THE ORGANIC RESEARCH CENTRE

ELM FARM

In this bumper issue:

Cover photo

Intercropping Fuego beans and Paragon wheat at National Organic Combinable crops 2017 (p15)

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Organic Research Centre

Bulletin

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News in brief

OCW producer survey shows rise in organic sales from Welsh farms

The Organic Centre Wales 2016 producer survey report has shown a rise in sales of organic products, despite a fall in the land area certified as organic in Wales. At the same time, there has been an increase in the number of farms and the land area covered by the Glastir Organic scheme, and there is strong interest from farms wanting to convert.

Compared with the 2015 results, organic finished lamb sales were up by 17%, from 120,000 to 140,000 head, organic finished cattle up by 16%, from 5,000 to 5,800 head, and organic milk sales up by 7%, from 56 to nearly 60 million litres. These increases are consistent with the 7% increase in UK retail market sales of organic food in 2016, showing the potential for Welsh producers to respond to growing domestic and export market opportunities.

However, the certified fully-organic and in-conversion land area recorded by Defra in 2016 fell by 1.8%, from 82.9 to 81.5 thousand ha, as a result of a combination of reduced area of land in conversion, but a 1% increase in the area of land achieving full organic status. Confidence within the sector remains high, with 39% of producers who were surveyed indicating an intention to remain in organic production for 10 years or more and a further 38% for 3-5 years.

Nic Lampkin, Director of ORC, which produced the report for Organic Centre Wales, raised concerns about the future: "With only a small proportion of applicants qualifying for Glastir Organic agreements from 2017 due to funding restrictions, and no window planned for 2018 agreements, will Welsh producers be able to take advantage of the renewed optimism in the organic sector? Or will the opportunities be left for their English neighbours to take up at their expense?"

In-conversion land area on the rise

The key findings of Defra's release of organic farming statistics for 2016 are:

- **Organic land use and crops.** In 2016, the United Kingdom had a total area of 508,000 ha of land farmed organically, down from 521,000 ha in 2015. The area in-conversion expressed as a percentage of the total organic area rose for the second consecutive year.
- **Organic livestock.** Poultry and sheep remain the most popular livestock types farmed organically in the UK.
- **Organic producers and processors.** The total number of organic producers and processors rose by 5.1% in 2016 to 6,363. The number of producers only and producer/processors continue to decline. The numbers of processors only rose for the third year running and now stands at 2,804, the highest number since 2008. Aside from the manufacture of 'other food products', most processors in the United Kingdom were engaging in the processing and preserving of meat and production of meat products and the processing and preserving of fruit and vegetables. Full details can be found in the time series data, which is available to download at www.gov.uk/government/statistics/organic-farming-statistics-2016

Innovative Farmers now free to join

After 18 months of enabling farmers to lead the way in practical, on-farm innovation, in April the Innovative Farmers network announced significant changes to make it easier for even more farmers to benefit. Joining the network is now free, meaning everyone can access the full write-ups from field labs and attend network events without paying an annual membership fee. Innovative Farmers brings together groups of farmers with researchers from top agricultural institutions in practical 'field labs'. Field labs so far have tackled challenges like finding alternatives to glyphosate for terminating cover crops, producing cheap and reliable peat-free compost from woodchip, and fighting blackgrass without chemicals. Until now, farmers have paid an annual membership to join the network, and also contributed to the cost of individual field labs and events that they take part in. The annual membership fee has gone, and sponsors cover the costs of a growing number of the field labs. Innovative Farmers is part of the Duchy Future Farming Programme, funded by the Prince of Wales's Charitable Foundation through the sale of Waitrose Duchy Organic products. The network is backed by a team from ORC, LEAF (Linking Environment and Farming), Innovation for Agriculture and the Soil Association.

'A Matter of Scale' report published

The *A Matter of Scale* report, published in July, highlights how a diverse and vibrant sector of small farms is providing employment, attracting new entrants and incubating entrepreneurs. A survey of 69 holdings of 20ha and less, undertaken by the Landworkers' Alliance in conjunction with the Centre for Agroecology, Water and Resilience at Coventry University, provides a preliminary insight into the diversity, productivity, financial viability and multifunctional benefits offered by such farms. The report is accompanied by five short films about key themes arising from the research.

Letter to Michael Gove on agroforestry

Some of the UK's leading farming and forestry organisations, including ORC, have put their names to a letter to Secretary of State Michael Gove, highlighting the benefits of agroforestry, the practice of cultivating trees and crops or livestock on the same area of land. The current Rural Development Programme for England does not include options to support agroforestry, the result of a perceived lack of demand from farmers and landowners to adopt the practice. A well-managed agroforestry system can boost land productivity by up to 40% by making efficient use of natural resources. Trees also store carbon, improve water management and enrich biodiversity. By using trees alongside livestock you create natural shelter that improves livestock welfare. These are just some of the benefits explained in the letter to Secretary of State Michael Gove, signed by organisations that want to see agroforestry brought in to the mainstream.

