit/your-farm/soil/492, where there is also more information on what the judges are looking for and the prizes available.

Changes at Organic Centre Wales

The Better Organic Business Links project (BOBL) at Organic Centre Wales ended on 31st August, the last day when dedicated staff were employed at IBERS (Aberystwyth University) to make it all happen. Our best wishes go to Dafydd, Tony, Jane and everyone else involved, with many thanks for all your efforts on behalf of organic farming in Wales. Organic Centre Wales will continue to be operated by its partner organisations ORC, ADAS and IBERS, with the helpline, website, e-bulletin, social media (Facebook, Twitter), producer survey, presence at the Royal Welsh and Winter Fair, and policy advice to Welsh Government continuing into 2016. We will be working to secure funding for future activities as opportunities arise. Further information is available from Nic Lampkin at ORC.

End of an era at ORC

In May 2015 our Senior Office Administrator Pam Tibbatts, who was the first voice or face that many of you met with at ORC, retired. Pam started at Elm Farm in November 1998. Although Pam is irreplaceable, Suzanne Oliver has now taken her seat in reception as our Office and Facilities Officer and a new era has begun!

Pam in 2006

We also say thanks and goodbye to James Skinner and Roger Harrison who have retired from our Council of Management.

For more details on items on this page, including links to the publications, visit the News link at www.organicresearchcentre.com or, to receive more frequent updates, register for our E-bulletin service and follow us on Facebook, Twitter and Flickr.

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About us

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The Organic Research Centre is the UK's leading, independent research organisation committed to developing sustainable land management and food production systems based on IFOAM organic/ agroecological principles; disseminating knowledge to current and future farmers/ land managers and other related businesses; compiling evidence on systems performance and informing public debate through communication with policy makers and opinion leaders, and through them the wider public, in order to ensure the health and well-being of soil, plant, animal, people and the environment.

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Editorial: Common Ground: 'a shared vision' or sharing tools?

I don't like elites or cliques but I'm not big on inclusivity either; at least not on an ongoing basis. There are people I quite enjoy watching sport with but I wouldn't want to spend an evening at home with them. A shared hatred of Chelsea FC isn't really a viable basis for a shared social life, a family or a joint business. It could be the foundation of a political movement though.

Hatred or mere dislike of something has always been a good basis for an opposition. Being inclusive against something works pretty well. It's when you move on to building something else that things get tricky. That's when different values and different world views kick in.

President John F Kennedy was great on inclusivity and sharing. His legend is built on his speeches about it. Here is an apt quote from one:

"So, let us not be blind to our differences. But let us also direct attention to our common interests and to the means by which those differences can be resolved. And if we cannot end now our differences, at least we can help make the world safe for diversity. For, in the final analysis, our most basic common link is that we all inhabit this small planet. We all breathe the same air. We all cherish our children's future. And we are all mortal."

In the same speech he called the Russian state repugnant – which it was - and promoted the American way of life and values as 'the way'. He also said "The United States, as the world knows, will never start a war". That was in 1963, the same year as the number of US 'military advisors' in Vietnam increased to 15000. Confused? Kennedy wasn't. We share 'this small planet' and 'cherish' the future but the sharing and the cherishing is to be done 'My Way' as another American icon had it.

One of the dramas of the 2001 Foot and Mouth outbreak was the infighting between scientists. They all wanted the outbreak stopped but they wanted their particular approach to be the one that ended it. Computer Modelling had to top boring old veterinary epidemiology and the smart Royal Society clique had to beat the pedestrian Maff scientists; and so the cull continued.

It's easy to say they could have worked together and used 'all the tools in the box'. But who owns the box and chooses which tools to use? It's a bit like car sharing. It works well if you are all going to the same school and the kids are going to the same after- school clubs. It doesn't if the destinations are different and you come from a different part of town.

The opening plenary session of the ORC producer conference will be exploring these themes. Well, probably not Kennedy or car sharing but tools, tool boxes and who controls them and how they are used and whether a 'shared vision' is needed to use them. Does it exist between agroecology, food sovereignty and organic farming? How does 'integrated management' fit in?

At first glance this could be so abstract as to be pointless. But these are key questions. In this Bulletin and in the conference there are plenty of examples of innovative research and on-farm practice some of which are delivered by previously unlikely partnerships. The applicability of many of them depends on the nature of the farming systems in which you use them and, crucially, the output you are striving for. And that, whether you realise or like it or not, is dependent on how you see the world and the role of farming and food in it.

Technology and innovation is not neutral and sharing is not a neutral act. They are framed and put in context by vision and aspiration. Wendell Berry didn't say "eating food is a political act"; he said it was "an agricultural act" but I like to think it is what he was getting at.

Personally, I prefer Schumacher's vision to Kennedy's; to paraphrase: we must develop new methods of production and new patterns of consumption built upon the principle of limitation, because our environment is strictly limited. We must only employ methods and equipment "which are cheap enough so they are accessible to virtually everyone; suitable for small-scale application; and compatible with Man's need for creativity."

I wonder how many share this as common ground?

Lawrence Woodward

Changes to ORC's Crops Team and work

After much thought, consultation, analysis, and discussion we have reluctantly decided to close our office at Wakelyns Agroforestry, Suffolk, and move the crops work and positions to our main site at Elm Farm in Berkshire. We will continue to work with Wakelyns and Prof Martin Wolfe on our agroforestry and farm systems work and will keep a part-time position there to undertake the fieldwork within that programme.

For a number of years now we have had concerns about undertaking pure crops work within the innovative agroforestry system at Wakelyns. The diversity and complexity that is essential in an agroforestry system was impacting on the robustness of the pure crops work we are undertaking. The added variability of this system, due to the trees, was adding a complexity to our trials and their analysis that we now realise it would be best to avoid. With a number of projects finishing this year and others just starting this autumn was an appropriate time to make the change. We spent a long time discussing the move with Martin, Sally Howlett (Senior Researcher) and Nick Fradgley (Researcher) and the impact on their work and personal lives. The outcome is that Martin will continue with his role as Principal Scientific Advisor but sadly both Sally and Nick have decided that the move west was not for them and left ORC at the end of October (see below). We have recruited their replacements to be based at Elm Farm.

Those of you who know Elm Farm will be aware that undertaking crops research is difficult on this site. Because of this we have come to an agreement to use two sites close to Elm Farm: Sonning Farm at Reading University and land on Doves Farm, Hungerford. This will give us access to good organically managed systems as well as closer contacts with academia and the industry. The first trials, for the Whealbi project at Sonning and DIVERSIFOOD at Doves Farm have been planted this autumn.

Dr Sally Howlett

Sally joined ORC as a Senior Researcher in October 2009 from New Zealand where she was working for AgResearch on plant protection, having completed her PhD in Newcastle University on slugs. Sally has worked on a number of crops projects but focused mainly on the SOLIBAM (Strategies for Organic and Low-input Integrated Breeding and Management) project that was successfully completed in 2014. She led a work package called 'Exploitation of diversity in breeding', which focused on the use of diversity to improve yield and quality traits in a range of crop species – cereals, tomatoes, beans and broccoli. As SOLIBAM was being completed she worked with others to successfully bid for the Horizon 2020 project DIVERSIFOOD, where once again she has been work package leader. She has got this work off to a flying start for others to pick up. As senior member of the ORC team at Wakelyns Sally also had a range of management/ admin roles with oversight of the staff and our facilities there. She worked hard with Martin, and the Wakelyns and Elm Farm teams to ensure that things ran smoothly. We are sorry to see Sally leave and wish her all the best in the future.

Nick Fradgley

Nick joined ORC as a Research Assistant in June 2012 as maternity cover, but we soon saw his potential and he was made permanent the following March and was promoted to Researcher in May this year. Nick has worked across a range of crops trials at Wakelyns and the other research sites that we work with in the East. He has taken a lead within the Duchy Future Farming Programme field labs and our work with Shimpling Park Farm on black grass management. He has been pivotal in establishing a number of innovative field labs such as; growing quinoa, and wheat varieties for thatching straw as well as working with others including; creeping thistle control, use of compost tea and sea minerals. Nick's growing abilities to communicate with producers and to juggle a diverse workload while not losing site of the quality of the science he is undertaking will be greatly missed at ORC and again we wish him all the best in his new position with NIAB-TAG.

Dr Ambrogio Costanzo

Ambrogio joins us a Principal Researcher and Head of Crops on 1st January 2016. He is currently working at SSSUP in Pisa, Italy as a post-doc research fellow on the project 'Enhancing functional diversity through crop diversification and habitat management to improve ecosystem services in organic and low-input cropping systems'. He brings lots of valuable experience to his new role including a PhD on 'Increasing crop species and genetic diversity in organic wheat systems to improve weed reduction and yield' and agroforestry from his MSc on 'Action research for food security and agroecosystem sustainability'. Ambrogio is well known to some of us as we have worked together on a number of European projects. We look forward to him starting.

Dominic Amos

Dominic started with us as a Crops Researcher on 16th November 2015. He follows a tried and trusted route to ORC after three years as a trials officer at Oxford Agricultural Trials Ltd (as was Nick). With this Dominic has a wealth of experience in managing field trials both on trials sites and on farms and communicating results to end users. He has a degree in Chemistry from Durham and a Graduate Diploma Agriculture from the Royal Agricultural University.

GREATSoils

*The three-year GREATSoils (Growing Resilient Efficient And Thriving Soils) project was launched in April 2015, aiming to evaluate, develop and improve growers' use of soil assessment methods. Senior Crops Researcher **Anja Vieweger** explains.*

The GREATSoils project is funded by AHDB Horticulture, led by the Soil Association, with ORC and Earthcare Technical as partners. The project aims to:

1. Evaluate soil assessment methods for growers;
2. Improve growers' confidence in 'reading the signs';
3. Offer the opportunity to practise assessment methods with colleagues and advisors;
4. Engage with, and disseminate the methods and approaches to a wide range of levy payers, growers, advisors and other stakeholders and
5. Develop methods and approaches for practical soil analysis and evaluation to enable confident choices for sustainable soil management.

There are two elements to ORC's work. Firstly we have produced a literature review on the different soil assessment methods and tools currently available for UK growers. This review will be publicly available by the end of the year. Secondly, we have launched a series of grower consultation events in four different growing regions of the UK, where we sought advice, critical feedback and opinions from growers and consultants on the usefulness and applicability of currently available soil assessment methods. Based on the outcomes of these consultation events, we will organise six field trials during the next two growing seasons (2016+2017) where we will explore various new and improved methods and new combinations of tools for soil assessments. These field trials on six different holdings across the UK will be accompanied by a number of field walks where growers and interested participants are invited to see the new soil assessment approaches in action, get feedback from the host-growers and give their own opinions on the usefulness of these approaches.

Benefits for growers

The benefits for growers should be:

- Improved health assessment of their soils;
- Ability to follow a more integrated and accurate strategy for soil management, specifically adapted to their own conditions;
- Enabling them to optimise inputs, and increase soil fertility and organic matter.

Where growers are able to optimise and maintain soil organic matter levels, the benefits can be financially and environmentally significant. Improved soil health management can increase yields and potentially reduce costs as the land will become more productive.

To get involved email anja.v@organicresearchcentre.com, or check out www.greatsoils.org going online soon.

Agricology goes live

Agricology is a new online resource that translates scientific research into practical advice to help farmers become more profitable and more sustainable, while protecting the environment.

AGRICOLOGY

Founded by three independent charitable organisations – the Daylesford Foundation, ORC and the Allerton Project – Agricology aims to provide farmers with the best practical information on ecological techniques, via the website **www.agricology.co.uk,** on social media, and through on-farm events. The Daylesford Foundation is actively involved in developing Agricology and has pledged nearly £500,000 to the project over the next five years.

"I have always been passionate about sustainable agriculture," says Carole Bamford, trustee and founder of the Daylesford Foundation. "There is a great deal of good and diverse information available on this important area and we wanted to bring this all together in an easy way for farmers and landowners to understand. By sharing knowledge on organic and other ecological farming techniques, I believe we can work together for the benefit of the soil, the pollinators and the wider natural environment".

Agricology is guided by a steering group of leading figures from the worlds of agriculture and horticulture. Together, they represent a diverse range of farming principles including organic, integrated conventional, biodynamic, agroforestry and permaculture.

Dr Susanne Padel from ORC comments: "Agricology allows us to make the best resources on ecological practices available to all farmers and growers, and those that support them, and encourages the sharing of knowledge and experience,"

Dr Alastair Leake, Head of the GWCT's Allerton Project, said: "Making agriculture more sustainable is challenging. We are collating useful information found in scientific journals and making it understandable, practical and available, then demonstrating its use with experts 'in the field'."

