THE ORGANIC RESEARCH CENTRE

ELM FARM

In this issue:

Cover photo

Spelt drying - the basic approach. Pioneering a local grain economy at Grown in Totnes, Devon (See p4). Photo: Lena Stolle

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Organic Research Centre

Bulletin

No. 128 – Summer 2019

News in brief

ORC changes

The Organic Research Centre (ORC) placed Elm Farm on the market for sale in May 2019. ORC uniquely works in partnership with a network of farmers and other organisations to conduct vital research and participatory trials. These activities increasingly take place at the farms and premises of our partners.

The trustees and senior management of ORC have, therefore, reached the view that Elm Farm is no longer essential to the core of this work. This is a strategic decision to enable a more flexible approach to our work and provide much needed investment income on an annual basis going forwards. Carter Jonas has been appointed to handle the sale.

ORC is undergoing a period of change and developing a new strategy for the future. As part of this we are reviewing our role and setting new priorities. We have pledged to engage with as many of our stakeholders as possible. We will be holding a Stakeholder Consultation on the eve of the National Organic Combinable Crops event (NOCC19). If you would like to input to our discussions please contact Gillian Woodward: gillian.w@organicresearchcentre.com

Our work in 2018

Through our research and knowledge exchange work we are influencing farm practice and driving change within organic and non-organic farming businesses. ORC wants to mitigate climate change, improve food security and increase sustainability.

Read our Impact Review 2018

https://tinyurl.com/ ORC-impact18

Organic farming statistics 2018

Defra have released their estimates of the land area farmed organically, crop areas, livestock numbers and numbers of organic producers and processors in the United Kingdom. The results are produced from data compiled by approved organic certification bodies.

The organic farming statistics for 2018 show an increase in organic producers, indicating opportunity in the sector. While the number of organic processors has declined, bucking the trend seen over the previous five years, the number of organic producers has increased. However, interestingly overall organic land area has reduced, indicating a shift away from larger farms.

Although total organic land area in the UK has fluctuated in and out of decline since the economic recession and, even though there are less farmers generally in the UK, organic producers are up over 2% since 2017, at 3,544.

Agroecological transitions

As an output of the *Transitions to Agroecological Systems: Farmers' Experience* project, led by ORC and GWCT and commissioned by the Land Use Policy Group, Scottish Natural Heritage have published five case studies.

- The Lakes Free Range Egg Co, Ltd, Cumbria
- Home Farm, Screveton, Nottinghamshire
- Pitt Hall Farm, Kingsclere Estates, Hampshire
- Durie Farm, Leven , Fife
- Balkaskie Estate, Anstruther, Fife.

https://tinyurl.com/ORC-transition

Martinsfield

In August 2018 the Ecological Land Cooperative (ELC) were granted temporary permission by Wealdon District Council to create three affordable smallholdings for new entrant farmers on a 18.5 acre field in the village of Arlington, East Sussex. We were delighted to hear that they have named the field Martinsfield in memory of Martin Wolfe. They wrote in their Summer newsletter:

"We've had the good fortune over the years to meet and work with an incredible array of humans involved in making our food (and land) better for all. With this in mind we've named the field at Arlington, Martinsfield, to remember Martin Wolfe who was a mentor to many. Martin Wolfe was an ardent and committed researcher into agroforestry and new crop trials. Like many a great teacher he was generous and gracious with his time for the inquisitive, the keen and the earnest. We honour and remember his life and work with our continued efforts to create three agroecological farms in Arlington."
(see also our 4 page tribute to Martin's legacy on pp14-17)

DiverIMPACTS webinars

The DiverIMPACTS project aims to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

The DiverIMPACTS webinar series is a platform to present and exchange practical information about the DiverIMPACTS project and its results, with a focus on the DiverIMPACTS case studies. Recent webinars available include:

- Helping to make things concrete: farmer-advisor workshops for strip cropping design
- How RIO helped building sustainable value chains for animal production
- How can value chains sustain crop diversification: the example of Organic Arable
- Suppliers as catalyst of crop diversification: a look from within

https://www.diverimpacts.net/service/webinars.html

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.

About us

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The Organic Research Centre is a leading, independent, research charity working for better farming, food and health, promoting environmental sustainability, quality food and health and wellbeing for all. We work in the UK and internationally to: research and develop practical, sustainable land management and food production systems based on organic and agro-ecological principles; foster knowledge exchange with and between current and future producers, food businesses and related professionals; and influence policy and public debates on the future of food and farming based on sound evidence.

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Editorial: Driving change

Over the past few months we have been working on and published our Impact Review for 2018. Not only did the work on this important publication allow us the luxury of looking back over the breadth and depth of our work in the past 12 months but it was also important to look at the context in which we work and, to be frank, the increasingly poor state of our environment and threats to our food and farming system. A recent review by Sánchez-Bayo and Wyckhuys[1] of insect biodiversity worldwide paints a frightening picture, with over 40% of insect species being threatened with extinction by habitat loss – with conversion to intensive agriculture identified as the main driver of these declines, and agrochemical pollutants, invasive species and climate change adding to the problem. A UN/FAO report[2] on the state of the world's biodiversity for food and agriculture identifies that a range of pressures are interacting and affecting the biodiversity that is essential for our food and agriculture. They suggest that the proportion of livestock breeds at risk of extinction is increasing. A similar threat is identified with plant diversity in some farmers' fields decreasing. They also report that many species such as pollinators, natural enemies of pests, soil organisms etc are in decline as a consequence of habitat destruction and degradation, overexploitation, pollution and other threats. There are also threats to key ecosystems that provide many services important to both food and farming, including the provision of habitat for species such as pollinators, which are rapidly declining.

However, there are positives to be found in both these studies that are relevant to ORC and to our work. Sánchez-Bayo and Wyckhuys recommend a change of current agricultural practices such as reduction in pesticide usage and the adoption of more ecologically based practices i.e. organic farming. They also say that organic farming and organic farms are clearly refuges for biodiversity. The UN/FAO report has also identified that biodiversity-friendly farming practices are on the increase and these will help protect and conserve biodiversity. Organic farming is identified as one such approach that can provide food as well as stop the decline and even restore this essential biodiversity. However, there are always questions about whether organic farming can feed the world. This was addressed late last year in the Paris-based Institute of Sustainable Development and International Relations report[3] which concludes that even using entirely agroecological approaches we can meet balanced food requirements for a European population expected to reach 530 million by 2050. They say "An agroecological project based on the phasing-out of pesticides and synthetic fertilizers, and the redeployment of extensive grasslands and landscape infrastructure would allow these issues to be addressed in a coherent manner".

These findings and conclusions, as well as the recent climate change and Extinction Rebellion demonstrations in London and elsewhere in the UK, are a rallying cry for ORC, our team and our work. We are already one step ahead of most research and information organisations with the work we have undertaken for years on increasing plant and farm biodiversity through our wheat population, intercropping, mixed farming systems and agroforestry. The work of Agricology is ensuring that practical information on best practice is available to farmers (organic or non-organic) that will allow them to farm more ecologically. Our work in late 2018, investigating what organic practices could be more widely used by non-organic farmers (see ORC Bulletin 127), and then producing information so that farmers can implement these practices, should also help with a move to a more agroecologically based UK farming approach.

A post-Brexit Britain will be a challenge for UK farming but also gives us opportunities to radically change the way that the UK farms, produces its food and manages its land and biodiversity. We believe that an organic approach based on good agroecological principles is the most sustainable and resilient way for our country to proceed. Clearly the future looks challenging for UK food and agriculture, but also presents many opportunities. ORC is ready and willing to play an important part, but we cannot do this without your support. Our Impact Review 2018 is available from our website, as is information on how you can support us and our work.

Mike Turnbull and Bruce Pearce

References

1. Sánchez-Bayo F, Wyckhuys KAG (2019) Worldwide decline of the entomofauna: A review of its drivers, Biological Conservation, Volume 232/2019, pp 8-27 https://doi.org/10.1016/j.biocon.2019.01.020.
2. Bélanger J, Pilling D (eds.)(2019). The State of the World's Biodiversity for Food and Agriculture, FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp.
3. Poux X, Aubert P-M (2018). An agroecological Europe in 2050: multifunctional agriculture for healthy eating. Findings from the Ten Years For Agroecology (TYFA) modelling exercise, Iddri-AScA, Study N°09/18, Paris, France, 74 p.

Pioneering a local grain economy in Devon: Grown in Totnes

Decentralisation continues to be discussed as the main mechanism to counter the commoditisation of the grain market and find a route to market for alternative, diverse and varied crops. At ORC we have been working to get genetically diverse 'heterogeneous material' such as ORC Wakelyns Population to market via changes to the seed legislation. We have also developed several case studies on innovative approaches to diversifying food systems in projects such as Diversifood[1] and Diverimpacts[2]. Now, as the UK Grain Lab[3] continues to blossom (see ORC Bulletin 125 for an introduction), there are examples of local grain economies making use of different crops and varieties emerging across the country. A pioneering initiative working in this area was Grown in Totnes. In this article ***Charlotte Bickler*** *looks back at the lessons learnt so far and future opportunities for decentralised grain economies with* ***Holly Tiffen*** *of Grown in Totnes.*

CB: What motivated you and the Grown in Totnes (GinT) team to begin this project?

HT: I had been working with Transition Town Totnes (TTT) to increase the amount of local food in the area and link up the different players in the local food scene and I was struck by the narrowness of the local food offering – mainly meat and dairy. From a land use and energy perspective these are inefficient ways of feeding the human population. We formed the Crop Gaps group and researched into the plant-based sources of protein grown in the local area. I am vegetarian, and a big part of my reasoning for this has been environmental; however this research led me to realise that my sources of protein weren't coming from the local area, or even Europe; most were coming from places like the US and China. We interviewed a number of local farmers to find out what they had grown historically on the farm and what infrastructure used to exist for processing and marketing their produce. From these contacts we found farmers willing to grow crops for us for local human consumption.

Holly Tiffen in John Lett's heritage population wheat.

Photo: Nicola Lang

CB: What was the main aim that you hoped to achieve?