Topics covered by Agricology's resources include:

- Improving soil structure, quality and health
- Minimising pressures of pests, diseases and weeds
- Utilising grassland and home grown feeds for livestock
- Reducing antibiotic use
- Encouraging biodiversity, notably pollinators and other beneficial insects

Agricology also features inspirational farmer and grower profiles, which are designed to stimulate farmer-led innovation and help spread the word.

Feedback on the site is welcome, including suggestions for information resources or hot topics. If you would like to share your experiences, or would like to nominate someone to be featured, get in touch with the Agricology team. Details can be found on the Agricology Contact page.

Organic Regulation: Towards consensus, compromise or chaos?

In mid-November negotiations on the new Organic Regulation moved into one of the most controversial phases of the EU's regulatory process – the trilogue. This system of negotiations between the Commission (EC), the European Parliament (EP) and the Council of Ministers (the Council) is now used to finalising virtually all EU regulations but is not fully elaborated in the EU constitution. The negotiation process at this stage is not very transparent so predicting the outcome is very difficult. Here ***Susanne Padel*** *outlines how the players lined up before the doors were closed.*

As we have previously reported, the EC tabled a proposal for a new Organic Regulation in March 2014. This had major shortcomings and the Council of Ministers had long negotiations about the proposal over three EU Presidencies and finally reached agreement on its approach and significantly amended the EC proposal in June 2015. Consideration of the proposals began in the EP after the May 2014 elections and in October 2015 its Agriculture Committee produced its concluding report. Under the leadership of Martin Häusling, a German Green MEP and organic farmer, the report accepted many of the organic sector's concerns and crucially demanded more detail in the regulation and reduced scope for delegated decision-making by the EC.

The structure of the legislation and the use of delegated powers or Implementing Acts

The EC's original proposal gave extensive powers to the EC to finalise the regulatory details through 'Delegated Acts'. This is opposed by the EP which seeks to maintain much of the detail in the basic regulation text and the Council which seeks to develop detail through the instrument of Implementing Acts in a similar way to how they are used in the current regulations. Defra has indicated that it will support the Council position. However, it is questionable whether the principles of organic farming are stated well enough in the Council's proposal to guide the development of detailed rules in problem areas (e.g. poultry, glasshouse production, use of non-organic inputs).

Scope of the regulation

The original proposal sought to clarify the scope of products included or excluded from the regulation, adding some that are closely related to agriculture, but excluding mass catering. In contrast the EP wants to include mass catering – a position opposed by Defra and the EU Group of the International Federation of Organic Agriculture Movements (IFOAM). It also wants to extend the scope by creating a longer list with some new categories, such as aromatised wine, natural corks, raw cotton, raw wool, raw hides and skins, and beeswax. The EP wants the scope defined in the basic regulatory text, which has the merit of clarity but makes either extension or reduction harder to achieve in the future.

Presence of non-authorised products and substances and decertification thresholds

There was widespread concern that the original proposal included automatic decertification of the operator in the event of unauthorised substances being found in organic products. This would change the emphasis of the organic regulation from being process or system-based to being end-product analysis-based. Both the Council and the EP have rejected the idea of automatic decertification thresholds but there are some differences between them. The EP position is more detailed on procedure when residues have been found, including the requirement for a database of non-compliances at EU and national levels and a detailed list of precautionary measures. Defra opposes thresholds but does not support the inclusion of an extensive list of precautionary measures which would be difficult and costly to comply with. The main problem is that there are fundamental differences and no coherence across the EU (member states and organic organisations) as to how to tackle the presence of unauthorised substances and a lack of sensible sharing of information. This issue should be discussed in close association with the control system.

Controls

The original EC proposal was to move all aspects of the control regime out of the organic regulation and into the revision of another catch-all regulation covering the control of all types of food and feed (organic and non-organic) in the EU and including all operators and retailers. The EP proposes to retain control provisions within the organic regulation. Meanwhile the Council likes the idea of risk-based inspections where those with a proven track record might be inspected less frequently. Defra supports this view but the EP favours the retention of annual inspections as the main trust builder for consumers. Annual inspections carry high costs which are largely borne by organic operators (with support in some countries), but consumer research has shown that they are a trust builder for organic products. A more risk-based regime using a tool-box of control measures could help reduce control costs and at the time ncrease the effectiveness of the organic control system, but whether this can be evolved by the trilogue is doubtful.

Minimum own feed or regional livestock feed requirements

The EC proposal required that at least 60% of the feed for non-herbivores and 90% for herbivores should be obtained from the farm or from the region, but did not provide any definition of the region. The Council removed this provision and proposed to introduce an Implementing Act which would provide a realistic definition. The EP has proposed that at least 60% of feed for herbivores (30% for pigs and poultry) should come from the farm itself or in co-operation with others within a 150km radius. This idea has resulted in vigorous debate amongst organic stakeholders throughout the EU. Defra will resist any move towards unrealistic demands which it considers to be restrictive, anti-competitive and impossible for UK organic livestock sectors

to comply with. This proposal has highlighted the variability of organic livestock production in the EU and the very different stages of development and regulatory approaches. There is also an issue of the legality of geographic restrictions within the EU Single Market. It is hard to see how the trilogue will resolve the issue with any degree of coherence other than to put it once again on the backburner.

Definition of 'group' of operators

The original proposal introduced the concept of group certification to encourage smaller producers to become certified and it has been generally welcomed. However, the definition of small operator has not been agreed. The EC proposed a 5ha, threshold which was endorsed by the Council text. However, the EP introduced a monetary threshold of €250,000. Defra supports the idea of ability of group certification for smaller operators; it is arguing for a definition flexible enough to cater for all Member States and believes this is best achieved through an Implementing Act rather than in the regulatory text.

Import of products from third countries.

The EC proposed to delete the possibility of recognising 'equivalent' control measures and to only permit products from fully compliant organic systems to enter into the EU. Both the Council and the EP largely agree. IFOAM however has argued that existing regional standards which cover important aspects not regulated in the EU should be recognised. Defra wants to ensure appropriate consultation of details through an Implementing Act rather than give the EC delegated powers in this area.

Moving towards a conclusion?

Many stakeholders believed that it was misguided to set out to create a new Organic Regulation and that revision of the existing regulation was both desirable and feasible. However, a new proposal was put forward and the resulting process has been very long and remains very uncertain. Nevertheless, various bodies have done a good job on behalf of UK organic stakeholders. The IFOAM-EU Group has been excellent in supporting its member organisations and has collaborated with some parliamentarians on the issue.. Defra itself has been responsive and has worked hard to consult with UK organic stakeholders and to represent their interests in Brussels. Defra's Nick Turner is happy to be contacted directly if you have questions: nicolas.turner@DEFRA.GSI.GOV.UK

With the opening positions of the EC, the Council and the EP being different on many questions it is too early to be definitive about whether the trilogue negotiations are likely to reach an agreement and adopt a final text in the first half of 2016: Judge for yourself from this article. If this succeeds a new organic regulation would enter into force in 2017 or 2018. It is a matter of opinion whether this revision process is likely to result in more coherence and clarity compared to the current regulations.

The EU parliament researchers have produced a useful briefing paper on the subject.

http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2015)568317

National Organic Combinable Crops

ORC had a big presence at National Organic Combinable Crops, Organic Farmers & Growers' (OF&G) flagship event hosted by John Pawsey at Shimpling Park Farm, near Bury St Edmunds on 7th July 2015.

Launch of ORC Wakelyns Population

ORC has pioneered an evolutionary breeding programme to produce a hugely diverse population of wheat suited to organic and low-input farming systems. This year, for the first time, ORC is marketing it as *ORC Wakelyns Population.* ORC chose the event to officially launch its *ORC Wakelyns Population* wheat, with grain from the crop milled and baked locally for the conference's breakfast and lunch. Bruce Pearce gave a presentation on the history and background behind the launch.

Bruce Pearce on the panel at NOCC15

ORC trials at NOCC15

Nick Fradgley gave a presentation on the trials on display at Shimpling Park Farm, including Grazing Cereals, Coordinating organic plant breeding activities for diversity (COBRA) and OSCAR (Optimising Subsidiary Crop Application in Rotations). Delegates had a chance to explore the OSCAR cover crop toolbox on the ORC stand and visit the trials in the field.

Nick Fradgley and group in one of the trial plots

Looking ahead to 2016

On 7th July 2016 National Organic Combinable Crops 2016 will be hosted by Richard Morris on the Wimpole Hall estate, in Cambridgeshire.

Who says vegetables don't fit in agroforestry?

*Certainly not acclaimed organic grower Iain Tolhurst (Tolly) and he's setting out to show that it works. Early in 2015, Tolly and his crew planted up a 3ha field with 600 trees in rows 23m apart, allowing for 30 rows of vegetables in between. That's about a 15% reduction in the veg growing area, so will the benefits outweigh that loss? An ORC team lead by **Jo Smith** is monitoring the field and she reports on progress to date.*

For a long time now Tolly has been saying that he farms biodiversity, with vegetables as a bi-product. His management has always been highly sensitive to soil biology: he has carefully planned rotations and set aside areas, including nettles and beetle banks for above ground biodiversity. Adding trees to the mix is the next logical step. In planting up an agroforestry system in one of the fields, Tolly aims to diversify further his growing system to provide benefits for the vegetable enterprise and support higher biodiversity.

Reducing costs with flowers and rhubarb

Funding for the trees came from the Woodland Trust through their Trees for Farms scheme. Tolly chose a mixture of species that grow naturally in the area and will provide fruit, timber and firewood. Oak and apple are the main species, interspersed with hornbeam, birch, cherry, maple and alder.

An obvious problem in establishing agroforestry is that the area beneath the trees is taken out of crop production immediately, with no returns from the trees for several years, if not decades. In this case 15% of the available growing area is being taken out of vegetable production – quite a considerable loss. To counteract this, Tolly plans is to make the tree understorey productive this autumn, by planting rhubarb in two tree rows, a selection of daffodils and narcissus for early cut flowers in another row, and a selection of herbaceous flowers for early summer cutting in a fourth tree row.

Growing benefits

As the trees become more established a range of benefits are expected to emerge and have a positive impact on the vegetable production as well as general biodiversity. These include: reducing wind speeds and buffering extremes of temperature, improving soil structure and fertility (alder is a nitrogen-fixing species), and importantly, providing a diversity of structures and resources for a range of animals and plants. It is expected that most of these will be beneficial to the system for example by pollinating crops, reducing pests, or helping breakdown organic matter, but it is also possible that some pests might increase, although, as elsewhere on the farm, it is likely that a balance will be found.

Baseline abundance

As part of the AGFORWARD project, (www.agforward.eu) ORC will monitor the progress of the system as it establishes and matures. In this first year, intern Celine Venot measured the heights of the trees and floral and beetle biodiversity underneath to provide a baseline against which we can identify growth and changes. The trees were planted into standing green manure mixes, vegetable residues and an existing beetle bank, so there was some variation in the plant species found in the tree understorey. The most diverse was the long term beetle bank with 28 species.

Ground beetles (*Carabidae*) were collected over a two week period in June, and species identified. These are the most active ground-dwelling predators, and their abundance and diversity are good indicators of habitat changes and disturbances. So we might see a change in the community of ground beetles over time as the trees grow and affect various elements of the field (e.g. by shading areas, increasing soil organic matter and surface litter). In this baseline monitoring the beetles were very abundant. Celine identified the 3000 individuals caught and found 24 different species, the most common being *Poecillus cupreus* and *Pterostichus melanarius*. There was little variation in the number of species found in the different tree rows, the minimum being 7 and the maximum being 10 species (Fig 1).

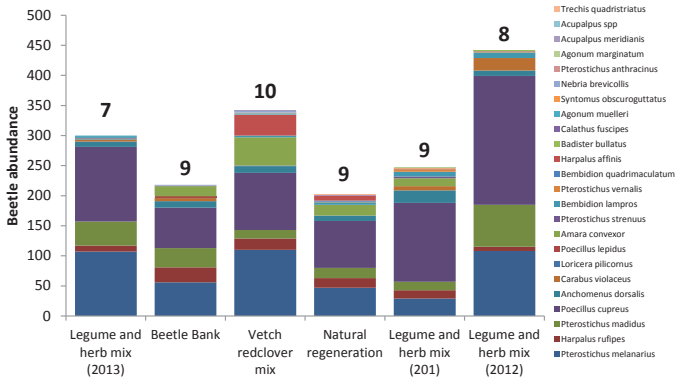


Fig. 1. Abundance of ground beetles in different tree understoreys in the new agroforestry site (total abundance from 10 pitfalls per tree row trapping for 2 weeks in June 2015). Numbers above bars refer to number of species found.

It will be interesting to see if and how these communities change once the understoreys are planted with rhubarb and cut flowers, and whether it is possible to maintain this level of biodiversity while still producing crops.

If you're interested in attending a workshop on agroforestry for growers at Tolhurst Organic in the Spring see ORC's website or register your interest with Gillian Woodward gillian.w@organicresearchcentre.com or on 01488 658298 ext 554.

DOFF your hat to Innovative Farmers

Innovative Farmers is part of the Duchy Future Farming Programme, funded by the Prince of Wales's Charitable Foundation. The new initiative builds and expands on the previous Duchy Originals Future Farming Programme (DOFF) that was completed this spring, with new partners joining the Soil Association, ORC and Waitrose. ***Bruce Pearce*** *reports.*

Innovative Farmers launched

The new Innovative Farmers programme was launched in the Houses of Parliament on 12th October 2015. It is once again led by the Soil Association, with Organic Research Centre and Waitrose. The partnership has been extended and is now joined by LEAF (Linking Environment and Farming) and Innovation for Agriculture (IfA), ensuring that the new network reaches a wider audience.

Building on success

The programme focuses on the successes of the previous programme as 'Innovative Farmers' intends to give farmers research support and funding on their own terms. It will use a bottom up approach putting the farmers and grower in control of their own research and learning. The programme recognises that many of the best ideas in farming come from farmers themselves. From our wider experiences with producers it is clear that many undertake their own trials, test and analysis but that it is often in isolation and frequently not completed due to time and other pressures on the farm. To overcome this Innovative Farmers will match farmer groups with research teams, including our own but also Rothamsted Research, IBERS and Harper Adams. It provides professional support, a web portal where groups share their learning, and access to a dedicated research fund. The programme aims to award more than £800,000 from the research fund to farmer groups by 2020, allowing farmers to investigate techniques that will really make a difference on the ground. The network will also help groups apply to the new European Innovation Partnership, unlocking further funding.

Prof Nic Lampkin, Executive Director of the Organic Research Centre, said:

"ORC are proud to continue our involvement with the Duchy Future Farming Programme and to be a member of the expanded Innovative Farmers delivery team. As with all of our work Innovative Farmers puts producers at the heart of the programme of research, innovation and knowledge exchange - this matches our core philosophy and will ensure that more farmers are empowered to work together with other farmers and researchers to build on their own innovations to improve the sustainability of their own and other farm businesses."

Extending the reach and impact of field labs

At the heart of the network are 'field labs', where farmers meet in small groups to test and develop new ways of tackling a shared problem or opportunity.

Field lab on Growing Quinoa, at Wakelyns Agroforestry

Tom MacMillan, director of innovation at the Soil Association said: "More than 750 farmers and growers have been involved in the Duchy Future Farming Programme in the last three years, running field labs on 35 topics. The field labs really struck a chord. We asked these farmers how we could make them even better and Innovative Farmers is the result.

"We're excited to be joined in this by LEAF and Innovation for Agriculture, so our partnership represents progressive farmers across the industry. This doesn't simply recognise that these farmers can share know-how – whether they're farming to organic, Integrated Farm Management or other principles – but that they can actually pioneer new approaches together."

The network focuses on finding sustainable answers to farmers' practical problems, from managing weeds and pests with fewer chemicals to testing more sustainable animal feeds. Field labs have already tackled topics from reducing antibiotic use in dairy farming to methods in controlling blackgrass, with farmers driving investigations. The field labs were inspired by the 'farmer field schools' that started in Indonesia, now a movement that has involved more than 10 million farmers in teaming up as groups to learn and solve problems together. The new network adapts this approach to suit the UK's most innovative farmers.

As well as inviting farmers to join, the network is encouraging farm advisors to get involved as group coordinators, accessing benefits for themselves and the farmers they work with. The first 20 coordinators, including some from ORC, have already received their training. The role of ORC within the programme will be as lead research partner. We will work on matchmaking farmers and researchers as well as coordinating field labs.

If you want more information on the programme visit its newly launched website at www.innovativefarmers.org and you can also follow the programme on social media on Facebook (search for 'Innovative Farmers') and Twitter (@IFarmers and #innovativefarmers)

Looking into the hedge and finding local energy

*The TWECOM (Towards Eco-energetic Communities) project ended this autumn. ORC researcher **Sally Westaway** reflects on how over three years the project has brought farm hedges back into focus and worked out how biomass can be sustainably and economically harvested from hedgerows and whether hedges can be a viable source of woodfuel.*

Hedgerows provide numerous functions, or ecosystem services, within agricultural landscapes, including supporting biodiversity, controlling erosion, offering shelter, buffering natural habitats from agricultural impacts and enhancing aesthetic appeal. Hedges are dynamic, constantly changing habitats and so maintaining these services depends on skilful, appropriate management and an understanding of the impacts of this management.

This is already a big ask; so can this management be extended to secure energy outputs – in the form of good quality woodfuel – from hedgerows whilst maintaining biodiversity and ecosystem services?

To answer this we took the management method of coppicing and looked deeper into hedgerows to see how we could quantify the potential impacts of coppicing hedges for woodfuel on the biodiversity of the hedge network.

Pushing forwards into hedges

Over the course of the project we have investigated the impacts of hedge harvesting on our resident dormice population, hedgerow flora and soil carbon dynamics. We have tested machinery, big and small, to identify the best harvesting methods, weighed woodchip and measured our hedges, interviewed farmers and provided training and discussion forums to really get to the bottom – and the middle – of these hedgerow questions.

Far from being pulled through a hedge backwards we have gone forwards with eyes wide open and as a result have produced firstly, a comprehensive, best practice guide to harvesting woodfuel from hedges; and secondly, the first published biodiversity protocol to monitor the impacts of hedgerow harvesting on the biodiversity of a hedge network.

Best practice guide

Despite increasing interest in managing hedges for woodfuel there is limited data and knowledge of its productivity, practicality and logistics. To address this, we carried out hedgerow harvesting machinery trials at two sites in southern England during winter 2014/15. At each site a section of hedge at the right stage to be coppiced or harvested for fuel was selected and different machinery options for harvesting and chipping were tested. We quantified cost, time and fuel use associated with each machine and method as well as practical considerations such as ease of use and availability.

Both large- and small-scale agricultural and forestry machinery and methods were included in the trials.

The best practice guide is largely based on these trials but also pulls together current and previous research, related projects, policy recommendations and management guidelines. The guide will be valuable to farmers and landowners, agricultural and forestry contractors, conservation organisations and local authorities interested in managing hedges for woodfuel.

It provides information on logistics and practicalities as well as methods and machinery selection. It outlines how and why you might manage your hedges for woodfuel and includes advice on how to select appropriate hedges, how to plan the management, what the machinery and processing options are as well as the economics and any legal considerations.

Best practice management – key conclusions:

- Every hedge is different and so, therefore, are precise costs for the various elements of the process. Every hedge has to be assessed and managed on its own merits. The best practice guide provides advice to help with this.
- The trials demonstrate that woodchip of reasonable quality which meets industry standards (P16B and G30 grades under BS EN and ÖNORM woodfuel standards respectively) can be produced from hedgerows. It is however important that the woodchip is matched to the right boiler to cope with the variable nature of hedgerow woodchip, such as fines, shards and higher ash content
- Generally it will make more economic sense to use the woodchip produced from hedges on-farm than to sell it; however there is a market for hedgerow woodchip to owners of larger woodfuel boilers or woodfuel hubs of £18-20/m3 (£72-80/t or €99-110/t) at 30% MC.
- The unit energy cost of hedgerow woodchip produced ranged from 1.4 to 3.9 p/kWh depending on machine options and hedge type, and seems relatively favourable compared to the cost of other woodfuels (3.43-5.21p/kWh), fossil fuels (3.5-8.33p/kWh) and electricity (12p/kWh) (Forest Fuels, 2015). Using woodchip from hedges on-farm could therefore not only create savings from reduced flailing but also provide low cost energy, as well as rejuvenate hedges and support wildlife.
- Farmers are in a great position to establish woodfuel hubs, waste recycling facilities or local firewood or woodchip enterprises. Farms are ideally suited as hubs, being locally-based, minimising transport costs and consequently firewood and woodchip prices and potentially providing much-needed rural employment.

The best practice guide along with a full report of the machinery trials is available to download from www.twecom.eu or http://tinyurl.com/TWECOM

The biodiversity protocol

The introduction of coppice management for woodfuel production is likely to have positive and negative impacts both on the wildlife of individual hedges and on biodiversity at a landscape scale. In order to quantify and monitor these impacts we have developed a biodiversity protocol to:

- Identify the current condition and value of a hedgerow network to biodiversity
- Identify and monitor the potential impacts of altering management
- Aid management decisions for both biodiversity and woodfuel production

The protocol is designed for use by farmers, landowners and advisors and is largely based on a set of indicators selected to provide quantitative links between, for example, habitat quality or structural diversity and biodiversity. Indicators were selected using a range of sources including a review of current literature and a synthesis of existing knowledge. Methods for measuring each indicator were field tested as part of the project.

The hedgerow biodiversity assessment tool

The assessment tool is a Microsoft Excel based. Farm hedgerow surveys are undertaken and all the data are entered. The tool evaluates all the hedges according to the indicators measured in the surveys using a scoring system and outputs a series of results sheets for the user to view. The six indicators derived from the surveys include: the percentage of hedges with good continuity, the hedge network density, the density of hedgerow trees, the structural diversity of hedge network, the percentage of hedges in favourable condition, and the percentage of hedges providing a good food resource.

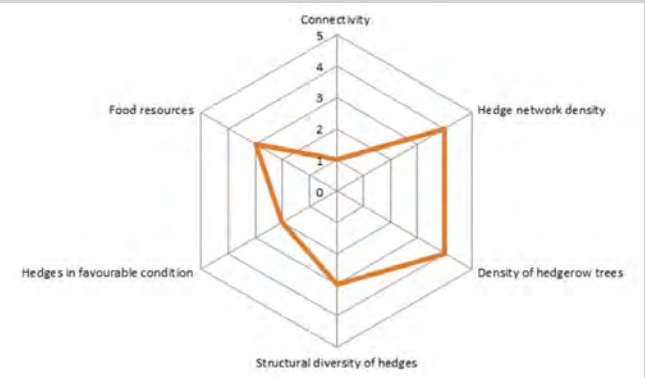


Figure 1. An example radar diagram of the hedge survey indicator results.

Each indicator is scored from 1 to 5. These scores are then represented visually using a radar diagram (Figure 1). Scores lower than 5 indicate there may be room for improvement; however it is important to remember it may be difficult to score highly on some indicators depending on where in the country you are located. For example, in the UK upland farms are likely to have a lower density of hedges per ha compared to farms in the south-west. This is simply a characteristic of the region and not necessarily a reflection on management or farming practices. Recommendations on how to improve the score for each indicator are also included along with general management advice on how to reduce the impact of harvesting hedges for woodfuel on wildlife.

The protocol consists of three main components: an Excel-based assessment tool, a user guide, and a series of surveys (with accompanying survey notes) carried out on the hedges and on associated taxa (butterflies, bumblebees, birds, and ground flora).

As with most early developments of assessment tools, future improvements to the hedgerow biodiversity protocol depend on its continued adoption and use by users. The protocol has been trialled on hedges at Elm Farm but in order to further refine it and ensure usability and practical relevance we are looking for volunteers to test it further. If you would be interested please get in touch.

Looking into the hedge for future solutions

TWECOM has highlighted an important alternative vision for hedgerows – as a valuable resource for local community energy production. It is part of a vision that reinstates farms at the heart of the local community economy and the farmer as an important player in rural and community development.

Clearly more work is needed; e.g. on the logistics and impacts of hedgerow coppicing for woodfuel over the entire coppicing cycle (15-20 years) and in a number of regions taking into account variations in landscape characteristics such as hedgerow densities, soil type, climate and farming practices.

But we gave the project a hugely aspirational title – Towards Eco-energetic Communities – because we knew we were developing a community based technology built on local resources which can make a major contribution to creating resilience in future local economies where outside resources are limited.

All project outputs are available to download from www.twecom.eu or http://tinyurl.com/TWECOM

Acknowledgements

Many thanks to the following contractors and farmers for their involvement in and support of the machinery trials carried out by The Organic Research Centre:

Practicality Brown Ltd, Englefield Estate, Newton Lodge Farms, Wessex Biofuels Ltd, Sutton Estates, Morrisen Tree Surgery and Fencing contractors Ltd, Eling Farm, Kintbury Holt Farm, Hills Waste Solutions, West Berkshire Council, Volker Highways, Wakelyns Agroforestry, Marshall Agricultural Engineering, PJ & MJ Ward Contracting and Peter Frizzell Ltd.

To those who provided their expertise and advice:

Rob Wolton from Devon Hedge Group, William Hamer from Hampshire Woodfuel Co-operative, Sid Cooper from Forestry Commission, Kathleen Bervoets from Agrobeheercentrum Eco^2 and Pieter Verdonckt from Inagro.

To Martin and Anne Wolfe at Wakelyns Agroforestry for the use of their hedges during the trials.