HT: We wanted to reconnect people with grains and pulses and the story of where these staple crops come from to illustrate a different way to the centralised commodification of these crops. We wanted to empower farmers and encourage a new end market for their harvest and in the process address the disengagement of farmers with where their crops end up, so helping to address their powerlessness in global food pricing. We set about offering a fair price to farmers and growing, processing and selling grain and pulse products that hadn't travelled more than 30 miles from Totnes.

CB: Do you feel that you were successful in this?

HT: I feel that our timing was perfect, there was a lot of knowledge when we started out held by a very few people, we received a tremendous amount of support from people like John Letts (archaeobotanist and founder of Heritage Harvest). We were riding on the cusp of a wave of revived interest in the small-scale grain and pulse scene. By being both at the forefront of this wave and creative in our approach we helped spread knowledge and interest amongst growers and bakers. The community-based nature of TTT meant that a large part of our activities involved engaging the community; we ran tours of the processing facilities, hosted practical and fun events, worked with other businesses in the local community, engaged volunteers both local and overseas in our activities. We were very successful at engaging the support and participation of locals. We ran a crowd funding campaign that raised funds for all of our processing equipment and consistently involved the community in the development of the project. We came up against many challenges and in hindsight were hugely ambitious with our vision. However I don't feel I would have changed this vision. The Transition movement is about being experimental, imaginative, trialling new things and coming up with solutions to today's problems. I feel that our experimental nature helped to make it that bit easier for others involved in the resurgence of small-scale grain and pulse growers and processors, as witnessed by the growth in participants attending the UK Grain Lab.

Holly and intern Lena Stolle milling at Grown in Totnes

CB: Do you have a favourite product that you produce?

HT: Pea flour! In the first year we hand-sieved peas from a local organic farmer's fodder harvest of wheat and peas (grown in combination), to separate the two crops. We invited the community to help us and called it 'The Split Pea Party'! When we put the peas through our mill the processing unit was filled with the sweet summery smell! They make the best savoury pancakes, which I regularly serve to guests staying at my B&B for breakfast!

Grown in Totnes products

Photos: Holly Tiffen/Grown in Totnes

My other favourite is the Heritage Population Wheat, a mixture of many different lines of old varieties developed by John Letts. Standing in that field of wheat just before harvest and seeing the variety of colours, sizes and shapes and heights, was like being a child again – many of the varieties were taller than me! It was a beautiful sight and it was fascinating to see how well the plants did despite the drought that we had here in Devon last year, particularly when we compared it to the Wakelyns Population, which hasmore modern parents, grown a mile down the road. The greater height of the plant corresponded to its deeper roots, which were able to penetrate down to the water table level. I am really proud that we have grown Heritage grains and been able to demonstrate the important role of bringing diversity into crop production in order to create resilience against unpredictable climatic conditions.

CB: What are the three most important lessons that you've learnt from your experience so far?

HT:

1. The importance of working in collaboration with other like-minded spirits and gathering a team around me that had a broad range of differing skills. The GinT team was a strong supportive network for each other when we faced challenges, and bouncing ideas around with each other was an invaluable source of creative solutions.
2. That I can't know what I don't know, and I can't assume that the other party knows all that I don't know, even if I perceive this to be their area of expertise. The solution is to acknowledge my limitations, to ask lots of questions even when they feel naïve, and not to assume that the other party knows my requirements; clarify what both parties' responsibilities will be and then have a written agreement between both parties and keep checking that everything is in place.
3. To trust the power of the community to support the project:
   - When there were seemingly insurmountable tasks to overcome we engaged the community in specific tasks, making them both informative and fun; invariably we fed them as well and in return their many hands would make light weight of the work.
   - We had a strong local network of farmers, chefs, bakers, independent shops, breweries and tradesmen that we were able to support and call upon. This strong local network supports each individual business to be more viable and competitive against the large corporations, and is one of the key advantages that the small-scale has over the large-scale.

CB: What challenges remain? What are the next steps?

HT: We have passed the equipment and knowledge over to a local collaboration of two farmers (who previously grew for us) and a baker. Their challenges will be many of the same that we encountered; including dealing with contractors and trying to ensure that harvest happens at the most opportune time, or finding a way to circumnavigate the need to use them by investing into purchasing their own equipment, having appropriate vermin proof storage, getting the crop dried and cleaned appropriately immediately after harvest. Without the necessary infrastructure it will be difficult for the partnership to make the enterprise financially viable and grow; however they have many of the key ingredients, namely land, technical expertise and practical skills as well as the end market and community support.

We have learnt so much through this process over the last seven years and we want to document our learnings so that others can benefit from our successes and mistakes. We have recently received funding from the Halleria Trust and Esmée Fairbairn to develop an online toolkit that will enable the user to hone in on the topics that are of interest to them and visit case studies (including GinT) to learn how other enterprises have dealt with the different aspects of growing, storing, milling, selling and baking grains and pulses. If you would like to feature in the toolkit or would like us to present the toolkit at a future event then please contact me at holly@transitiontowntotnes.org

As part of the CERERE project Holly is travelling to the Cereal Diversity festival in Denmark to share her experiences from the UK with Andrew Whitley from Scotland the Bread. ORCs Abel Villa, Bruce Pearce and Dominic Amos will be presenting on approaches to growing and testing alternative wheats, organisation and cooperation through the whole value chain and the new Organic Regulation. Look out for a report in the next Bulletin.

This project received funding from the European Union's Horizon 2020 Research and Innovation program under Grant Agreement n° 727848

Links

1. http://www.diversifood.eu/publications/booklets-and-reports/
2. https://www.diverimpacts.net/case-studies/case-study-15-uk.html
3. https://www.ukgrainlab.com/
4. https://www.liveseed.eu/resources/publications/

UK Grain Lab update

The 2018 UK Grain Lab event was hosted by Kimberley Bell at the Small Food Bakery in Nottingham. Since then a great many seed breeders, farmers, millers, bakers and researchers have all been beavering away at building production and demand.

More farmers are participating in on-farm crop trials by drilling their own seed, including rare varieties, in strips in their own fields. Each strip will yield around one tonne of grain, which is sufficient for millers and bakers to do some realistic processing tests, including all-important taste tests. Farmers have sourced seed ranging from modern German E Wheats to British Isles heritage varieties such as Hen Gymro. In November Hen Gymro will be celebrating the centenary of its first collection by TJ Jenkin of the Welsh Plant Breeding Centre in Aberystwyth in 1919. The Welsh Grain Forum, with Andy Forbes of Brockwell Bake and the National Trust farm at Llanerchaeron are planning a celebratory event.

A *Bread as a Commons* workshop was held at Fred Price's Gothelney Farm in Somerset in May. Tomaso Ferrando of Bristol University and Kimberley Bell brought together people involved in all aspects of the new grain economy now being built across the UK. Over two days the group shared meals and experiences, and discussed what makes good food, how to make more of it and how to help others get involved. People are putting their heads together, their hands together and are looking forward to a rich harvest, whatever the weather!

Steven Jacobs, OF&G

OK-Net EcoFeed: Organic Knowledge Network for Monogastric Animal Feed

When feeding organic farm animals, the goal is to offer balanced diets that are fully organic and from home-grown or regionally-sourced feedstuffs. For monogastrics, pigs and poultry, updated European legislation will come into force in 2021 which will require that "at least 30% of the feed shall come from the farm itself or, if this is not feasible or such feed is not available, shall be produced in cooperation with other organic or in-conversion production units and feed operators using feed and feed material from the same region." (Regulation EU, 2018). Achieving diets containing 100% organic feed for monogastrics is problematic, and current EU Regulations acknowledge this difficulty by allowing the use of 5% non-organic feed. However, this will cease when the updated legislation comes into force. Senior Livestock Researcher ***Lindsay Whistance*** *reports on progress being made by the OK-Net EcoFeed project to address the issues.*

The major stumbling block in achieving fully organic feed for pigs and poultry arises from the difficulty in sourcing quality protein that also satisfies specific amino acid requirements for different ages and production targets. For monogastrics, the amino acids in focus are cysteine, lysine and methionine. Feeding the correct amount of each amino acid is important not only for healthy growth and egg production but also for animal welfare. For example, low levels of methionine in poultry diets can lead to feather pecking and cannibalism. Additionally, when amino acids levels are low, protein is overfed, leading to environmental pollution through excessive nitrogen excretion.

A further complication is that several sources of protein currently used for monogastrics, such as wheat, are also part of the human diet and are regularly imported from other continents such as soya from China (Table 1).

Innovation Groups

There are between one and three Innovation Groups in each country and these can consist of single themes (pigs, layers or broilers) or be mixed, since problems and solutions are similar for all themes. Being a member of an Innovation Group is voluntary and each group is open to new members joining throughout the project. Every group is facilitated by a project partner and each year, the groups all have an official meeting where topics, appropriate to the stage of project, are formally discussed. During the first year, groups were also invited to attend a Science Bazaar where selected material contained in the mapping library was presented and discussed by the groups. Meetings during the testing phase will be more flexible and will depend on the test design and process. Innovation Group members are also welcome to join the annual project meetings, where their input and feedback is an important component considered at each key phase in the project.

OK-Net EcoFeed

OK-Net EcoFeed is a three-year, European-funded project (2018-2021) which aims to address issues currently limiting the level of organic and regional feed being produced by monogastric farmers and their associated industry partners in Europe. The project aims to do this by:

- Identifying current gaps and barriers to achieving fully organic and regional feed
- Creating a mapping library of existing knowledge to share between countries
- Translating some of this knowledge for use in different countries
- Testing potential solutions in each country
- Producing videos and fact sheets, and
- Adding all knowledge to the Organic Farm Knowledge Platform.

To do this, the OK-Net EcoFeed project (coordinated by IFOAM EU) is engaging with farmers and other industry partners in eight different European countries. These are UK, Sweden, Spain, Italy, Germany, France, Denmark and Austria, who is also working with farmers in Serbia. Innovation Groups have been established in each country and represent many different organic systems including low-input and extensive and both small- and large-scale, single species and mixed species organic farms.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773911.

The information contained in this communication only reflects the author's view.

Table 1: Origins of feedstuffs in organic monogastric diets in UK

Imported feed*	Pigs	Poultry	Origin
	%		
Cereals and by-products	60+	60+	UK/EU/Russia/Australia/Ukraine/Kazakhstan
Processing waste	<10	<5	Anywhere
Pulses	<10	<5	UK/EU
Soya and soya products	10-25	15-25	S.America/China/EU
Minerals and supplements	<4	<4	Africa/S.America/Germany
Fats		<5	EU
Limestone (layer birds)		7-10	UK/Africa

**(organic and non-organic components)* *(Soil Association, 2010, modified)*

Photo: Jo Smith/ORC

Laying hen on grass/clover ley

Identifying gaps...

In the early part of the project, each Innovation Group identified the existing gaps and barriers to feeding 100% organic and regional feed to their pigs, layers and broilers. The identified gaps include a lack of knowledge about the quality of protein and levels of amino acids in all current and potential feedstuffs, not just the traditional sources of, e.g., cereals and soya. They also included a lack of knowledge about the specific nutritional requirements of breeds of animals, at different ages and stages of production, managed in organic systems.

A further gap, in some countries, is a poor or absent relationship with feed companies or mills where home-grown feed can be processed. For on-farm feed management, there is a gap in knowledge about optimal storage techniques. A particular gap identified by some Innovation Group members is that arable farmers, rather than growing superior cereal varieties grown specifically for animal feed, focus instead on the growing of grain destined for human feed from which the lower quality grain is then redirected to animal feed.

...and barriers

Barriers to growing more organic feed include a shortage of land, organic seed and field equipment as well as storage facilities. For some, it also includes unfavourable weather and geography (steep terrain), poor soils and a lack of appropriate soil inputs. Further issues are related to the processing of feedstuffs, including a lack of processing equipment on farm and local mills not returning feed to the farm where it was grown. For some farmers, a lack of knowledge/expertise and financial support are also considered barriers to seeking solutions.

Barriers at industry level also exist since organic monogastric farming is heavily influenced by the conventional industry which, by its sheer scale, exerts a control over breeds available to organic farmers. Additionally, breeds and cross-breeds that may be more appropriate to organic farming systems can be much less uniform in size and shape than modern breeds and crosses, which makes it harder to find slaughter houses that will accept them.

Regional solutions

Innovation Group members' responses highlighted just how important is the focus on regional conditions. For example, when considering soya, Serbia enjoys good growing conditions whereas in Denmark, soya is difficult to grow under current climatic conditions, where the plants produce a lot of foliage and few beans. In Denmark, silage and protein cake from grass/clover leys are considered to offer more promising solutions. In the Dehesa system in Spain, where limited land is available for growing crops, one solution is the by-products from the human food processing industry.

Further suggestions for solutions were harvesting sea creatures such as starfish in Denmark, using insects either by creating enriched environments in which pigs and poultry have increased access or by producing them as a feed source. Producing insect protein is currently not a legal option for organic pig and poultry producers.

During a round-table discussion at an early project meeting, Innovation Group members suggested a threefold approach that, in the long term, could help farmers reach a sustainable and regional solution to rearing pigs and poultry on 100% organic feed. This approach would be based on the careful selection of breeds suitable to each region and system, an in-depth knowledge of their nutritional requirements at each stage and a greater knowledge of the nutritional value of all feedstuffs available to them including that present in the range.

Photo: L. Whistance

Growing pigs feeding on silage

What is regional?

The word 'region' is legitimately used to mean several things relating to, e.g., climate, geography and administrative districts. Organic regulations state that feed should be produced in the same region in which the animals are kept but there is no accompanying definition of what is a region. Innovation Group members were therefore asked to consider what they thought was regional production of feed. Responses differed depending on the identity of respondent, with farmers generally considering it to mean closer to the farm compared to advisors and feed companies, who accepted a wider – up to EU – definition. Responses also differed depending on the value of feedstuffs, so that one farmer thought it 'OK to consider EU as a region' if there was a lack of available protein in a given year. For farmers who were part of a local cooperative, the definition of region was more restricted, for example, to the 'maximum distance for a farmer to deliver to another by tractor'.

Creating a mapping library of existing knowledge

In order not to reinvent the wheel and to value what has already been learned in each country, project partners gathered existing knowledge (called tools for the purposes of the project), in the form of reports, research papers, on-farm trials and extension material to put into a mapping library. In addition to the collection of these tools, more than 30 of them have been selected, and shorter user-friendly Practice Abstracts are currently being created in English.

Translating existing knowledge for other countries

From the mapping library, the Innovation Groups have been given the opportunity to identify tools that are of particular interest to their farming systems and to translate this work into their own language, if required. All eight countries have taken the opportunity to do so for various topics under the two main themes of 1) feeding and ration planning and 2) processing and handling of harvested feed (Table 2).

Table 2: Tools selected for translation by the Innovation Groups in OK-Net EcoFeed

Topic	Translation from	Translation to
Technologies for processing soya beans	German	Serbian
Fodder in organic production	Swedish	French
Feed values of and how to grow faba beans	French	Swedish
Growing soya beans for animal feed	German	Serbian
Legume varieties for organic farming	French	Spanish
Feeding organic pigs, an overview	French	Spanish
Dehulled legumes for broiler chicks	English	Italian
Protein sources and feeding strategies for organic broilers	French	Danish
Substituting soya with oil seed rape and sunflower seeds	English	Danish
Report on feeding regimes, protein sources and rations	French	Swedish
Improving range use and foraging behaviour in poultry	Danish	French
Improving range use and foraging behaviour in poultry	Danish	English

Testing potential solutions in each country

In the next year of the project, each Innovation Group will be testing a potential solution in a practical trial. The focus of these trials has been identified (Table 3). Some of the trials are entirely novel for the systems in which they are being tested whilst others build on knowledge gained from previous trials. For example, previous research looking at individual sources of feed and forage in France will be integrated into a year-round ration plan for pigs.

Table 3: Practical tests to be carried out by Innovation Groups in each country.

Country	Themes	Test
France	Broilers	Replacing soya with camelina, canola and sunflower
UK	Broilers	Nutritional value of tailings and weed seeds from grain
Denmark	Broilers	'Green-protein' from grass/clover leys
Italy	Broilers and Layers	Growing and using camelina to replace soya in feed
Denmark	Layers	Fermented silage and lactic acid on intestinal health
France	Layers	Replacing 5% non-organic with organic feedstuffs
UK	Layers	Sprouting seeds to optimise protein and palatability
Spain	Pigs	Brewers yeast as silage
Serbia	Pigs	On-farm toasting of soya beans
Sweden	Pigs	Forage turnips for non-lactating sows and growing pigs
Sweden	Pigs	Methods of feeding silage to growing pigs
France	Pigs	Development of an annual ration plan with in-season forage and fodder

Most trials are farmer-centred, with a few being driven by other industry partners although, in all cases, farmers are part of the trial process. An example of the latter is the trial in Serbia where a non-profit organisation from Austria is supporting a pig farmer to trial on-farm soya processing using a small-scale toaster. In Spain, the trial will focus on the use of brewer's yeast for growing pigs in the Dehesa system. Brewer's yeast is difficult to conserve and feed on-farm and the regional availability is sporadic. The Spanish Innovation Group will therefore experiment with making a silage of brewer's yeast, straw and other potential by-products.

Photo: L. Whistance

Sow grazing

Videos and practice abstracts (fact sheets)

For every trial, the Innovation Groups will produce a short video illustrating the process and capturing results and key moments along the way. They will also produce at least one practice abstract for each trial and these, along with the videos, will be added to the Organic Farm Knowledge Platform.

The Organic Farm Knowledge platform.

The knowledge created in OK-Net EcoFeed will find a home on the recently launched Organic Farm Knowledge platform. This platform is designed to be a hub for different projects and news items that help to enhance organic farming through knowledge exchange: https://organic-farmknowledge.org.

Further information

https://ok-net-ecofeed.eu

Facebook page https://en-gb.facebook.com/oknetecofeed/

Twitter page https://twitter.com/ecofeed?lang=en

OK-NET EcoFeed (2018) Synthesis report on Innovation Group Framework (Feb 2018) http://tinyurl.com/OKNet-IG

The knowledge synthesis report produced from the mapping library is available at: http://orgprints.org/34560/

DIVERSIFOOD – Embedding crop diversity and networking for local high quality food systems

One of the key opportunities for, and expectations from, organic farming is to reverse the trend of agricultural standardisation and to embed more species and genetic diversity into farming and food systems. This year marked the end of the four-year European research project DIVERSIFOOD, 'Embedding crop diversity and networking for local high-quality food systems'. Principal Crops Researcher ***Ambrogio Costanzo*** *looks back on what's been achieved and learned in this international and participatory project on cultivated biodiversity 'from the seedbank to the plate'.*

How much diversity do we use?

Throughout history, thousands of plant species have been domesticated and used in agriculture. Most of them are now underutilised. Forgotten, untapped plant genetic resources have often been the object of efforts of conservation, either *ex situ*, i.e. in seedbanks, where seed and reproductive material is stored securely, or *in situ*, i.e. being actually kept in cultivation in their supposedly original areas and systems, also with the help of legal and marketing frameworks such as 'conservation varieties'. DIVERSIFOOD has attempted to go beyond mere conservation of diversity and towards innovation, considering these genetic resources as a key asset to restore agricultural diversity and thereby fuel successful transitions to agroecological food and farming systems. This has entailed a 360-degrees approach to systematise the process of bringing underutilised genetic resources from being bunches of seeds in seedbanks to become actual crops and, ultimately, food.

What are underutilised crops?

At times, to be effective in practice, an effort of theory is needed beforehand. In DIVERSIFOOD, the first step has been to conceptualise what underutilised genetic resources are, in a way that pointed us directly to address specific challenges and to undertake specific processes. In fact, the 'working definition of underutilised crops', does not focus on the plants. It rather focuses on the process of building opportunities across a wide range of neglected or unexplored resources.

In the DIVERSIFOOD project, an underutilised crop was defined as:

A plant genetic resource with limited current use and potential to improve and diversify cropping systems and supply chains in a given context.