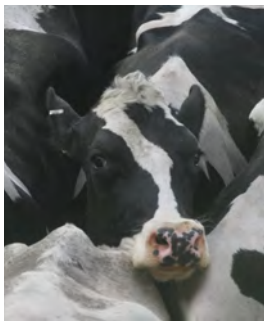
Funded by INTERREG IVB NWE, the Ashden Trust, the Woodland Trust, the North Wessex Downs Sustainable Development Fund, the Gerald Palmer Eling Trust, and the Englefield Trust.

The Greenhouse Gas Platform

*The Greenhouse Gas Research Platform is a Defra and devolved administration funded research programme that seeks to improve the accuracy of the greenhouse gas reporting system for UK agriculture. ORC's senior sustainability researcher **Laurence Smith** is involved with this work and reports on progress so far.*

The Greenhouse Gas Platform consists of three, closely-linked projects focused on regionally-specific emission factors to reflect current and changing specific practices and production systems within agriculture. The projects aim to achieve better forecasting and monitoring of performance against the wider UK target emission reductions set by the UK Climate Change Act (2008) and targets set in the legislation and policies of the Devolved Administrations.

The projects and platform also aim to help the agricultural industry track uptake of mitigation measures included within greenhouse gas reduction plans and sector-specific roadmaps.



The three projects are:

- Data Management and Modelling: project AC0114 (in progress) – brings together existing and newly-researched activity and emissions data to create a new, more-disaggregated inventory model and a set of revised emission factors with an assessment of uncertainty.
- Methane (ResearchCH_4) project: AC0115 (finished) – developed new enteric CH_4 emission factors from different ruminant species, breeds and genotypes (and their manures) under a range of typical farming systems.
- Nitrous Oxide (InveN_2Ory) project: AC0116 (in progress) – improving quantification through measuring and modelling N_2O emissions from different nitrogen inputs as influenced by season, climate, crop, soil types and conditions, and land management representative of UK farming systems.

In January 2015, Defra also launched a parallel 'Representative Feeds and Diets' project (SCF0203) to assist with the collation of necessary information on the quality and composition of ruminant livestock diets.

Platform output

Outputs from all the projects are closely coordinated (through Defra project SCF0102) in order to calculate and deliver the annual UK agricultural greenhouse gas and ammonia inventories (and projections) for submission to the United Nations Framework Convention on Climate Change (UNFCC), the UK's component administrations, and the United Nations Convention on Long-range Transboundary Air Pollution, respectively.

Considerable progress has been made across the Platform over the last 12 months. Probably the most notable output has been the final report for the Methane project which has reinforced the importance of the relationship between feed intake and methane emissions and highlighted the relatively minor role that livestock breed has on methane output beyond that driven by feed intake.

ORC on the platform

ORC has overall responsibility for Knowledge Exchange with industry across all the platform projects and for organising workshops to facilitate the transfer of expertise and data from industry sources.

We are playing a major role in the Data Management and Modelling project by assessing the suitability of industry and government level farm-practice data for inclusion within the working inventory. In addition, we are contributing to the development of a revised inventory structure by helping to define the (organic and non-organic) farm systems that will be included within the annual reporting.

Updates on progress within each of the projects, in addition to newsletters and details of past/future events can be found on the Platform website at: www.ghgplatform.org.uk. More information on the Greenhouse Gas R&D Platform projects can also be obtained by contacting Tom Misselbrook: tom.misselbrook@rothamsted.ac.uk or Laurence Smith: laurence.s@organicresearchcentre.com.

The Role of Agroecology in Sustainable Intensification

The new study, 'The Role of Agroecology in Sustainable Intensification,' undertaken by the Organic Research Centre with the Game and Wildlife Conservation Trust, was commissioned by the inter-agency Land Use Policy Group (LUPG) and funded by Scottish Natural Heritage and Natural Resources Wales. The study found that agroecological practices and and systems, including integrated farming, organic farming and agroforestry, can help maintain agricultural productivity and enhance the environment. The authors ***Nic Lampkin, Bruce Pearce, Alastair Leake, Henry Creissen, Catherine Gerrard, Sofi Lloyd, Susanne Padel, Jo Smith, Laurence Smith, Anja Vieweger*** *and* ***Martin Wolfe****, the range of agroecological approaches and their performance, finding that there was potential for win-win situations where both productivity and the environment could be enhanced.*

Sustainable intensification and agroecology

'Sustainable intensification' is now often used to describe the future direction for agriculture and food production as a way to address the challenges of increasing global population, food security, climate change and resource conservation. While sustainable intensification is interpreted by some to relate to increasing production, with more efficient but potentially increased use of inputs and technology, there is also a need to consider environmental protection, including the conservation and renewal of natural capital and the output of ecosystem services. There is a growing consensus that sustainable intensification should not only avoid further environmental damage, but actively encourage environmental benefits. This includes addressing issues of consumption (including diets), waste, biodiversity conservation and resource use, while ensuring sufficient overall levels of production to meet human needs.

'Agroecology' is also now receiving increasing attention as an approach to agriculture that attempts to reconcile environmental, sustainability and production goals by emphasising the application of ecological concepts and principles to the design and management of agricultural systems. Agroecology can be seen as part of a broader approach to sustainable intensification focusing on ecological (or eco-functional) and knowledge intensification alongside technological intensification.

Three levels of adoption of agroecology are relevant:

1. an efficiency/substitution approach focusing on alternative practices and inputs with an emphasis on functional biodiversity, or eco-functional intensification, to reduce or replace external, synthetic, non-renewable inputs;
2. a whole system redesign approach focused on the farm ecosystem;
3. a focus on agriculture as a human activity system, including the issues of labour and knowledge/skills on farm as well as interactions between producers, supply chain actors and consumers.

Agroecology can also be considered in terms of transformation of social and economic systems, but this aspect was not a focus of this report.

The report explores from a UK perspective how agroecological approaches can contribute to sustainable intensification by:

- exploring the concepts of 'sustainable intensification' and 'agroecology';
- reviewing the range of individual practices and systematic approaches that are typically defined as agroecological;
- assessing the extent to which different agroecological approaches can contribute to sustainability outcomes; and
- considering the policy drivers and constraints that may affect the adoption of agroecological approaches.

Lampkin NH, Pearce B.D, Leake AR, Creissen H, Gerrard CL, Girling R, Lloyd S, Padel S, Smith J, Smith LG, Vieweger A, Wolfe MS. (2015) The role of agroecology in sustainable intensification. Report for the Land Use Policy Group. Organic Research Centre, Elm Farm and Game & Wildlife Conservation Trust.

www.snh.gov.uk/docs/A1652615.pdf

Nitrogen provided by clover nodules can help to reduce imports of synthetically fixed nitrogen and increase forage yields

Agroecological approaches

A wide range of agricultural practices and system components are identified in the literature as being agroecological in nature. The following list provides an illustrative overview, but is not exhaustive:

- reliance on soil biota, e.g. earthworms, for soil structure, formation of water stable aggregates, and soil water infiltration;
- biological nitrogen fixation using legumes and symbiotic N-fixing bacteria;
- the use of biologically active soil amendments (e.g. composts) to suppress soil-borne diseases;
- passive biological control of pests using field margin refugia or beetle banks to encourage presence of beneficial insects;
- temporal and spatial design of cropping systems to disrupt pest life cycles or attract pests away from sensitive crops (including push-pull systems);
- crop rotation to manage soil fertility and crop protection more generally;
- use of cultivar and species mixtures, including perennial and annual species and composite cross populations within species, to improve resource use efficiency and reduce pathogen spread between individuals with different genetic susceptibilities;
- utilisation of grassland by multiple livestock species, ensuring effective resource utilisation (different grazing behaviours) as well as health management (pathogen/parasite transfer and lifecycle patterns in pastoral ecosystems).

There are some common features within these practices:

- they have a strong biological rather than technological focus, with reliance on knowledge, skills and experience for their effective management;
- they emphasise diversity of system components and complex relations between components to deliver system resilience and stability;
- to the extent that they are used effectively, they permit reduced use of industrial/ technological/ synthetic agrochemical inputs.

Mollison (1990) describes the idea of complexity in agroecosystems as follows:

- each function (e.g. weed control) is delivered by multiple components/practices (e.g. variety selection, timing of sowing/planting, rotations etc.)
- each component/practice (e.g. green manures) has multiple functions (e.g. nutrient conservation, nitrogen fixation, soil protection etc.)

This builds on the ecological theory of niche differentiation - different species obtain resources from different parts of the environment, and the greater the number of trophic relationships (where one organism obtains resources from another), the more resilient a system is to shocks or disturbances that may impact seriously on one component. It is clear that any of these practices can be used by any farmer, but it is the use and integration of multiple practices and the possible synergies at a system level that characterises an agroecological approach to agriculture.

Recognising the potential for synergies, there have been many attempts to integrate agroecological practices and

Chicory helps reduce parasite problems in sheep

restrictions on the use of certain practices/technologies into defined agroecological approaches, ranging from integrated pest, crop and farm management through conservation agriculture, organic farming, biodynamic agriculture, eco-farming, regenerative agriculture to agroforestry, permaculture and many similar variants. Some have been better developed, codified and researched than others, and for the purposes of this study we focused on evaluating integrated crop management/conservation agriculture, organic farming and agroforestry in more detail.

The contribution of agroecological approaches to sustainability outcomes

To assess the contribution of agroecological approaches to sustainability outcomes we drew on a combination of grey and peer-reviewed literature, other web-based resources and quantitative data where available, to describe and assess the performance of agroecological systems and strategies compared with more conventional approaches to sustainable intensification.

Any assessment of performance requires the identification of relevant objectives, related outputs or indicators of performance, and criteria against which success or failure of different systems can be determined. In this context there are a very wide range of possible objectives, systems, metrics and indicators with variable data quality and comparability, so inevitably some constraint to the assessment, and reliance on judgement, is required.

Given the potential complexity of the evaluation, we have restricted the scope to five primary objectives:

i. Productivity
ii. Carbon sequestration, greenhouse gas emissions and energy use
iii. Biodiversity and related ecosystem services
iv. Soil and water resources (physical aspects)
v. Profitability

The assessment of the different agroecological practices and approaches presented in the report demonstrate that there are differences in performance with respect to each of the objectives, and that there may be both synergies and conflicts between objectives in specific cases. In Table 1 we summarise our assessment of the relative contribution of individual practices, as well as of the major approaches (integrated, organic, agroforestry) reviewed. It should be noted that in this table the scoring represents an assessment of whether the impact is better or worse than conventional intensive systems.

Table 1. Contribution of different agroecology practices and approaches to defined sustainable intensification objectives

Practice	*Productivity*	*Non-renewable energy use and GHG emissions*	*Biodiversity and related ecosystem services*	*Soil and water resource protection*	*Profitability*
Fertility-building legume leys	+ (- if not utilised)	+	+ (++ if flowering)	++(if well managed)	-
Organic soil amendments	+	+	++	+	0
Reduced/ zero tillage	+	+	+	+	+
Avoidance of agrochemicals	--	+	++	++	--
Extended crop rotations	+	0/+	+	+	+/-
Polycultures	++	0/+	+	+	+/-
Variety mixtures and populations	+	0/+	+	0	0/-
Field margin and other refugia	+/-	0/+	+/++	0/+	+/-
IPM/biological pest control	+	0/+	+	0	+
Diverse pastures	+	0/+	+	+	0/+
Mixed crops and livestock	+ (if complementary)	0/+	+	+	+/-
Mixed livestock species	+ (if complementary)	0/+	+	0	+/-
Integrated crop/ farm management	0	+	+	+	0/+
Organic farming	--	+ (0 per unit product)	++	++	0 (with premiums)
Agroforestry	+	++	++ (- if bare understorey)	++	+/-

- = worse than conventional, 0 = similar to conventional, + = better than conventional

Source: Own assessment based on literature presented in the full report.

Overall, our assessment is that, in general, the potential of agroecological approaches to contribute to sustainable intensification is positive. We recognise that this assessment does not account for sometimes wide performance variations in specific situations. We have also not sought to provide an overall rating combining the different objectives assessed, as the allocation of weightings to individual objectives can vary widely between different stakeholders.

In some cases the impacts could be positive or negative, depending on a) whether the practice, e.g. field margin refugia, enables more cost-savings/yield gain than the land taken out of production, and b) whether the species mixtures used (crops and/or livestock) are complementary and similarly profitable. In some cases, such as the impacts of reduced use of agrochemicals and organic farming on productivity and biodiversity, there is clear evidence of trade-offs that need to balanced. The resolution of trade-offs is a complex question, which is only starting to be explored in the sustainability literature (e.g. German *et al*., in review).

Despite the very wide range of studies reviewed in this report, there are still significant methodological challenges to measuring and understanding the relative performance of different practices and approaches.

From our evaluation, we concluded that agroecological perspectives may be applied to the management of soils, crops and livestock, as well as to broader societal, environmental and food system issues. Agroecological practices, such as the use of rotations and polycultures, biological pest control, or legumes to biologically fix nitrogen, are not unique to particular groups of farmers. They can be used by all farmers, individually or in combination. However, synergies between individual practices can be important. Agroecology emphasises the idea of 'system redesign' rather than 'input substitution' for maximum benefit. In some cases, as in organic farming, the combination of practices may be codified (regulated) to enable marketing of products at premium prices to consumers. A range of more or less codified, systematic approaches, ranging from integrated pest and crop management through conservation agriculture and organic farming to agroforestry and permaculture, are described in the literature.

Three of the best documented approaches – integrated crop/farm management, organic farming and agroforestry – are assessed in detail, in comparison with intensive, conventional systems, with respect to their contribution to: (i) productivity; (ii) energy use and greenhouse gas emissions; (iii) biodiversity and related ecosystem services; (iv) soil and water conservation; and (v) profitability.

This analysis concludes that agroecological approaches can:

- maintain or increase productivity, with the exception of organic farming where yields per ha may be substantially reduced due to restrictions on the use of agrochemical inputs – however organic system productivity with respect to other inputs including labour, and in terms of resource use (other than land) per unit of food produced, may be similar or better;
- contribute to reducing non-renewable energy consumption, both on a per unit of land and a per unit of product basis – although the benefits per unit of product are not as high in the organic case due to the lower yields;
- maintain or increase biodiversity and the output of related ecosystem services – with appropriately designed and managed agroforestry and organic systems offering potentially greater benefits than integrated systems;
- maintain natural capital in the form of soil and water resources as a result of reduced use, careful management (e.g. reduced or zero tillage) and reduced or restricted use of potentially polluting inputs;
- maintain or increase the profitability of farming systems through more efficient input use reducing costs, diversifying the range of outputs and, in the organic case, developing specialist markets with premium prices to help compensate for the lower yields.

The analysis further suggests that there will be both win-win situations, as in the case of agroforestry, as well as trade-offs between objectives, for example between productivity and biodiversity in the organic case. The latter might be compensated for by market mechanisms and/or policy interventions. To the extent that high outputs per unit land depend on inputs of non-renewable resources and degradation of natural capital, some compromises might be needed to deliver longer-term sustainability. This also illustrates the need for the maintenance of functional biodiversity components in productive agricultural landscapes to deliver the ecosystem services that can enable reduced use of unsustainable inputs and practices.

Overall, there is a clear case that agroecological approaches can make a substantial contribution to sustainable intensification, but this needs to be supported by an improved knowledge system (including training, education, advice and research with active farmer engagement), as well as by policy drivers, such as those adopted in the French agroecology action plan, to encourage change. There is also no one single approach that is likely to deliver all benefits simultaneously – a mosaic of approaches addressing specific needs is likely to deliver better overall results, as well as provide insurance against a single preferred strategy failing to deliver in practice.

Photo: Bob Crowder

Orchard and flowering understorey: Passive biological control of crop pests by encouraging beneficials

Cattle grazing in a silvo-pastoral system

Recommendations

- Future work on sustainable intensification should place high priority on the sustainability component of the concept, including eco-functional and knowledge intensification, environmental protection and the delivery of ecosystem services;
- The potential of agroecological approaches to contribute to sustainable intensification (used in this sense described above) should be more widely recognised and developed. Agroecology is not just an option for, but an essential component of, sustainable intensification;
- Appropriate evaluation metrics should be developed to support business and policy decision-making, both at farm and regional/landscape level and taking account of different priorities (e.g. water use) in different areas;
- Policies to mitigate the negative impacts of many agricultural inputs, including fertilisers, pesticides, anti-microbials and anti-helminthics, should emphasise agroecological approaches in addition to technological or risk management solutions (as in the EU Sustainable Use of Pesticides Directive and the French agroecology action plan);
- Agri-environmental support, payments for ecosystem services (PES) and market-based policies (e.g. product certification) should be used to encourage the adoption of a broad range of agroecological approaches;
- Improved agroecological information and knowledge exchange systems, building on tacit farmer knowledge and active producer participation, should be developed and promoted. Achieving this will require better integration and co-ordination between individuals and organisations working on the subject, as well as the collaborative development of both on-line resources and traditional extension services;
- Educational provision, whether at vocational skills, further and higher education levels or more widely, should include a stronger focus on agroecological approaches – in the short term this issue can be addressed through the provision of targeted support (using the RDP vocational skills measures) but in the longer term a wide range of educational curricula need to be reviewed and updated;
- Research and innovation policy should include more focus on the development of agroecological approaches, not just their comparative evaluation. Support policies need to facilitate participatory delivery models and address the challenges involved in securing private sector funding for applied research that generates public knowledge not linked to saleable technologies and intellectual property.

References

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Working with the Swiss to improve sustainability assessment

ORC has been working with the Swiss Research Institute of Organic Agriculture (FiBL), pooling our expertise to further develop methods for sustainability assessment and monitoring for organic farms. ***Susanne Padel****,* ***Catherine Gerrard****,* ***Laurence Smith*** *and* ***Bruce Pearce*** *from ORC, and* ***Christian Schader****,* ***Lukas Baumgart*** *and* ***Matthias Stolze*** *from FiBL summarise the conclusions of the Ekhaga Foundation-funded project.*

Why we did it

In recent years there has been a great deal of interest in assessing the sustainability of agriculture in terms of its social, environmental and economic impact. This interest has led to the development of sets of indicators (which can be split into 'themes' such as biodiversity, air quality, water management, etc.), and a variety of tools which combine indicators to carry out sustainability assessments. Indicators can be outcome related e.g. number of butterfly species present, or management related e.g. percentage of fields with margins growing wildflowers to attract butterflies.

Given its underlying ethos, the organic/ecological agriculture sector should aim to be at the forefront of sustainability. The development of assessment approaches and recent discussions within the movement have identified continuous improvement towards best practice in sustainability to be one of the important features of the new direction. Positive environmental impacts are seen as one of the most important reasons for the financial support given to the organic sector, and as one of the reasons for consumers' willingness to pay a premium for organic food. This project aimed to provide practical recommendations on the suitability of the available sustainability assessment frameworks, themes, tools and indicators for the organic sector and to help consider and further develop sustainability assessment approaches.

What we did

A review of tools, indicators, themes and sustainability assessment methods was carried out. The opinions of organisations and individuals from within the organic sector were obtained through an international workshop and an online survey. Synergies and trade-offs between indicators were investigated using the database of FiBL's SMART sustainability assessment tool to investigate the relationships between themes.

What we found

1. **Choose indicators according to importance of theme.**
   Choosing the most promising indicators for the organic sector needs to be driven by the importance of the sustainability theme as well as the suitability of the method. Choosing indicators solely on the basis of desirable goals may lead to a subjective and non-transparent indicator selection which cannot be externally verified. On the other hand, assessing the quality of indicators alone appears to be too much driven by method and the choice of tools will also need to be influenced by data availability and/or cost of data collection.

2. **Include indicators for social sustainability and good governance.**
   The inclusion of indicators that assess areas within social sustainability and good governance (e.g. corporate social responsibility) should be encouraged within existing tools. This should build on recent frameworks provided by, for instance the Food and Agriculture Organisation of the United Nations (FAO) and OECD (e.g. SAFA, guidelines on social life cycle analysis, DFID Sustainable Livelihoods Framework). Indicator development should also consider stakeholder views and perspectives (perhaps using, for example, the European Innovation Partnership Programme to contact stakeholders) and decide on threshold values that indicate poor, acceptable and good performance.

3. **Farms with good governance perform better on other aspects.**
   The assessment of synergies and trade-offs has illustrated that farms with good performance with regard to governance are likely to have positive performance on most environmental, social and economic aspects. This highlights the importance of good corporate management at the farm level. Further work on synergies and trade-offs using samples of farms is urgently required. In addition, trade-offs between economics and environmental and social dimensions may need to be accepted at the farm level. There is scope, however, for these to be addressed by policy makers, to help farmers set the right priorities. Substantial trade-offs also exist within the environmental dimension (for example between greenhouse gas emissions and animal welfare) which might be more difficult to resolve. Priorities need to be set depending on the specific context of the farm.

4. **Communicate the sustainability strengths of the organic sector.**
   Areas of sustainability that are perceived by those within the organic sector as being potential strengths were identified. These could be harnessed in terms of communicating the benefits of organic production. These key strengths include biodiversity, ecosystem diversity, soil quality and greenhouse gas emissions. Although such key strengths may seem obvious to those working within the sector and for several there is some good scientific evidence available, it is likely that the benefits are not widely-known or publicised and that further development of the evidence base is required.

Publications resulting from the project

A number of papers and publications have resulted from the project and can be accessed from the ORC project page. http://tinyurl.com/Ekhaga-SA

Horticultural costings tool

Making financial data 'fit for purpose' for small-scale growers was the mission we set ourselves as part of Organic Centre Wales's Better Organic Business Links (BOBL) project. There is an absence of tailored information on the viability and productivity of market gardens and small-scale horticultural holdings growing for supply chains in Wales (but of course not just Wales!). The problem is exacerbated by a lack of financial skills/knowledge of new entrants, for example on setting prices, estimating the cost of production and uncertainty about choosing a business model. ***Phil Sumption*** *introduces the tool.*

At ORC we have been wanting to include material in the Organic Farm Management Handbook that will be more appropriate and applicable for complex small-scale horticultural systems, but have been hampered by lack of data and funds. Horticulture Wales has recently developed gross margin data and calculators for conventional field-scale production; but they don't take into account the lower or different input costs, higher labour requirements and the inclusion of fertility-building leys in organic systems.

However the application of standard gross margin data to small-scale horticulture remains problematic: small-scale operators can typically grow and market more than 60 different crops, often in succession throughout the season. The production of mixed salad bags, one of the most important crops for small growers, can involve the harvest of 10 or more crops from polytunnel and field, which makes it much more difficult to work out gross margins than for a field of potatoes! Cropping areas are frequently between 100 and 1,000m^2, and rotations include crops for fertility-building; but standard data sets are published per hectare and assume annual harvesting rather than growing in succession. They also do not cover likely costs that are incurred when setting up a stall on a farmer's market, or setting up a box scheme.

Workshop and survey

We ran a workshop at the Organic Producers' Conference last November[1] to discuss how growers approach their planning before each growing season, how they are recording their outputs and costs and how they are evaluating the financial viability of their business. To further inform the process of developing a tool, a survey was distributed to organic growers, prior to conference.

The survey (15 responses) found that most growers surveyed are using spreadsheets and/or an accounts package and all are recording sales with most recording according to their sales channels. The most common unit used when planning the business is m^2, followed by metre rows. However, most are not attributing costs to crop categories, though some do. Most respondents record seed costs, growing media, crop protection, fleeces (allocated to crop category). But some things such as heat used for propagation, manure and fertility-building crops were thought to be difficult and not done. Less than a third of respondents recorded labour costs per activity, citing difficulties of allocating to tasks, especially when using volunteer labour. Own time was thought to be the easiest to record/allocate. Land and rent, interest and bank charges, wages for paid labour were all recorded by many (but fewer than half the respondents found it relatively straightforward to allocate to crops). Investment and maintenance of equipment, etc., is relatively easy to allocate to crops, but fewer are allocating the latter apart from obvious jobs such as machinery repairs. Transport costs were generally thought OK to allocate; storage, communications and promotion however were not so easy.

Features of the costings tool

- The crop is the main unit of enterprise, but crop groupings are summarised with net margins.
- One of the fundamental features of the tool is the use of m^2 months. We adapted the method from Kate Collyns' Gardening for Profit[2]; she worked out the fixed costs of her growing space, which is apportioned to the crop grown, according to the time it is in the ground. This is important as it enables us to compare a rocket crop, which might be in the ground for less than two months with a purple sprouting broccoli crop, which could be growing for 11 months. We like this approach as it gives more realistic costs for short-term catch crops. We use it for allocating all costs that are not crop-specific. Another way of doing this would be to allocate things such as overheads in proportion to the labour requirement of the crop, which is how the Manchester Veg People do it. Of course, a month in June, with higher light levels and temperatures, would be more valuable than a month in January; but incorporating that into the tool would require a different level of sophistication!
- Choose the level of detail you require. If it is easiest for you just to record the costs according to crop group, e.g. brassicas, alliums, salads, cucurbits, then do that; but if you prefer to enter the detail for individual crops, you can. We recognise that some operations and costs are easier to record on a field or holding basis and divided up accordingly.
- Recording labour costs is difficult, as demonstrated in the survey, but it is perhaps the most important for growers to get a handle on. We have different options for recording this and you should decide which works best for you. As with other costs you can record the level of detail you want. Many tasks might be non-crop specific, and these should be recorded so they can be divided up amongst crops on an area basis. At one level you can just record all work on a particular crop, which is the approach that Veggie Compass[3] takes (a project at the University of Wisconsin-Madison that involves the development of whole farm profit management tools), dividing labour into non-crop specific field growing, crop specific field growing, non-crop specific harvest and packing and crop specific harvest and packing. Under our tool you could do the same, but also choose to tease out the tasks for each crop, such as: planting/drilling, tractor work, hand-weeding, pest control, crop training, irrigation, other. You could focus on one category you want to nail down, such as hand weeding; record everything; or just put it all in 'other'.