Agreeing on this general definition enabled us to highlight three main processes, according to which 'underutilised status' a given genetic resource starts from in a given context.

1. **Introducing 'outsider species'.** This challenge applies whenever there is a need or opportunity to shift a cultivation areal, either across a geographical discontinuity (e.g. Quinoa from South America to Europe) or extending the borders of the original cultivation areal (e.g. moving Chickpeas and Buckwheat northwards). In many cases, the primary interest can arise from professional or home growers/gardeners. In other cases, it can even be from climate change, with likelihood of warmer and longer growing seasons, that the opportunity (or the necessity) to introduce new species where they are not usually grown arises. Examples that have been explored in DIVERSIFOOD are growing chickpeas in the UK or extending buckwheat cultivation northwards in Finland.
2. **Reviving 'old, forgotten species'.** The starting point is to understand why these species, e.g. old minor cereals, have been 'forgotten', and why it has been so easy to 'forget' them. Although specific answers are related to specific cases, abandonment is generally an overall result of the Green Revolution, i.e. the widespread diffusion of high yielding varieties and related 'technological packages' starting post-war. This has led to a standardisation of environments, cropping techniques, processing and supply chains, that most of these 'abandoned' species did not fit into. A typical example in DIVERSIFOOD has been rediscovering accessions of rivet wheat (*Triticum durum* subsp. *Turgidum*) in France, the Netherlands and the UK.
3. **Using 'neglected germplasm of common crops'.** Open pollinated varieties (OPs) of currently hybrid-dominated crops which went through the same process of abandonment as 'forgotten species' during the Green Revolution. Increasing the use of OPs would broaden the genetic diversity of these common crops and facilitate local adaptation. Reviving these germplasms and exploring new genetic structures such as genetically diverse populations could help overcome agricultural standardisation, giving back marginal areas, artisanal processing and low-input farming significant chances of successful sustainable development. Examples that have been explored in DIVERSIFOOD are testing OPs of Broccoli (in Switzerland, France and the Netherlands) or Maize (in Portugal and in Cyprus).

ORC intern Anne-Lise Villard assessing rivet wheat in Sonning last summer with Ambro (deep into the canopy).

Embedding more diversity in farming and food

Currently, with highly standardised cropping systems, having a diversity of genetic resources available in genebanks is no more than a starting point towards their successful use. The whole process of embedding a greater diversity of genes and species in farming and food systems needs to be considered, and often these systems need to be developed from zero. To address this challenge, DIVERSIFOOD has carried out work in two parallel streams. On the socio-economic side, we have engaged with communities (farmers, processors, consumers) already working with 'underutilised crops', to understand the key drivers of success and the barriers they face. One example is the value chain developing around the ORC Wakelyns Population wheat (a typical example of 'alternative germplasm of a common species'), from seed merchants to growers and to bakers, namely Kimberley Bell and the Small Food Bakery in Nottingham (see p14-17 and ORC Bulletin no. 125, p. 14).

In parallel, on the agronomic and biological side, researchers and farmers have sourced and exchanged small quantities of seed of many different accessions and species, to test them in specific cropping systems aiming to understand their strengths and weaknesses.

From the seedbank to the field

ORC has coordinated a series of experiments conceived as an exploration of genetic resources in specific, local agro-environmental or market contexts, often linked with farmer initiatives. Nine species have been tested with hundreds of accessions in 33 different trials across Europe. Seeds have been sourced from a variety of both informal and formal, *ex situ* and *in situ* collections, such as those maintained by the partner ProSpecieRara in Switzerland, and from public seedbanks, such as the John Innes Centre in the UK. This created a unique merging and on-farm deployment of genetic resources from very different sources. A lot of information has been generated in these experiments, but perhaps the most important highlights are the lessons learned in terms of process and methodology, including the most precious learning of all: the mistakes.

The DIVERSIFOOD project aimed to enrich cultivated biodiversity by testing, renewing and promoting underutilised genetic resources. Through a radical multi-actor approach, with the active engagement of communities of farmers, processors and researchers, it has proposed an innovative way to bring genetic resources in use also aiming to encourage a new food culture. The project has involved 21 partners from 12 European Countries, from Norway to Cyprus, from Portugal to Finland, over four years between March 2015 and February 2019.

This project has received funding from the European Union's Horizon 2020 researchand innovation programme under grant agreement No 633571

Describing the genetic resources

What do the plants look like? How to identify or simply describe them? Virtually every cultivated plant species is the object of publications and guides to successfully describe the genetic resources in terms of key characteristics. However, many germplasm screenings usually stop once the plants are carefully described in terms of their appearance, whereas little useful, consistent information is available in terms of how the plants can perform as crops in a practical farming context.

In the DIVERSIFOOD trials, all tested genetic resources have been described, yielding two main comments:

1. When growing underutilised genetic resources, certain traits that during modern breeding had been lost reappear. These also include undesirable traits that might have played a role in the abandonment of certain phenotypes. A typical example is the brittle rachis in einkorn that can generate huge grain losses prior to, or during, harvest. Another is the extreme straw height of certain winter cereals like rivet wheat (*Triticum durum* subsp. *turgidum*), that creates problems of lodging (although rivet wheat accessions with similar straw height were found to differ significantly in terms of lodging susceptibility).
2. Many genetic resources show considerable within-crop phenotypic heterogeneity. This can be linked to their genetic structure, them being landraces or OPs or composite cross populations. However, this can also result from intentional or even accidental mix-up, as we observed in certain entries of rivet wheat that included considerable amounts of bread wheat (that was probably not supposed to be there).

Assessing performance of genetic resources

The key challenge in DIVERSIFOOD, beyond describing the appearance of the plants, was to understand how these plants behave in specific agroclimatic conditions and cropping systems, what benefits they could offer, what drawbacks can they entail, and what the potential would be to introduce them at a commercial scale. This meant to carefully evaluating their performance.

Evaluating performance of underutilised genetic resources is easier said than done. Considering the range of species tested, from tomatoes to wheat and buckwheat, and the diversity among the 33 specific contexts of evaluation, we were stimulated (and forced) to understand and highlight what performance evaluation is in general, so as to make learning useful to whoever wants to engage with whichever other crop in other contexts. What is a crop's performance? How to unpack it? How to measure it? Interestingly, this reasoning was not done beforehand. On the contrary, it has accompanied step by step the experimentation in a unique, collective learning-by-doing process. The resulting framework is shown in Fig. 1. On one side, we need to consider the '**predictors of performance**':

1. Those mostly borne by the plant's DNA, i.e. its morphology (the 'shape' of the plant) and phenology (the 'timings'of its growth cycle), and
2. Those embedded in the cultivation environment.

On the other side, resulting from the interactions between the two above categories of 'predictors', we need to consider the three main '**dimensions of performance**':

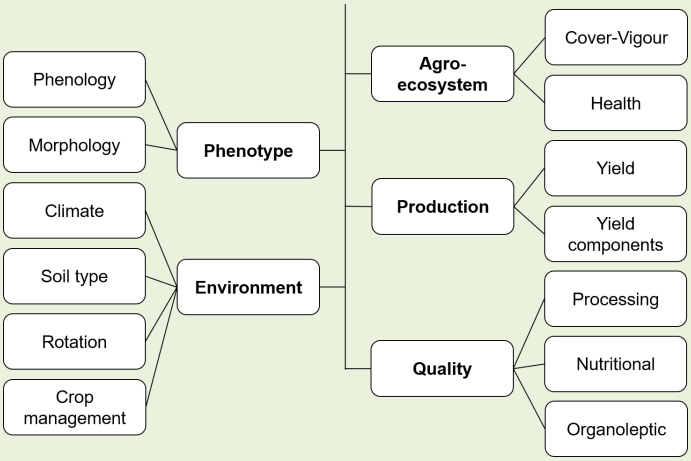


Figure 1: The components of crop performance

3. The **agro-ecosystem performance**. How does the crop fit into the growing environment? Does it pre-empt the space and resources or does it get overwhelmed by weeds? Is it too much affected by pests and diseases?
4. The **productive performance**. How much production, and in which form and timings, can the crop provide? Is harvest manageable or difficult?
5. The **quality performance.** What end-use is possible with the crop's produce? What kind of processing is possible or needed? Does it have a nutritional added value? Does it taste good?

Readers can imagine how difficult it can be to consistently provide an answer to all the above five points at once. Imagine a cereal crop producing an extremely nutritious and tasty grain but limited by a ridiculously low yield. Or a crop that has a perfect fitness to the growing environment, no diseases, high yield, but a disgusting taste. I invite the readers to keep reading through and see what sort of overall conclusions we reached.

Agroecosystem performance was evaluated from different directions but the two aspects that we suggest as the most practically useful to look at are (1) the crop 'cover', as a proxy of its fitness, ability to capture resources including light and space and to compete against weeds, and (2) the 'health', i.e. the overall response to pests, pathogens and abiotic stresses. The overall outcome across all DIVERSIFOOD experiments and species confirms that 'underutilised genetic resources agroecosystem performance of the same genetic resource can vary greatly depending on where it is grown and must therefore be looked at on a very local scale. In ORC Bulletin no. 123, pp. 4-5, we showed how underutilised relatives of wheat, emmer, einkorn and rivet wheat, thrived on a poorly-drained heavy blue clay in the North Wessex Downs, where commercial wheat was not a viable option (Fig. 2). As obvious as it might seem, this reinforces the importance of deploying and testing genetic resources in multiple farms rather than on research stations. Or to use a centralised research station to simulate different growing conditions such as different rotational positions and/or tillage systems (Fig. 3).

From the perspective of **productive performance**, the DIVERSIFOOD experiments highlighted a, perhaps expected, two-fold trend: yield of 'underutilised genetic resources' can be a serious limiting factor, as the tested material can be either low-yielding or difficult to harvest, but, in many cases, can be a relief for marginal conditions. Species such as einkorn, emmer or rivet wheat can thrive where their

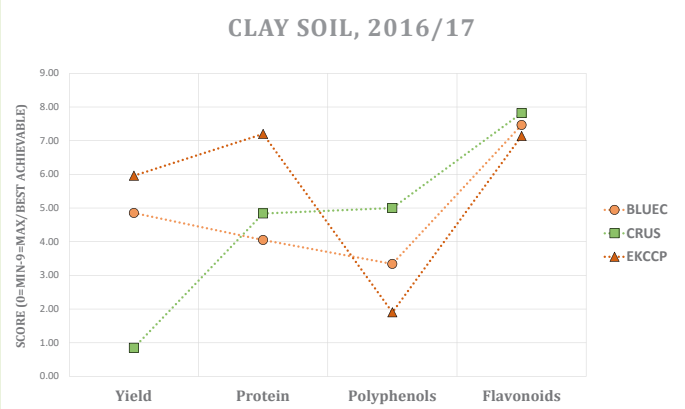


Figure 2: Performance profiles in terms of yield, protein and anti-oxidant compounds (polyphenols and flavonoids) of a rivet (BLUEC), and einkorn (EXCCP) and a commercial wheat (CRUS) grown by ORC on a clayey soil in Doves Farm (Wilts) in 2016/17. The y axis indicates an overall performance score fom 0 to 9. Einkorn and rivet yield much more than wheat.

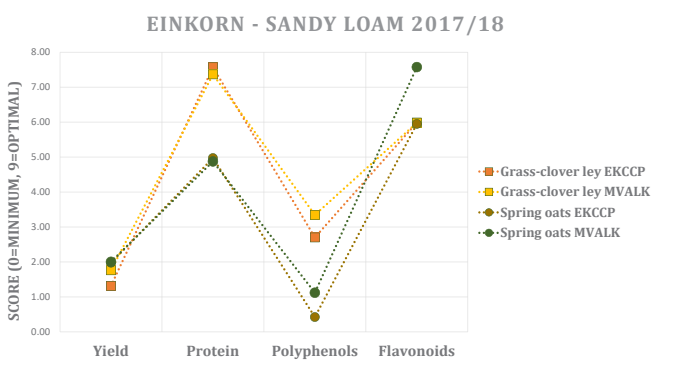


Figure 3: Performance profiles in terms of yield, protein and anti-oxidant compounds (polyphenols and flavonoids) of two einkorn accessions grown by ORC on a sandy loam soil in the University of Reading Crops Research Unit experimental farm in Sonning in 2017/18. Yield was low, but protein and polyphenols content were higher when einkorn was grown after a grass-clover ley than when it was grown as a second cereal after spring oats. Figure from the DIVERSIFOOD database.

commonly grown closest relatives (e.g. durum or bread wheat) are not a viable option. This is one of the key benefits expected from underutilised crops: they can be a valuable resource for more marginal land.

Quality performance was evaluated under different aspects namely (i) processing quality, (ii) nutritional and nutraceutical quality, (iii) organoleptic quality. A diversity of crops triggers a diversity of products that, in turn, need adaptation in both the processing and the methods and concepts used to assess their quality. Grains from minor cereals are not necessarily suited to industrial milling but provide an opportunity for artisanal millers and bakers, whose processing methods are more flexible and adaptable to the raw material, to add value to highly nutritious grains. Broccoli OPs have shown a higher concentration of health-promoting compounds (e.g. glucosinolates, proved to have anti-carcinogenic properties) than mainstream F1 hybrids, without necessarily a lower yield (Fig. 4). The diversity in shape and taste of the florets (glucosinolates are actually amongst the drivers of broccoli's bitter taste) makes them more suited to direct marketing or farmers' markets than supermarket sales, at least for the time being.

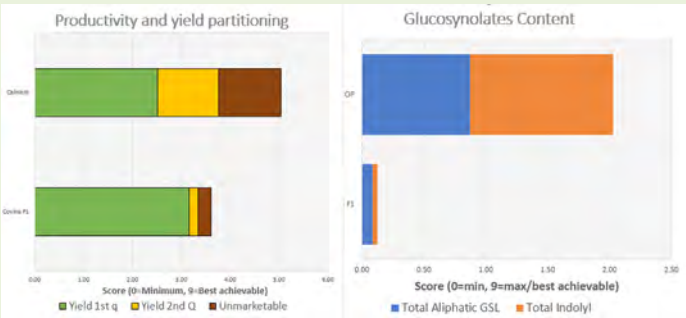


Figure 4: Comparison between the performance of an open pollinated broccoli (above) and a hybrid broccoli (below). The left shows that the OP yielded more than the hybrid, but the yield advantage was mostly made of second-class (yellow bar) and umarketable florets (brown bar). The right shows that the content of two categories of glucosinolates (health-promoting compounds) was higher in the OP than in the hybrid (data from an experiment in Switzerland in 2016, courtesy of FiBL). The horizontal axis indicates an overall performance score from 0 to 9. Figure from the DIVERSIFOOD database.

From the field to the table

ORC looked at eight case studies, four on vegetables and four on cereal species, considering the perspectives of different actors from farmers to consumers, and generating pointers that need to be carefully considered when aiming to create novel value chains that embed diversity.

1. At an early stage of value chain development, the commitment to preserve and increase genetic diversity can struggle in establishing market interest and demand. Opportunities arise from the story behind the product becoming an added value in itself. However, it is essential to build an evidence base behind the story to substantiate marketing claims.
2. Once the value chain starts developing, several initiatives show that problems arise with meeting, instead of creating, a demand that can grow quite fast. Lower yields, unsteady supplies and wastage in processing can be serious limiting factors.
3. To make these value chains grow further, several of the initiatives studied highlight how successful it can be to move beyond the initial value chain (generally oriented around fresh vegetables, bread and pastas) to more innovative products and services, thereby expanding market opportunities.
4. Some more developed case studies are reaching markets through collaboration with other stakeholders, for example multiple retailers that have skills and resources to facilitate sales.
5. It is generally thought that to market underutilised crops one must select either a national/international marketing strategy, or a local/decentralised strategy. However, these two strategies can work alongside each other, and complement each other, offering potential to diversify marketing channels and reach new consumer groups.
6. Value creation around a higher diversity of crops often starts with a bottom-up approach from small-scale producers. This can have drawbacks; for instance, when many small-scale producers are involved, coordination of the collection of produce would be beneficial, but that involves complexity and requires an actor to take responsibility, which can be challenging in, often fragmented, networks.

The diversifood database

In research, making information available and useful is the 'elephant in the room'. Even more so nowadays, as we are bombarded by claims through all sort of, increasingly uncontrolled, social and conventional media. Data are often the most overlooked piece of information, however data are the building block of information and should be accessible.

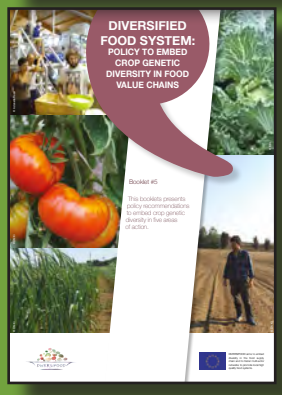
To merge results from all the experiments on 'underutilised crops' in a unique, available, accessible repository, the ORC team has generated the 'DIVERSIFOOD database'. Unlike many existing databases on genetic resources, mostly focused on descriptions and generic information, this tool aims to provide an information basis on actual performance data of genetic resources, with minimally filtered data.

The DIVERSIFOOD database is currently no more than a proof-of-concept of how context-specific information can be stored and made accessible. We hope to see it developing as a common resource to enable communities engaged in testing and using a diversity of plant genetic resources to collect, share, and base their decisional processes on, structured evidence.

The DIVERSIFOOD database is currently downloadable from the DIVERSIFOOD website. You will find the Excel database and a PDF report including a user guide and factsheets from all trials at: http://www.diversifood.eu/diversifood-database/

References and useful resources

1. **DIVERSIFOOD innovation factsheets** A series of 25 'practice abstracts' covering all aspects of embedding diversity in sustainable farming and food systems, including the definition of underutilised crops, factsheets on rivet wheat in France, einkorn in Hungary, farmers' rights, community seedbanks, marketing strategies and much more. All downloadable at: http://www.diversifood.eu/publications/innovation-factsheets/
2. **DIVERSIFOOD booklets.** A series of seven booklets covering practical aspects of research, farming, marketing and policy around increasing crops diversity in the farm and in the supply chain. These include the *Guide to participatory experiments on underutilised genetic resources* (also available at http://orgprints.org/35259/) and *Case studies of the marketing of products from newly bred lines and underutilized crops* (http://orgprints.org/34456/), both edited with contributions from ORC. All booklets are downloadable at: http://www.diversifood.eu/publications/booklets-and-reports/
3. **DIVERSIFOOD Congress,** held in Rennes (FR) on the 10th -12th December 2018. Full proceedings are available at https://symposium.inra.fr/diversifood2018/. Presentations from the DIVERSIFOOD congress and the DIVERSIFOOD forum with policy makers and stakeholders held in Brussels on the 11th April 2018 are available at: https://www.slideshare.net/diversifoodproject/presentations



Environmental Land Management – relevance of the 'organic systems' option

Environmental Land Management (ELM) will be a key component of England's Agriculture and Environment Bills, the two key pieces of legislation that will shape future farming and food production if we leave the EU. If we remain in the EU we will continue to implement the EU Common Agriculture Policy (CAP). There is active debate in Europe formulating the objectives and measures for the reformed CAP from 2021, the UK will have to reengage with this process if that is what happens. ***Christopher Stopes****, interim chair of the English Organic Forum and OF&G policy advisor, has been attending Defra ELM meetings,including the Strategic Stakeholder Group meeting on the 4th June and reflects here on where he believes Defra are in their thinking.*

With regard to the current position at Defra and ELM the scheme and the team running it are undergoing a 6-12 month overhaul. There is however an opportunity to engage with them, as they seek to answer the following questions;

- How we decide what environmental outcomes should we deliver
- What scale should the outcomes be delivered on e.g. national/local?
- What are the options for scheme design?
- What is our approach to payment e.g. outcomes/actions?
- How much will we pay, and potential methodologies?
- What is our strategic approach to the national pilot?

We do need to get involved with this to get our voice heard and it is frustrating that the scheme could be delayed.