The tool – step-by-step

The tool has a step-by-step approach, each step being a separate inter-linked worksheet

Step 1: Map out your holding and plan your rotation; measure out each plot. It is important that the area includes wheelings, paths and so on for comparison purposes.

Step 2: List all the crops you grow, their areas (including wheelings, paths and so on) and time in the ground. We have tried to list the most commonly grown crops and have grouped them into what we think are sensible groupings. However you might wish to enter your own crops, instead or in addition to those listed, or change the groupings as appropriate to your system and rotation. These will be entered automatically into the other sheets.

Step 3: Record your overheads here, per year, and they will be directly allocated to the crops according to space and time.

Step 4: List your investment costs here and the period of time it is sensible to spread them over. We have listed field, protected cropping and general investments separately so that they can be allocated appropriately.

Step 5: Record all direct costs that are not crop-specific, such as costs of manures. If you record these directly per crop, then don't put them here since they would be counted twice.

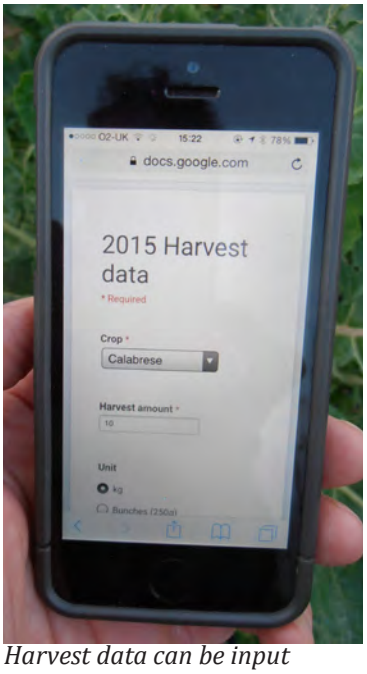
Step 6: Record any costs that are directly related to the individual crops. There may be costs that are specific to a group of crops, such as fleece for brassicas, Bt for brassicas and so on. These costs can be spread evenly over those crops.

Step 7: Inputting crop by crop labour data: the more detail the better – since it will better inform costs of production – but it is a balance between ease of recording and info gained. The non-specific crop labour is divided up amongst the crops according to time spent in the ground and area of the field.

Step 8: Gathering sales data. For some outlets this is relatively easy, such as sales data from invoices to shops and restaurants; but markets can be more problematic. We have designed a form to help that involves recording what you take to market and what you bring back, and the price that the item was sold for. If the final takings are put in then the sales of all items are adjusted to fit, recognising that it can be difficult to reconcile the two, because there is a tendency to be generous with quantities weighed for customers and some produce may be sold at lower prices at the end of the day or given away.

Your summary sheet allows you to compare the cost of different crops and crop groups and their margins. You can then drill down into the detail to see where those costs are incurred and how your system can be improved.

- In the tool we have chosen to allocate labour costs (total costs) according to the hours spent on that crop. This doesn't distinguish between the cost of different labour (such as volunteer/ contractor/skilled employee), but gives an indication of how labour-intensive a crop is. The tool generates a figure for average cost per hour, which could be frightening as it may appear well below minimum wage! This figure is used to allocate the costs to crop or crop group.



Harvest data can be input directly to a spreadsheet using Google DocForms online or via a free smartphone app.[4]

- Fertility-building is a very important part of organic systems and I have often argued that it should be considered as a crop in its own right, and the most important crop in the rotation. Individual crop gross margins often ignore this. We list it as a crop with a negative margin and share the costs amongst the crops in the rotation. We also generate a figure to indicate the proportion of fertility-building crops in the calendar year.

The tool and supporting documents/worksheets can be downloaded at: http://tinyurl.com/Hort-costings

Next steps

We will be working on the tool and refining it further. We welcome volunteers to road(or field-) – test it for us. We are hoping that it can be used to generate benchmark data, for use in the Organic Farm Management Handbook, and for sharing between growers.

Phil will be presenting the tool in the 'Business tools and support for new entrants/converters' workshop at the Organic Producers' Conference in Bristol on January 27th 2016.

References and resources

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2. Collyns K (2013) Gardening for Profit: From home plot to market garden. Green Books
3. Whole Farm Profit Management. http://www.veggiecompass.com/
4. See tutorial on using GoogleDocForms for recording data http://tinyurl.com/GoogleDocForms

This article was adapted from an article written for The Organic Grower No.31, Summer 2015, journal of the Organic Growers Alliance.

Michael Meacher: Defender of the faith

Photo: http://flickr.com/photos/mintyboy CC-by

Michael Meacher in 2005

Which faith? The one that holds that genuinely sustainable production and consumption is something more than tweaking 'business as usual'; that we can live within the resource capacity of our planet in a fair, equitable and joyful way; that we must take radical and urgent steps to confront global warming; that science is an amazing tool when it's not being corrupted by vested interests, egos and the narrow pursuit of private profit. Michael Meacher believed in and fought for these things. He also saw the crucial need for, and was committed to, bringing about a radically different food and farming system which he believed would "certainly be more localised, it will be less internationalised, less dependent on chemicals and fertilisers ... more organic." He died on 21st October, a few weeks short of his 76 birthday. ***Lawrence Woodward*** *looks back on achievements.*

Michael Meacher was an MP for 45 years and for 29 of them was on the Labour frontbench both in opposition and in government, mastering various briefs, and at times being at odds with some of his party's leaders. Not that treading on New Labour sensitivities bothered him when they got in the way of his own radical agenda.

Probably he will be best remembered for his environmental legacy. He was responsible for the Countryside and Rights of Way Act which gave the public 'the right to roam'. And, as an early observer of the dangers of climate change, he was at the forefront of those calling for effective preventative action and promoted the development of wind and tidal power.

Fighting GM

Most notably Michael opposed the government's ill-considered push for genetic engineering in agriculture. As junior environment minister he turned the tables on GM supporters by insisting that their hitherto largely empty rhetoric about 'following the science' was acted upon. At his instigation the Farm Scale Evaluation trials into the environmental impacts of GM crops began in 2000.

The results showed that GM cropping was even more damaging for farmland biodiversity than intensive conventional farming. The UK government consequently had little choice but to oppose the growing of GM beet and oil seed rape in the EU. This played a large part in bringing about Europe's virtually total moratorium on GM cropping which has lasted until today.

Supporting organic

Michael's support for organic farming received fewer media headlines than his opposition to GM crops, but it was significant. As an environment minister he took up the organic farming brief enthusiastically and he championed the cause of supporting organic farmers through direct payments and policies. He chaired the English Organic Action Plan working group and promoted all aspects of the organic cause throughout what increasingly became an anti-alternative, pro-industrial agriculture ministry under the withering hand of Margaret Beckett.

Michael was very isolated in Beckett's team. He once asked to meet ORC trustee Prof Hardy Vogtmann and me to discuss GM issues and steps that might be taken to avoid contamination. At the time Hardy was president of the German government's nature conservation agency – the equivalent of our Environment Agency and Natural England – and as such could expect to be openly welcomed by ministers and top civil servants.

In this case, we were asked to turn up quietly after hours and Michael made sure all the doors along the Minister's corridor were firmly closed so no-one would know we were talking about GM. He joked about how bizarre it was for a grown man and a minister of the Crown to have to skulk about the place, but it highlights how much opposition he had to overcome to get the Farm Scale Evaluations up and running and just how determined and resolute he was.

"I will not cease...."

He was outwardly mild mannered – well mannered – but with this had an inner toughness. His blogs show how much he detested the austerity policies of recent years. The uncharacteristic title of his last posting -"Osborne stirs up more shit in which to bury himself in" - perhaps indicates how angry he was about those imposing what he saw as unfair measures damaging the most vulnerable in our society whilst protecting corporate interests.

Seeing that title, I wondered whether Michael remembered standing in a cold, windy field looking at a dung patch while I explained how it is broken up by the action of soil life on organic farms, but how the use of wormers on conventional farms slows up and in some cases stops this process.

The day was also cold and windy when I last saw him. We were standing outside Downing Street. Michael had just helped deliver 'The Letter from America' (http://www.theletterfromamerica.org/) from organisations representing over 50 million US citizens which sets out the problems GM cropping has caused to health and environment over there; problems which Michael played a major part in preventing over here.

As we parted he said to me; "we have to keep at it you know, different battles, but the same fight. And it's gets more important. Let me know when I can help again."

Read his outstanding weblog http://www.michaelmeacher.info/weblog/ and you will be in no doubt about he meant, what he stood for and how much he will be missed.

Europeans deserve a better agricultural and food policy

*Increasing investment in research for organic farming will help to provide answers to many environmental and social issues of Europe's farming systems, says a new study presented at the conference 'Research for Transition' on 22nd October 2015 to the European Parliament. The study, carried out by **Susanne Padel** of ORC with the Université Catholique de Louvain in Belgium and commissioned by the Greens in the European Parliament, reveals a paradox between the potential of and actual investment in organic farming research.*

Scientific evidence shows that organic farming is better placed to address sustainability challenges than conventional farming. This is in clear contrast to the limited research money spent on organic farming, at both European and national levels.

"The organic food and farming sector is a frontrunner in the transition towards sustainable food systems," comments Eduardo Cuoco, head of the TP Organics secretariat. "In 2014, TP Organics published a Strategic Research and Innovation Agenda for Organic Food and Farming. The agenda shows that the organic sector has much to offer for the whole of agriculture, both in terms of designing more sustainable production systems, and for the design of resilient business models. The study presented today points out that the EU and Member States under-invest in research to deliver on this potential. The Horizon 2020 Work Programme adopted last week contained significantly more budget for organic farming than previous EU research programmes, but it is only a first step. A fair share of public money should be allocated to the development of the organic sector."

Organic farming is often criticised for having lower yields than conventional farming but given the huge discrepancies in research investment between organic and conventional farming, organic is performing amazingly well. Whilst the productivity of conventional farming systems is reaching a plateau despite intensive use of fossil energy and non-renewable inputs, the potential of the productivity of organic farming has still to be explored.

Figure 1. Impacts of organic farming v conventional farming. A synthesis of scientific reviews

Research funding for organic farming

Estimates of the share of public agricultural research budgets allocated to organic farming are less than 5%. The Netherlands and Belgium devote 3 and 5% respectively of their total agricultural research budgets to organic farming. France and Germany lag behind with a share of only 1% for organic farming research. Data may not be complete, e.g the data for France are only based on additional costs and do not take into account the salaries of INRA and other research institutions involved in organic farming research projects, and the same might apply in other countries. Funding of research into organic farming remains the exception at both EU and national levels. Countries with long- term programmes include Denmark, France, Germany and Sweden.

Case studies of research initiatives

Inspiring case studies are presented in the report including:

- CORE Organic: a €35 million (2007 to 2015) transnational partnership of 24 countries collaborating to enhance the quality, relevance and utilisation of resources in European research in organic food and farming.
- ICROFS: this Danish research centre has spent €63 million since the centre started and the share of organic farming in Denmark increased from 1.8% of land area in 1996 to 6.7% in 2010.
- The Hessian State Domain Frankenhausen: this experimental farm and research project of the University of Kassel, aims to serve as a model for ecological, economic and socially sustainable management. Intense knowledge exchange takes place between farmers and scientists. Amongst other things, new alternatives have been developed to increase the potential of winter peas as a harvest crop by increasing winter hardiness and endorsing their value for cultivation in organic farming. The cultivation area of winter peas has increased from 2 to 270 ha in ten years as a result.
- Mirecourt: INRA's organic and self-sustaining crop and livestock pilot farm in north east France gets 800 to 1,000 visitors a year. Numerous interactions with researchers have demonstrated that agricultural models prioritising autonomy and resilience, and taking into account environmental impacts, can achieve profitability.

Organic farming is relevant and profitable at both the farm level and for society as a whole. Increasing investment in research into organic farming will help to provide some answers to many environmental and social issues of our farming systems.

Barret P, Marq P, Mayer C and Padel S(2015) Research for transition: Europeans deserve a better agricultural and food policy. Université catholique de Louvain and Organic Research Centre, commissioned by the Greens/EFA in the European Parliament, Brussels.