ELM should provide the framework for farmers', growers' and land managers' delivery of Defra's 'public money for public goods' policy. Six public goods are identified by Defra:

1. Climate change
2. Water quality
3. Air quality
4. Risk (e.g. flooding)
5. Culture/heritage/landscape, and
6. Biodiversity.

Animal health and welfare should also be on the list.

The overhaul aside, Defra are committing huge resources and very clever minds to work out how ELM, based on Land Management Plans (LMPs), will define practices at the farm/holding level that deliver the public goods. Defra recognises that some outcomes require action at a regional, catchment or landscape level. The ELM framework will provide the options for what will be paid for, the payment methodology and rates, the criteria for what should go in LMPs, and provide the relevant guidance.

In Defra's terms, the public good objective to be delivered through ELM by land managers will arise from the outcome of the action – the longer term impact of management that contributes to public good. In turn, the outcome will depend on the output, which arises from the action – what land managers, farmers, foresters and growers actually do. Defra recognises that the 'output' is made up of an asset (the features within the land manager's control) plus a function (what the asset provides via enhanced quality or reduced pressure on it).

So far so good. As stated, the design of a whole new approach is under way: payment to farmers for their delivery of public goods. From a farmer/grower point of view however the transition to this 'new world' is fraught with problems. Defra's indicative time line is to complete the proposals for schemes ready to launch by 2022. That depends upon the development of a very complex and well refined concept for ELM, one which moves entirely away from the current approach comprising the Basic Payment Scheme (BPS) (75%) and agri-environment schemes (25%). This is planned to be from 2022. It looks like this will be a challenge to meet. Any delay will disrupt the transition from the current to the new system and could leave farmers and growers in limbo, with potentially serious repercussions. There is the promise that the £2.1 billion public money that goes into CAP payments to farmers in England will continue; how much will be earmarked for an effective ELM scheme, based on reliable and easy to implement LMPs that deliver the goods?

But will the current payments (BPS and agri-environment Schemes) that are essential for the upland sheep farmer to stay in business be matched by the new ELM payments? It depends on how the public goods are defined and valued.

The scale of Defra's work is becoming more and more apparent. Their justified initial desire to make it all easy and clear cut has been gradually cut away as the reality of the consequences of complexity become apparent.

There is a significant implication of moving from the present system of payments to farmers, that have been within the WTO 'amber box' (i.e. potentially distorting of commodity prices), and so have been calculated on the basis of 'income foregone'. This clumsy and inappropriate approach is no longer necessary if public money is being spent on public goods. This places any future scheme firmly within the WTO 'green box', so it is able to properly recompense farmers for the outcomes they deliver.

So far Defra has not included organic land management (nor any other system-based approaches such as pasture-fed and LEAF) in the ELM outcomes framework. Instead, a long list of specific land management practices are included, each linked to an outcome, to a greater or lesser extent. Many of these are brought together by organic production systems – defined in organic standards and with robust evidence on outcomes. Organic systems provide a short-cut to the outcomes desired by Defra, in common with a growing number of consumers and citizens.

The organic approach based on clear standards independently inspected and verified at the individual holding level, somehow needs to be included in the ELM framework because it facilitates the changes that demonstrably help to reduce pressure on the natural system.

Professor Martin Wolfe, the farmer's Darwin: The story of Wakelyns Agroforestry and decentralised food and energy production

__Charlotte Bickler__, __Sally Westaway__ and __Jo Smith__ (ORC) reflect on Martin's work on diversification in food and farming and the ongoing legacy of his work in this field, with contributions from __Maria Finckh__ (University of Witzenhausen) and __Kimberley Bell__ (Small Food Bakery).

In March this year, we sadly lost one of the pioneers of organic agriculture, evolutionary plant breeding and agroforestry in the UK (and beyond), Professor Martin Wolfe. Those who were lucky enough to spend time with Martin will remember his infectious energy and enthusiasm, and his generosity in making time for all who visited Wakelyns. His revolutionary challenge to conventional farming systems was backed up by practical, yet rigorous research and enthusiastic persuasiveness. His inspiration for greater diversity in the way we produce our food will be sorely missed, but not forgotten.

From 1997 Martin and his family were partners in and ran Wakelyns Agroforestry, a highly innovative, integrated and organic agroforestry farm in Suffolk, east of England. Based on his experiences in plant pathology, Martin firmly believed that the future of sustainable agriculture was rooted in Darwinian evolutionary processes, where adaptation to the agricultural abiotic and biotic environment leads to increases in overall productivity and resilience[1]. Martin hypothesised that moving away from the industrialised monoculture approach towards polycultures with major increases in diversity both within and among crops, trees and livestock was key to success. His work produced evidence, and practical experience, of the overall productivity, biodiversity and environmental gains when modern knowledge and techniques in ecology and genetics are applied at all levels. In this article we touch upon some of the key areas of research and other less tangible contributions that Martin and his late wife Ann made to the world of sustainable agriculture.

Diversity from genes to species

Martin first explored the value of increasing in-field diversity in his work on varietal mixtures (or blends) of spring barley varieties in Eastern Germany in the 80s. His work in this area convinced him of the benefits of diversity when it comes to reduction in disease spread and severity, at the time nearly all of East Germany's spring barley was grown in such mixtures. The challenge was to increase the amount of diversity even more and this led on to experimentation with evolutionary breeding and composite cross populations (CCPs). Thus, ORC Wakelyns Population (OWP) was created and has spread across Europe as a case study CCP for research (see Maria Finckh, opposite). Martin worked with the team at ORC to understand whether or not CCPs could deliver comparable yields and greater yield stability than genetically homogeneous varieties. Based on the good results obtained, Martin tirelessly spread the word about the potential of such alternative breeding methods. This included working with policy-makers to find a certifiable route to market for seed of diverse crops. More inclusive seed legislation and recognition of the benefits of agrobiodiverse seed is key to reaching the full potential of

Martin and Charlotte work with a group of millers and bakers at UK Grain Lab 2017 to develop sensory descriptors of the 'YQ' loaf

biodiversity on farm. Organic seed, including organic varieties and organic heterogeneous material, is now recognised in the new Organic Regulation which will come into force in January 2021; this is one legacy of Martin's work (see box opposite – What's next for heterogeneous material?).

As well as aiming to increase within species diversity, Martin conducted various trials at Wakelyns that aimed to explore the best ways to optimise species diversity. This began with exploring diverse leys of up to 15 species. Trials were also conducted on various intercropping combinations, including wheat and beans, and lentils and camelina. Such trials were seminal for much of the ongoing work on cropping system diversification that we see in the world of organic farming and beyond.

Bringing different, underutilised crops to market, such as lentils or naked barley, was another part of Martin's vision (and then of course there's the trees!). Hodmedod's are a legacy of his work in this area, with co-founder Nick Saltmarsh stating "His dogged yet relentlessly open-minded approach will always remain a guiding inspiration" (https://hodmedods.co.uk/blogs/news/martin-wolfe). Working with companies such as Hodmedod's to bring the 'Wakelyns experiment' into the 'real world' brought great joy to Martin and fed into his ever-increasing desire to promote a more diverse, equitable and interesting food and farming system. ORC Wakelyns Population really came to life when it was born as 'YQ' via Martin's friendship with Kimberley Bell of Small Food Bakery (see Kim's piece overleaf and ORC Bulletin 125 for an interview with Kim about this). Seeing both the seed and grain of OWP reach the market has been an ongoing learning experience for all. We have begun to understand that we need to begin working in different ways as researchers, having alternative approaches not just to the crops that we study but the data we collect and how we collect it. This continues in all the projects that we do at ORC.

Charlotte Bickler

Maria Finckh, University of Kassel

I have known Martin for more than half of my life. We first met in Japan in 1988 and I was lucky to be able to work with him from 1994 to 1997 in Switzerland. His kindness and skills as a group leader have taught me so much about how to support others. Some very special times were the planting of trees at Wakelyns in 1994 and 1995 and the beginnings of the work with the CCPs. He has inspired and supported so many of the people that work with me, and thus has been the 'hidden' and much appreciated co-supervisor in so many ways.

Martin's vision was to enhance diversity among crops and within crops. He started evolutionary plant breeding of wheat in 2001 in collaboration with the John Innes Institute[2] (now John Innes Centre).This has inspired scientists across Europe and the wheat CCPs are now in the F18, growing from Hungary to the UK. They have the potential to adapt to organic and conventional conditions[3] and can tolerate vastly variable weather conditions from year to year, producing more consistent baking qualities than reference varieties[4] and protection from newly evolved rust races[5]. The CCPs are the basis of several large research projects across Europe and have inspired the production of new CCPs (e.g. www-insusfar.de) and Martin's work was instrumental in inspiring the first International Symposium on Breeding for Diversification held in 2018, where Martin was an important keynote speaker[1].

Martin with Maria and her PhD students at the Breeding for Diversification Symposium in Witzenhausen in 2018

What's next for heterogeneous material?

More inclusive seed legislation and recognition of the benefits of agrobiodiverse seed are key to reaching the full potential of biodiversity on farm. The marketing of genetically diverse populations has been allowed in past years thanks to a temporary experiment allowing derogation of the seed legislation surrounding variety registration and seed certification. We hope that the changes will be incorporated into the seed directives once the experiment ends. Either way, heterogeneous material is now recognised in the new Organic Regulation and as part of LIVESEED, ORC is involved in the development of the delegated acts for the Organic Regulation around seed, and organic heterogeneous material in particular. We are drawing on our experience, and that of our project partners, in marketing populations of cereals, e.g. ORC Wakelyns Population, and we are exploring how different tools can be flexibly used to respond to end-user needs whilst maintaining the integrity of seed supply.

Decentralised energy production

A key part of Martin's work and passion at Wakelyns was to look to decentralise food and energy production and provide a model that would prove the concept and act as a demonstration for others.

Martin, Jo Smith and ORC intern Vincent Delobel taking samples in the short rotation coppice at Wakelyns Agroforestry in 2014

Martin very successfully achieved this for heat production – using the short rotation coppice (SRC) agroforestry tree rows at Wakelyns to produce fuel. Woodchip from the coppice feeds a small 20 kW boiler on the farm which provided all-year-round heat requirements for the farmhouse, with additional woodchip left over for other purposes. The tree rows, planted in 1994, are hazel (*Corylus avellana*), cut on a five year rotation, and willow (*Salix viminalis*) cut on a two year rotation using a tractor-mounted circular saw and chipped using a small hand fed chipper. The two species of SRC produce very similar yields under current rotations when converted to annual biomass production (2.87 cubic metres of woodchip per 100m per year). Other methods to cut and chip the material have been trialled at Wakelyns as well as looking at boundary hedges as an alternative or additional source of woodchip – more information on these different methods and the economics here: https://zenodo.org/record/2641808#.XRClv497nct

Some of the additional woodchip Martin produced on the farm has been used for a trial of ramial woodchip as a soil improver. Ramial woodchip is made from smaller diameter material, chipped and applied fresh to the soil. It can be produced from hedges or short rotation coppice agroforestry and provides one piece in the jigsaw of decentralising food production – the ability to grow your own fertility and organic matter using perennial crops to improve soils that are part of an annual crop rotation. These trials are ongoing (https://tinyurl.com/ORC-WOOFS) but results so far have been positive and SRC agroforestry looks like it could have potential in arable and horticultural cropping systems as an on-farm source of fertility and organic matter.

Martin was also in contact with an innovative small business based in South Wales who were working to provide the first small (farm-scale) woodchip fuelled Combined Heat and Power unit to also produce electricity from the trees and maybe to power an electric vehicle. This technology is not quite ready for market yet but in the future this is something we would love to explore as part of Martin Wolfe's legacy – an agroforestry powered car!

Sally Westaway

Functional biodiversity

Biodiversity is a core concept in the design and functioning of Wakelyns – with the high level of planned biodiversity (i.e. the trees and diverse crops) having a knock-on (mostly) beneficial effect on associated wild biodiversity (e.g. 43 bird species were recorded at Wakelyns during an RSPB farmland bird count in 2010, including species characteristic of woodlands (blackcap, bullfinch, chiffchaff, great spotted woodpecker) and farmland (greenfinch, kestrel, rook, starling, stock dove, turtle dove, whitethroat, woodpigeon). This increase in biodiversity has a functional value; for example, by planting 21 different varieties of apple trees in amongst seven different species of timber trees, the rates of apple scab was found to be much lower than in an intensive organic orchard (Fig. 1).

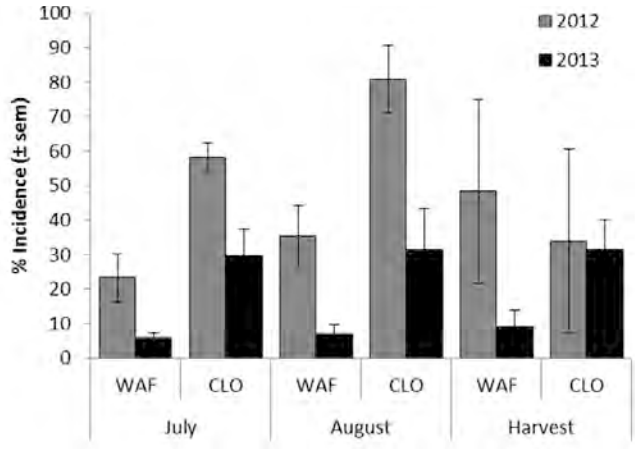


Figure 1: Lower incidence of apple scab incidence in the mixed timber and apple tree system at Wakelyns (WAF) compared with an organic orchard control (CLO)[6]

PhD student, Alexa Varah, recorded much higher numbers of pollinating insects (bumblebees, solitary bees and hoverflies) in the agroforestry when compared with an organic arable monocrop, likely due to the additional resources provided by the early-flowering willow (Fig. 2).

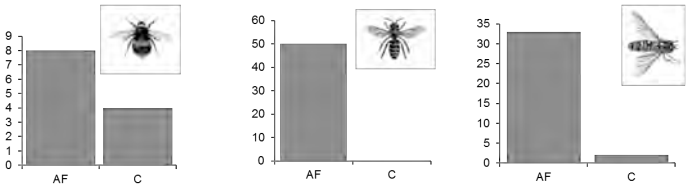


Figure 2:Higher abundances of bumblebees, solitary bees and hoverflies in in the willow alley system at Wakelyns compared with an arable field control [7]

Martin even made the most of the 'bad' biodiversity – in the last couple of years he had teamed up with a local deerstalker, Steve Tricker, who would harvest the muntjac that lurked within the agroforestry and, with his wife Lynn, make them into award winning pies and sausage rolls!

The final words go to Kimberley Bell of the Small Food Bakery in Nottingham. Over the last few years, Martin was re-energised through his contact and subsequent partnerships with artisan bakers, particularly Kimberley, who have made more tangible the connection between the way the agricultural system is designed and managed and the quality of the products that result. But his impact goes way beyond the tangible effects, as Kimberley explains here:

Jo Smith

Martin and the Small Food Bakery

I hope I can capture and share a little in this piece of how Martin has contributed to our work here in our little bakery in Nottingham.

I dearly wish we could load you up with a counter full of fresh loaves of bread, bags of crispbreads, dried fruits, granolas, custard and chocolate tarts, and chutneys. These are all products we make that use ingredients either from or inspired by Wakelyns. These things I see as the more simple, tangible expressions of Martin's work that now form a very small (but important) part of the food system here. We have been so proud over the past couple of years to have been able to demonstrate the qualities of exceptional ingredients grown at Wakelyns through our baking and cooking. That said, what has become more important to us, is how Martin, the landscape and the wider community that has formed around Wakleyns have also shaped many of the less tangible elements of our work, heavily influencing the way we organise ourselves and driving us to do things better.

My colleague Laura and I travelled to Wakelyns Agroforestry to meet Martin for the first time only 2½ years ago following an introduction from Josiah Meldrum (Hodmedod's). This visit initiated a butterfly effect back here in Nottingham, changing our thinking about food systems and influencing our work at the bakery in ways we couldn't have imagined. It has changed our bread; the decisions we make in purchasing ingredients; helped us articulate a philosophical framework around the bakery; and perhaps most significantly inspired me to convene an ambitious meeting called UK Grain Lab in both 2017 and 2018. Martin has had such a positive influence on so many people from many backgrounds – that influence extends to all of the team here and also into the new community that has formed around the UK Grain Lab.

Curiously perhaps it wasn't the scientific outputs of Martin's work that resonated with us, it was the opportunity to see, touch and taste things, experiencing a real-life example of agroforestry, a landscape that was so unique and different. It got in your head and your heart almost instantly. Spending time at Wakelyns, gently shepherded through the trees and alleys by Martin, was always magical. That day, our first visit of many, being welcomed into Martin's home and shown around the farm was all it took to convince us. There was a kind of truth and beauty in the ideas being explored at Wakelyns that we had been looking for and wanted to parallel in our baking and cooking. We were inspired to dig deeper and learn more.

On our first journey there, we of course noticed the stark contrast between much of the Suffolk landscape we had driven through, with large fields, either with bare soil or homogenised single crops stretching as far as we could see. It was winter, and the wind was vicious and biting. Arriving at Wakelyns for the first time seemed like an oasis; visually exciting, on a scale that was very human, and sheltered; safe and calm amongst the trees.

As bakers, we went to Martin looking for a sustainable wheat, having read a snippet about agroforestry online and thinking that growing the alley cropping system could be the answer. We got so much more than we bargained for: the outputs from Wakelyns were certainly as diverse and productive as the agricultural system being proposed!

Martin with Kimberley Bell and other bakers from Small Food Bakery and e5 Bakehouse

The YQ, a heterogeneous 'Population' he created and grew amongst trees at Wakelyns defied the *status quo* on every level. On that first visit, Martin calmly and patiently explained to us the politics and science of plant breeding and seeds, the national recommended list, how plant pathogens behaved, the genetics of old and new varieties of wheat, his work with mixtures, and then of course the population wheat and many philosophical and practical musings on diversity and resilience. I list all of these things because we are not academics, farmers or scientists, and one thing that Martin was brilliant at, was explaining complex ideas to the many and varied curious visitors that turned up at his door.

The energy gained from his vision will continue to drive us forward in our work for years to come. He had a long view and a quiet wisdom. We shared a belief that a systemic approach to changing food and agriculture was critical, exploring many ways in which his philosophies converged with those unfolding within the bakery. He was patient, gentle, supportive. He set me up for some challenging public speaking events, forcing me to learn to articulate my work. He saw the value in the occupation of a humble baker in joining the scientific and agricultural community in a movement towards better agriculture. He taught me to value complex systems, to pursue diversity, and to have faith that nature – even human nature – will ultimately balance.

Through the newly established Grain Lab network, many people have been inspired by the YQ Wakelyns population wheat. I am observing a great momentum within this community to move away from commodity cereals; networks are starting to form to support localised growing, milling and baking of minor cereals – including more unusual varieties, landraces and even populations. Its so exciting to watch it unfold.

Agroforestry is not simply about agronomics, it's a poetic and practical restoration of vital connections on every level. Amongst those trees, he fostered the most amazing community of people and presented an incredible contribution to organic agriculture in the UK;, he gave us (here at Small Food Bakery) 'our wheat', now forming part of our identity. In doing so he taught us the revolutionary power we hold, simply contained within the act of baking a loaf of bread. What we gained from Martin directly and indirectly was so huge, I can't really imagine what the bakery would be like now if we had never met him. No YQ bread to soften our hands and hearts, no Grain Lab community. So many experiences that have set our intentions in an exciting direction, steadfast, ready to face the future.

We remain connected to and in collaboration with many other people who have been similarly inspired by Martin's work here in the UK and I hope that together, our community can become an ecosystem as diverse and resilient as an agroforestry system should be, in turn moving food and farming culture closer to this vision.