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The GM hydra is an ever increasing threat to organic farming and food

The Hydra was a terrifying, many-headed serpent of Greek mythology. Every time one of its heads was cut off, two new ones replaced it. ***Lawrence Woodward*** *says the same thing is happening today with GM technology and its threat to organic food and farming is increasing.*

One of the most frustrating things that happened in EU food and farming during 2015 was the passing of a regulation allowing member states to 'opt-out' of growing genetically engineered crops.

It was generally welcomed as a 'break- through' and a 'good thing' when it was neither; it was hailed as a victory by some anti-GM campaigners and organic producers whilst in some respects it weakened their positions and generated a false sense of security.

It's true that it allowed countries to 'opt-out' of the GM crops that had been approved for cultivation in the EU but many were commercially past it anyway. None were suitable for UK conditions. But the 'opt out':

- fails to provide a legally watertight basis for those countries wishing to opt out;
- fails to ensure there are meaningful mandatory measures to prevent the contamination of non-GM crops;
- fails to put in place liability measures;
- fails to change the fundamentally flawed EU approval process.

It only covers cultivation and does not tackle the invidious spread of GM ingredients in feed, processed foods, processing aids and through imports. And it does not allow the much criticized EU assessments by the European Food Standards Authority (EFSA) on health and environment to be overruled by member states.

GM crops in all the UK

The grounds for 'opt-out' are so narrow that they will certainly be challenged when a commercially viable crop or one that is widely perceived to be so, comes along. If, that is, a member state is prepared to stand up to its farming lobby.

This is very pertinent to the UK where Scotland, Wales and Northern Ireland have 'opted-out' of the currently approved GM crops. But I wouldn't bet that they will stick to that position for, say, a 'blight-resistant' potato. Even if they tried, would they be able to find a legal case that is 'reasoned, proportional and non-discriminatory' and 'based on compelling grounds' not already covered by the EFSA assessment? I certainly wouldn't bet on that – especially if farmers in England were allowed to grow the crop.

A recent assessment for the Agriculture and Horticulture Development Board sees a 5 to 10 year time frame before any GM crop suitable for the UK comes along. However, it did not fully consider the impact of new breeding techniques. In fact some of these – e.g. cisgenesis, rapid trait development – are not so new but they are being swept up in the hyper wave that is building around gene editing (e.g. CRISPR) techniques and the argument that these fall outside the regulatory definition of GM.

If that argument wins, a number of crops that are on or close to the market in the US and/or have been developed in Europe will suddenly move a whole lot closer to the end of the pipeline. GM potatoes, oil seed rape, beet, maize, cereals, possibly grasses and even GM insects and animals will cease to be a distant threat and become an imminent danger to organic farmers.

'Opt–out' is co-existence cop-out

In fact 'opt-out' regulation has opened up the way for widespread commercial GM cropping – without any meaningful measures to deal with the consequences of 'co-existence'. Ask US organic farmers what this means. 52% of them have had crops rejected by buyers because of GMO contamination.

The EU does not have in place – and at present has no plans for – any legal framework for co-existence, none for liability following contamination, and zilch about contamination or so called 'thresholds' in seeds. It does have a reference to a threshold for 'adventitious and technically unavoidable' GM presence (of 0.9%) in crops and products but no-one in Brussels or Whitehall acknowledges this is an exception and not the baseline rule.

The EU 'opt-out' is in fact a 'cop-out' and leaves all these difficult bits to member states to sort out for themselves: so much for the single market. Some member states will undoubtedly put robust measures in place. The UK will not be one of them and organic farmers and gardeners here will not be protected unless they begin to fight for it. Defra's declared aim is to put in place 'pragmatic measures' which will not obstruct the development of 'agri-technology'.

Bringing up the bodies and chopping off the heads

It is not at all clear that GM and non-GM farming can co-exist, nor that GM cropping and biodiversity in crop and non-crop habitat can. The evidence is probably they can't but it largely depends on what contamination threshold you are willing to tolerate. Which leads on to other questions: what level of GM contamination should be allowed under a 'GM free' label? Can 'GM free' labels and organic labels co-exist? What about the 'hidden' GM – veterinary products, vitamins, food processing aids?

See what I mean about the GM hydra?

All these heads can be faced and chopped off. Principled organic farming can survive and thrive. But not if organic food becomes a bland, compromised corporate brand and not if organic farming becomes an indistinguishable tool in someone else's all-encompassing toolbox. But there is still time for organic producers to work together and stop this happening.

English Countryside Stewardship Organic Support

The introduction of Countryside Stewardship (CS) in England has proved challenging with the plans for online applications falling through and frequent changes to the guidance manual, report ***Mark Measures*** *and* ***Nic Lampkin****. Despite this, 171 out of a total of 2314 mid-tier applications were from organic and converting producers, hopefully including all or most of those with expiring OELS schemes.*

Following two years of work, off and on, by us at ORC we now have a Mid Tier CS scheme which is immeasurably better than it might have been, with modest area payments for organic management, a much improved balance between organic conversion and maintenance payments and out of the six management options specifically designed for organic farming two or three should prove very useful.

Table 1: The options and payment in England

	Conversion*	***Maintenance***
Improved permanent grassland	£75	£40
Unimproved permanent grassland	£50	£20
Rotational land	£175	£65
Horticulture	£400	£200
Top Fruit	£450	£300
Rough grazing	n/a	£8

* Converting farmers apply for two years (or three for permanent crops) at the conversion rate and the remainder of the five year agreement is made up of maintenance payments

Table 1: Management Options exclusive to organic farming

Option code	***Option title***	***£/ha/year***
OP1	Overwintered stubble	116
OP2	Wild bird seed mixture	640
OP3	Supplementary feeding for farmland birds	247
OP4	Multi-species ley	115
OP5	Undersown cereal	86

Unlike the conversion and maintenance options, the additional Management Options are subject to regional targeting and scoring, along with all the other Management Options that are not exclusive to organic farming. Most of these other options are also available to organic land, but not all, particularly if there are requirements for non-organic practices or there is an organic-specific equivalent. There are also (mid-tier, not universal) capital grants which can be applied for alongside the conversion and management options. The scheme closed for applications for this year on September 30th and we expect it will reopen in July 2016.

Further guidance on CS is available on https://www.gov.uk/guidance/countryside-stewardship-manual

During the summer we have been seeking clarification on several points relating to the organic CS, those that have been confirmed are summarised below:

- There is now no 5 ha minimum but there is a minimum of £5,000 for the five years of any CS agreement – this will potentially exclude farms with less than 5-25 ha depending on the eligible payment rate – this is currently under review and may change for 2016 applicants.
- Commonland is not eligible for CS organic maintenance payments – this is unlikely to change but we would be interested to hear if anyone is affected.
- Phased conversion can be accommodated either by registering the planned timing of field conversion in the initial application OR by making subsequent applications for additional land as it commences conversion. The former lacks flexibility if plans change, but should ensure that there is a commitment to fund all the land, should RDP funds dry up some time over the next 4 years, while the latter requires holding multiple agreements, which may be more difficult to manage but provides for flexibility.
- Although agreements run from 1st January in a given year, the critical date for payment rates and certification is 15th May. The certification status (conversion year 1 or 2, or fully organic) will determine the payment rate applicable for the year on a given parcel. This means that land converted before 15th May in the year of application to join the scheme (i.e. before an agreement is in place) will not qualify for first year conversion support, and therefore for spring conversions it may be appropriate to apply first and convert the following year once the agreement has started.

Application for the scheme has inevitably thrown up quite a number of questions and real difficulties for some, discussion on some of these is ongoing.

1. In the case of short-term lets the landlord may countersign the application agreeing to maintain the organic status and the scheme. In this instance the landlord must be an 'active farmer', which is a problem if the landlord has let out all his land, but would take it back in hand or let out to another organic producer if the current tenancy did not continue.
2. The dates and specifications in some options may be difficult. In particular, The Overwinter Stubble organic option specifies that a minimum of 10% may have a cover crop; guidance elsewhere states a maximum of 10% of the area. We understand that surface cultivation to establish a cover crop is not prohibited by the stipulation 'do not cultivate after harvest'.
3. There is a major problem for land that is part way through an existing HLS or ELS scheme; it is not possible to exit before the terms of the agreement, usually 5 or 10 years, are completed. This means that organic conversion cannot commence in response to current market signals or to a new land manager taking over. This may put a real constraint on the future development of organic farming and we are working hard with other organisations to get Defra to review this decision, particularly given the potential market impacts of the support mechanisms.

Identifying the 'best practice' for health in organic farming

In an earlier research project – 'Reviewing and Developing Health Concepts for Ecological Agriculture' – ORC investigated how health is described by soil scientists, plant pathologists, veterinarians and in human medicine. We are now looking at how farmers perceive health and measure or note it in their farming. Our aim is to create an international network of producers and scientists to try to identify and measure 'best practice' for health outputs in organic farming and research. ***Anja Vieweger*** *reports on the first results of this new project.*

One of the fundamental bases of organic farming is the IFOAM principle of health[1], which is built around the concept that the health of soil, plant, animal, man 'is one and indivisible' first set out by Soil Association founder Lady Eve Balfour in her book 'The Living Soil' in 1943[2]. But what does this mean for organic farmers in practice? Is the development of health a driver of farm practice and if so what are the results?

Earlier this year we undertook an online survey in three partner countries (UK, Germany and Austria), where we asked organic farmers and growers to describe their understanding of health in their farming system, how the health of their farm has changed over the years since organic conversion and what outputs of their farm seem particularly healthy or unhealthy. In total, 79 practitioners took part in the survey (30 from the UK).

Health pushes conversion

We found a lot of similarities within the three countries regarding 'reasons', or 'key events', which made the farmers and growers decide to produce organically, and health-related reasons for conversion were dominant in all countries, e.g. 'Not having to spray pesticides myself'; 'Not using chemicals is very important to us, so we and our children can eat what we grow without second thoughts'; 'My grandchildren should be able to run around freely on my farm!'; 'My daughter's disease improved dramatically since we converted'. There was also a strong trend focused on environmental and ecosystem reasons: e.g. 'For the health of the environment'; 'Sustainability'; 'To keep my soil and all organisms healthy'; 'Read *Silent Spring* when I was younger'; etc.

Health and biodiversity increase over time

The question, 'how have they noticed the health of their system change over time', was split into four time periods: after 2-5 years, and after 10, 15, 20 and more years. A qualitative text analysis of this open question showed key words mentioned most frequently (see figure 1).

The results reveal that in all of the four time periods farmers perceived an increase in biodiversity and soil health, and a significant reduction of antibiotic treatments needed for livestock as the most apparent health changes. It is particularly interesting that these changes were noticed after only a few years of organic production, and remained the most important points throughout the following years. Another interesting result is that a

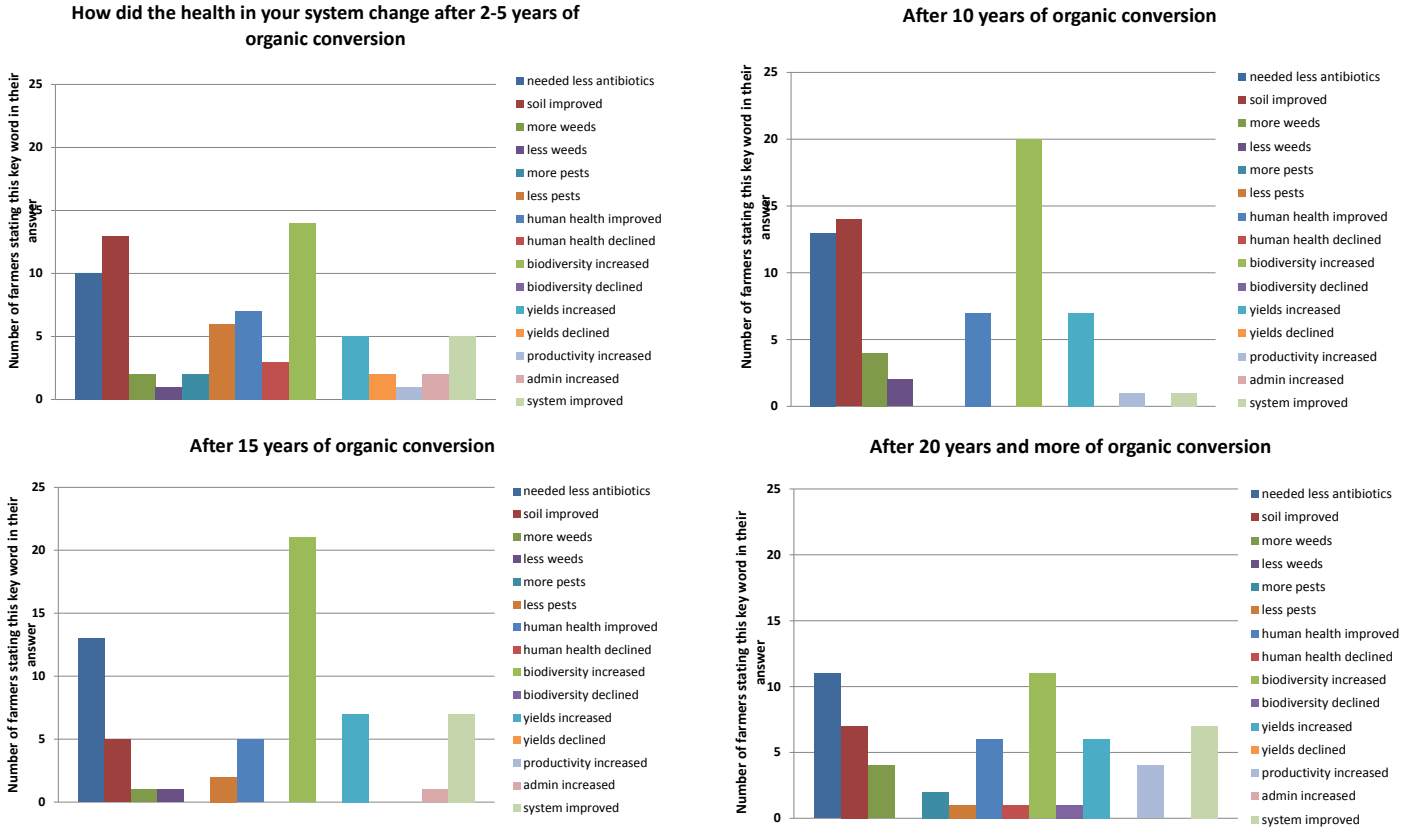

Figure 1: How farmers/growers from the survey perceived health changes in their system over the years since conversion.