Kimberley Bell

Martin planting trees with Maria Finckh at Wakelyns in 1994

Martin in his element on the plot combine at Wakelyns

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Organic Arable's 20th birthday

May 23rd saw Organic Arable bring together farmers, millers, researchers, certifiers and advisors to celebrate their 20th birthday and thank the many people instrumental in the foundation and development of the business. Hosted by Joe and Nigel Wookey of Rushall Organics at their beautiful events venue Casterley Barn, in Wiltshire, the day not only reflected on the successes seen in developing innovative supply chains but also provided an opportunity to set out how Organic Arable is evolving and growing as a company; preparing for the next 20 years and setting out their vision for Organic Arable's future, plans to support its producers and to develop the organic cereal market.

Of interest to farmers will be their new and innovative members' SharePoint site which will contain the latest price and market information, countless useful technical documents and a farmer-to-farmer forum for discussion on all things organic. They have also taken on a new staff member, Robin to provide additional on-farm support. Millers' ears will have picked up on hearing of plans to implement the integrity platform Check Organic and develop new biodiversity data and farmer profiles to help them strengthen their brand. And it was great to hear that Organic Arable will be investing a proportion of their profits in organic cereal research.

Bringing together these various strands of work will create a company with a range of services that will help to develop the organic cereals sector and one that ORC will be delighted to continue to work closely with in the delivery of research projects such as Cerere and Liveseed. We wish Organic Arable all the very best for the next 20 years and beyond.

Andrew Trump, Organic Arable 's Managing Director addresses guests

Organic Arable board members Mark Lea and ORC's Bruce Pearce

Photos: Kay Ransom Photography

Join ORC's Farmer and Business Supporters' Group

ORC is at the forefront of UK research on organic and other agroecological approaches to sustainable and healthy food production, including knowledge exchange and policy advocacy on behalf of organic farmers and businesses.

While much of this work is supported through project funds from the EU, governments and foundations, we rely heavily on donations from individual supporters to provide vital underpinning for our activities.

Regular monthly or annual donations help us to plan ahead with greater confidence about our ability to undertake new initiatives on behalf of organic farmers and food businesses.

Will you join the growing band of farmers and businesses willing to support us like this?

We're not just asking for your support – we're offering something in return to say thank you!

FAB supporters have:

- The opportunity to attend FABS annual events to hear about our current activities, with space to discuss your priorities for research, information and policy initiatives
- Opportunities to participate in bids and funded projects
- Networking opportunities and events
- Pre-publication access to research reports, technical guides, bulletin articles, conference papers and other publications, with an invitation to feedback comments where appropriate
- Access to the research team and a quarterly update on progress and staff news, with links to on-line resources, for each of the main areas of ORC activity
- Links to and (optional) membership of relevant on-line discussion forums
- Discounted access to ORC conferences and events, including our annual conference
- Free subscriptions to ORC's printed bulletin, monthly e-bulletins and the Organic Farm Management Handbook every two years or so.

Please give us your support and sign up today!

To join the ORC FABS group, please pledge a regular annual donation (or monthly equivalent) of at least:

£100 (Supporter)

£250 (Bronze)

£500 (Silver)

£1000 (Gold)

£5000 (Platinum/Organic Ambassador)

We are keen to recognise the different levels of support, but all supporters will receive the same benefits.

To register, please contact Gillian Woodward at ORC:
01488 658298 ext. 554
gillian.w@organicresearchcentre.com

Changes to our Council of Management

Vikas Agrawal

We are very sorry to announce the sad and unexpected news that Vikas Agrawal, our Treasurer, died in June after what his family describe as a relatively short illness.

Mike Turnbull, Chair of our Council of Management, said "Vikas was appointed as a Trustee/Treasurer in March 2013. He stood out amongst the candidates at that time because he had a long association with the organic movement – he was senior trustee of the Dean Organic Trust. He also had experience of dealing with environmental sustainability issues in roles he had played during his career. Since coming on board he made an extremely valuable contribution to ORC, not least as chair of the Finance Sub-committee, bringing his financial skills to bear particularly at the strategic level. He also played a key role in the transfer of the Dean Organic Trust (now the Dean Organic Fund) to ORC following the death of its founder Jennie Bone, and he continued to serve as a member of the DOF Management Committee. We will miss Vikas enormously."

Vikas was a graduate of Cambridge University, a chartered accountant and an experienced valuations and corporate finance practitioner with extensive experience of strategic planning and of leading large-scale business and technology transformations. He had lived and worked across the world, having been a consultant with Andersen Business Consulting, McKinsey & Company and Navigant. He worked at Siemens, as Director of Strategy and Innovation at Siemens Business Services and subsequently as Global Engagement Director at Nokia Siemens Networks. Vikas had a passion for green issues from an early age, winning the Daily Telegraph's National Schools Essay Writing Competition on 'The Green Economy'. Subsequently, as a management consultant and line manager, Vikas supported initiatives to develop new approaches to energy generation and resource conservation.

Our sympathies go out to his family.

Margaret Wagner

Margaret Wagner stood down from our Council of Management recently, due to workload pressures in her senior role in a large US-based marketing agency. A strong advocate of organic and local farming, Margaret brought a wealth of expertise and insight to the Council of Management that will be missed.

Roger Kerr

We welcomed Roger to our Council of Management in June. Roger is the Chief Executive at Organic Farmers & Growers CIC, the second largest UK organic control body, certifying just over half the UK organic land area and about a third of the sector overall. On top of his CEO duties at OF&G he is currently also Chairman of the UK certifiers group, the UK representative on the IFOAM EU Council and a Director of the Organic Trade Board.

He is from a farming family and spent much of his formative years working on various relations' farms. He holds an HND in Agriculture from Harper Adams and has worked on various farms over a number of years. He spent ten years working within the agricultural supply industry before moving full time into the organic sector in the late 1990's. He helped establish Calon Wen, a Welsh organic dairy farmers co-operative, in 2000, which secured the first ever branded organic milk listing in a UK major retailer amongst a number of other innovative projects. In 2007 he was instrumental in establishing a brand new liquid milk processing plant in South Wales seeking to supply local Welsh milk (both organic and non-organic) to Welsh consumers.

He has been a supporter and proponent of organic production since his days at Harper Adams in the 1980's and is keen to see organic food and farming become the natural choice for farmers, growers and consumers.

He says: "I see ORC as the keystone to the delivering of organic and agroecological research and development in its myriad of forms within the UK and in partnership with equivalent organisations worldwide. Consequently, I am keen to help shape and guide its future role as a centre of excellence".

Staff news

Susanne Padel

Susanne Padel speaking at ORC's Organic Producers' Conference in 2016

We were very sad to say goodbye to Susanne Padel who left us in May to start a post as Researcher at the Thünen Institute in Germany. Susanne joined ORC in 2009 and was a member of the Senior Management Team, leading on information and knowledge exchange and making major contributions to our livestock, socio-economics and sustainability assessment research programme. With a wealth of experience in organic farming systems, including working as a consultant in Northern Germany and as a researcher in the UK since 1993, Susanne strove to ensure that research considers the day-to-day realities of farming from the soil to the supply chain. She was a major driver in supporting good collaboration between famers and researchers and seemed to know everyone in the European organic agriculture research sector. Her research interests included policy evaluation, organic certification, farm business management (also co-editing The Organic Farm Management Handbook), markets and consumers and developing research and knowledge networks in support of the organic sector in Europe. She had input into the teaching at postgraduate level at Scotland's Rural College (SRUC) - Organic Farming MSc and was a member of the Exam Commission IAM Bari (Master in Mediterranean Organic Agriculture). We will miss her loads professionally and personally, and wish her well, as she joins Nic at Thünen.

Events and announcements - details at www.organicresearchcentre.com

Events

11 July 2019: Agricology Field Day: Diversity in action. Intercropping, companion cropping and cover crops: Andy Howard, Bockhanger Farm, Kent.

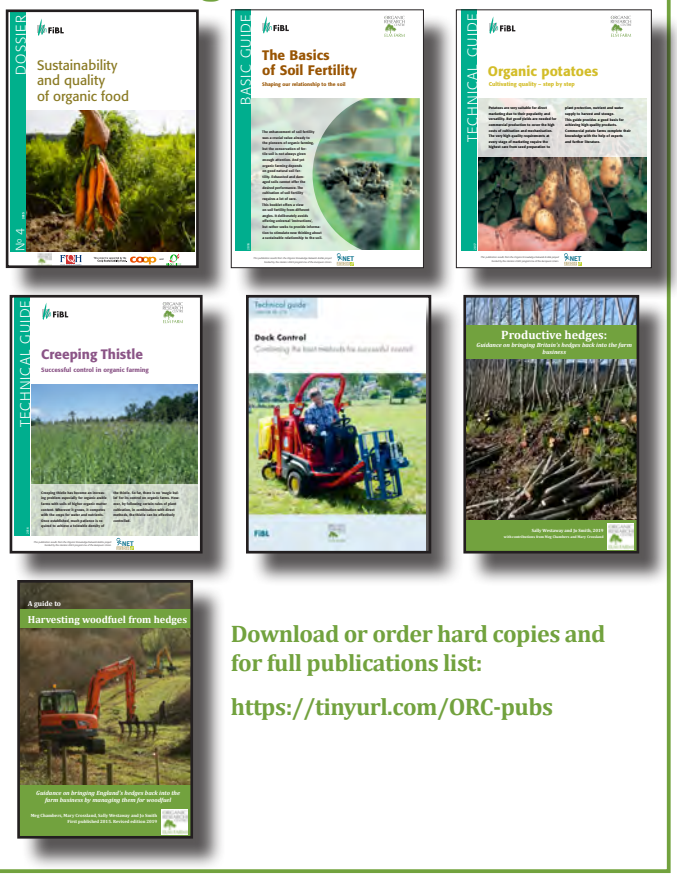
12 July 2019: Soil nutrient management. ORC, Elm Farm, Newbury. A workshop with Mark Measures for farmers, growers, researchers and advisers on soil nutrient and fertility management in organic and agroecological farming.

30 July 2019: Agricology Field Day: Talking diverse pastures. Rob Havard, Worcestershire.

14 August 2019: Agricology Field Day: IPM and biological control. Joe Rolfe, Norfolk

15 August Agroforestry Innovation Network meeting of the Trees and Vegetables Group at Gibside, Northumbria

Technical guides



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