decrease in yield was noted during the first couple of years by only two farmers; and after that, an increase in yield was mentioned by more participants (5-6 farmers in each time period). Overall, the improvement of human health was stated frequently throughout all four time periods. One respondent noted that a decline in human health during the first time period was due to higher stress levels of farm workers during the conversion period.

Meeting of the German best practice farmer group at the Kirchhof Demeter farm, 16-17 November 2015.

Towards a 'best practice' network

Following the results of this survey and extensive discussions with other experts and advisors in each of the three countries, we have identified 5 farmers/growers in each country who will participate in the next stages of the project.

We are now organising a workshop in each partner country and an international workshop with these farmers and growers to explore common strategies or common methods/techniques, which could potentially be developed to form a core of 'best practice'. One of the main outputs of the project will be to develop a set of transferable approaches to increase the direct translation of organic principles into practice and improve the communication and demonstration of health concepts among all stakeholders.

The project will initiate a best practice network of health in organic agriculture, connecting farmers, advisors and researchers for a joint approach to increase health effects in organic agricultural food systems which we will open up to other European countries in later stages of the project.

If you are interested in this work, or would like to get involved and join this network, please contact Anja Vieweger at anja.v@organicresearchcentre.com

Funding for these projects has been provided by the Swedish Ekhaga Foundation.

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Getting the most out of cover crops

*IOTA recently co-organised the Association of Applied Biologists (AAB) conference 'Getting the Most out of Cover Crops'. IOTA director **Mark Measures** reports.*

Collaborating with a conference aimed primarily at conventional farmers and advisers was a new experience for me; my single-minded focus on organic farming has its advantages but it does mean that I have become rather ignorant of what is going on 'out there' in the conventional world. When I look over the fence I find that my reasons for getting involved in organic farming 35 years ago are as strong as ever, only more so.

The interest in the organic experience of cover crops is a reflection of the dire problems facing conventional arable farming: depletion of organic matter, soil compaction, poor drainage and water supply, increased weed and pest problems and plateauing yields.

The conference incorporated an interesting mix of conventional and organic research. The use of brassica green manures, for example, can reduce oil seed rape yields. Organic research, including the ORC/IOTA work showing the benefits of multi-species green manures and leys, was presented. Garden Organic work showing a significant effect of green manures on organic crop yields was also highlighted. Stephen Briggs provided a review of cover crops and pointed out some critical management issues. An interesting presentation from a conventional farmer, an enthusiast for over-winter cover crops, supported our basic premise that diversity and mixtures are a 'good thing' and pointed out that we are still rather ignorant of the best mixtures for specific purposes under particular farm conditions. The apparently ill-thought-out and sometimes expensive mixtures provided by some merchants do need to be tailored to specific farm requirements. Three presentations provided help to do just that, including information and decision support tools from LegLink and OSCAR, both projects which ORC has been part of.

New and interesting research from Switzerland assessed the performance of several cover crop species, focusing particularly on rooting characteristics, N fixation and nutrient uptake. The work highlighted the astonishing characteristics of daikon (mooli or white) radish: above-ground yields of 5.1 t/ha dry matter, root yield of 4.8 t/ha and root length of 47 metres, all in 48 days growth!

Papers and discussion wrestled with the cost/benefits of cover crops in the short term and whether such techniques, which invariably require critical timing, can fit into conventional arable farming with simplified systems and minimal available management time. It seems to me that many of the benefits of cover crops are lost if they are 'burnt off' with a herbicide instead of shallow incorporation. Supporting a thriving soil ecology and the development of sustainable agriculture is more than a matter of borrowing a few organic techniques!

The conference papers are published by AAB and are available for £20 on the website:
Aspects 129 - Getting the Most out of Cover Crops
aab.org.uk/contentok.php?id=487

The real story about iodine in organic milk

Iodine concentrations in organic milk are within optimal levels for health. They are however normally lower than those in conventional milk and spurious claims that this might constitute a health risk to pregnant mothers have caused consternation in the organic sector. Case-studies undertaken in the SOLID project investigated the relationship between milk iodine and forage iodine concentrations and how they are affected by management practices. ***Dr Konstantinos Zaralis*** *discusses the outcomes of this research.*

Iodine is an essential trace element for animals and humans. It is necessary for the synthesis of the thyroid hormones which have multiple functions in energy metabolism, growth and brain development. The requirements for humans are related to age, body weight, physiological stage and gender, and can vary from 40 to 290 µg per day. However, the maximum iodine intake level in humans is only three times higher than the required level. Excessive iodine intake should be avoided as it can cause alterations in thyroid function and may increase the risk of thyroiditis, hyperthyroidism, or hypothyroidism. The World Health Organization (WHO) defines iodine sufficiency as median urinary iodine concentrations of 100–299 µg/l in school-aged children (i.e. 6 – 12 years-old) and ≥150 µg/l in pregnant women.

The highs and lows of iodine in milk

In the UK, milk and milk products are an important source of dietary iodine. Iodine concentrations in milk fluctuate from summer (low) to winter (high) and are sensitive to feed intake. Milk normally contains from 100 to 200 µg of iodine per litre while levels below 60 µg of iodine per litre may indicate nutritional shortfalls in the herd. The iodine requirement for a dairy cow is estimated about 0.33 mg per kg DM or about 0.6 mg dietary iodine per 100 kg of body weight[1] while the current authorised maximum content of iodine in animal feed in EU is 5mg/kg DM.

Recently, the European Food Safety Authority (EFSA) reported that the iodine content of milk, if produced using the current authorised maximum content of iodine in animal feed, would pose a substantially high risk to consumers i.e. the upper tolerable intake of iodine for adults (i.e. 600 µg/day) would be exceeded by a factor of 2, and that for toddlers (i.e. 200 µg/day) by a factor of 4. A recent publication by Borucki Castro *et al*., (2012)[1] proposed that in order to preserve milk safety, milk iodine concentration should be less than 400 µg/L. At this level a 3-yr-old child would have to consume more than 0.5 L/d of milk to exceed the upper tolerable intake of iodine by 2.8 fold. The EFSA proposes a reduction in the maximum allowed iodine feed intake for dairy cattle from 5 to 2 mg/kg feed to help lower the exposure of consumers to high iodine intake[3].

The organic milk 'risk'

On the other hand, iodine deficiency in humans is a health risk and there is some concern that iodine intake in the UK population has decreased due to a decrease in milk consumption[4]. Although iodine concentrations of organic milk are within the optimal levels, they are normally lower than those in conventional milk. Despite the fact that organic milk in the UK contains more iodine than organic milk in other EU countries (Table 1) this has attracted spurious and adverse media comment in the UK about the 'health risks' of organic milk.

Table 1: Average iodine concentration of bulk organic and conventional milk (µg/L) in some European countries. Adapted from EFSA Journal 2013[3] and Flachowsky et al., (2014)[5]

Author(s)	Country	Type of farming	
		Organic	Conventional
Rey Crespo et al. (2012)	Spain	78	157
Bath et al. (2012)	UK	144	250
Payling et al. (2015)	UK	404	595
Johner et al. (2012)	Germany	58	112
Jahreis et al. (2007)	Germany	112	169
Köhler et al. (2012)	Germany	92	143
Dahl et al. (2003)	Norway	72	199

This triggered discussion amongst stakeholders, farmers and researchers about the factors that can most affect the concentrations of iodine in milk.

The on-farm situation

A case-study was undertaken by ORC, in close collaboration with OMSCo, of ten organic dairy farms located in the south-west of England. The farms were selected on the basis of iodine concentrations in milk and were categorised as 'low' (i.e below 60 µg/l), 'optimal' (i.e between 60 to 120 µg/l) or 'high' (i.e above 120 µg/l) and farmers agreed to a monitoring protocol that allowed data collection on iodine and other mineral concentration in milk, blood, urine and forage samples.

The results show that the monthly milk iodine concentrations averaged over the farms remained within optimal levels, but, in some farms milk iodine concentrations were systematically low through the monitoring period. Urine iodine concentrations were significantly higher in the farms with high (i.e. 1.5 mg/kg) or optimal (i.e. 0.5 to 0.8 mg/kg) forage iodine concentrations compared to the farms with low forage iodine (i.e < 0.5 mg/kg). However this was not the case with milk iodine levels. Farms with low or average forage iodine concentrations had higher milk iodine compared to the farms with high forage iodine concentrations.

The impact of teat dips

This outcome may seem surprising, but it reflects the fact that milk iodine concentrations are affected by the use of iodine-based teat disinfectants. Indeed, six out of the ten case-study farms use iodised post-dip teat disinfectants, while the remaining four farms do not. Comparison between the two groups of farms indicated that milk iodine concentrations were 2.3 times higher (Figure 1) in the farms that use iodised post-dip teat disinfectants (mean 195 ± 13 µg/l) compared with the farms that do not use iodised post-dip teat disinfectants (mean 85 ± 8.9). This outcome indicates that iodised post-dip teat disinfectants have a major positive effect on milk iodine concentrations.

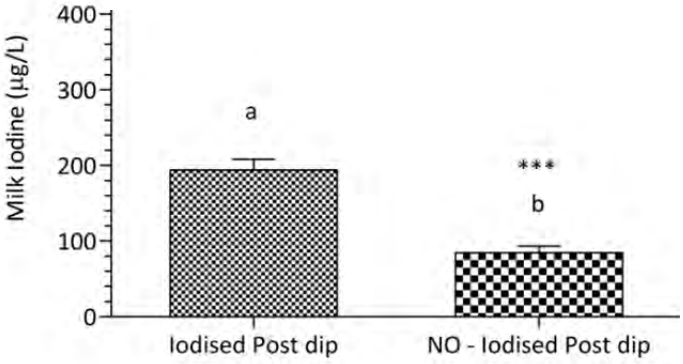

*Figure 1: Effect of iodised post-dip teat disinfectants on bulk milk iodine concentrations (means with different letters differ significantly by t-test, ** P ≤ 0.01; *** P ≤ 0.0001)*

It was beyond of the scope of this study to determine the way by which iodine from teat disinfectants enters into the milk. However, comprehensive studies in this area show that the primary mode by which post-dipping affects milk iodine concentration is absorption from the teat's surface and secretion into milk rather than contamination from the skin's surface[2 & 6]. Pre-dipping with an iodine-based sanitizer is also an acceptable practice, but must be performed with a product that contains 0.5% iodine and be completely wiped off before milking[2 & 5].

Simple truths are complex

The recent EFSA conclusion about the risk of high iodine intake from milk throws a significantly different light on the rather misleading debate about the relative merits of organic and conventional milk in the UK. It is well worth reiterating that iodine levels in organic milk in the UK are within the optimum range for health. However, the present study shows milk iodine concentrations fluctuated within farms across samplings and in some farms they were systematically low; further investigation to ensure greater consistency is required. Forage iodine concentration is an important factor in maintaining milk iodine concentrations at optimal levels, in addition to its importance in maintaining optimum animal health and performance. However, the study highlights that iodine concentrations in milk do not serve as a robust indicator in identifying shortfalls in iodine intake and that the use of iodised post-dip teat disinfectant is an important influencing factor for the iodine concentration in milk.

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