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About us

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Bulletin editor
Phil Sumption

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: Can we make a difference?

Summers were traditionally quiet times in politics, but maybe we're experiencing policy climate change as well as the real thing. Last year it was the Brexit referendum kicking off a period of uncertainty and political change. This year we've had an election, but not a lot more clarity as a consequence. The election is over, the Conservatives have limped back into government, the Labour Party is reinvigorated, we have a new Secretary of State in the unexpected form of Michael Gove, an Agriculture Bill has been announced in the Queen's speech, the Brexit negotiations have started and a new organic regulation has been agreed (or has it? – see page 11), which may or may not find itself incorporated into UK law as part of the European Union (Withdrawal) Bill.

For some, the forecast seems dismal, but are there reasons to be more cheerful?

Secretary of State Michael Gove's speech at the WWF Living Planet Centre on 21st July seems designed to reinforce his desire to be seen as a leading environmentalist himself. Let's be clear – the speech he gave could have been given by many a high-profile environmentalist. It is thoughtful, wide ranging, recognising the challenges and the need for action. As Gove said, it's not enough simply to halt or slow the deterioration of our environment – we must raise our ambitions so we seek to restore nature and reverse decline. Gove was clear that the Government commitment to maintaining the current £3billion per year spend on agriculture needed to be justified in terms of environmental gains and that current agricultural trajectories were unsustainable. He praised the engagement of environmental organisations and emphasised the role of the Natural Capital Committee in reinforcing Defra's proposed 25-year Environment plan. Science and business also have a key role to play in shaping this once in a lifetime opportunity. Brexit means a Green Brexit.

Yet despite the recognition of the contributions made by many, one approach that combines environmental commitment and business engagement was not mentioned. Yes, you've guessed it.

Compared with many other countries in the EU, there remains a real challenge to convince UK government policy-makers and NGO policy-advocates in the UK of the real contribution that organic food and farming can make to addressing environmental and other issues. The scientific evidence for the environmental benefits – for biodiversity, soil and water protection, and climate change – continues to pile up, and there is increasing evidence on quality, health and welfare benefits. Food quality, health (in its widest sense) and sustainability come together in a system-based approach, which also succeeds in maintaining comparable financial viability with non-organic approaches (see p12) and helps secure rural employment.

This is achieved through a combination of public subsidy recognising the environmental benefits delivered and premium prices in the growing, global market for organic food. There are few other long-term success stories where environmental management and markets have worked so closely together. In many countries, organic production and markets are flourishing and delivering real gains that are no longer niche.

Yet in the UK, the land area under organic management continues to decline, and is now at lower levels than were achieved 15 years ago. In Wales, the government has halted the renewal of the organic sector in its tracks by withdrawing funding for new agreements under the Glastir Organic scheme. Brexit now creates yet another uncertainty that is deterring farmers, businesses and policy-makers from making the necessary investment decisions.

For these reasons, the initiative by Defra to establish an Organic Roundtable, in partnership with the English Organic Forum, to support the development of an industry-led organic action plan for England, is very much to be welcomed (see p11). It will provide us with an opportunity to set out clearly the contribution that organic food and farming can make to government policy goals and the steps that are needed to make sure we can deliver, at a time when future policies are in the melting pot and clear thinking is sorely needed.

We need to work together to ensure that our case is well made, supported by evidence, so that our real potential can be achieved.

Nic Lampkin

The Netherlands: a glimpse into the future of UK organic farming?

Does the market-oriented development of organic farming in the Netherlands point the way towards our future in the UK? ***Mark Measures*** *and clients travelled there, in May, to see how arable and field vegetable farms are coping.*

Our hosts

Our hosts were Jos and Ana Pelgrom of Man@Machine, who had selected some stimulating examples of farms to visit. Weeds and soil management preoccupied us, with diversions into marketing, potato blight control and machinery.

Weed control is a universal challenge

Don't think that because some of the land was only reclaimed from the sea 30 years ago that they don't have weeds in the Polders! All farms are using spring tined weeders in cereals and field vegetables to control annuals. Inevitably the Treffler harrow, as seen at NOCC 2016, featured strongly: it is genuinely a third generation spring tined weeder, having a more sophisticated spring action which ensures constant ground pressure irrespective of undulations, shallow depth control and precise, on-the-move pressure control, all of which allows operation at an earlier stage of plant growth. This of course means that weeds can be pulled out before they get roots established – critically important for control of all annuals in veg crops and weeds like poppies and charlock in arable.

The Treffler harrow

The field vegetable farms growing carrots, onions, brassicas, celeriac and beetroot are very highly mechanised. We visited the Steketee factory, which showed us the latest in inter-row hoe equipment, hoe blades, torsion-weeders, finger-weeders for working at the base of the plant and in-row weeders. The latter use a camera to identify the individual crop plants, notably brassicas, and it weeds between them with a pneumatic driven blade that flicks between the plants. Cost is about 75,000 Euros per bed.

Steketee in-row weeder

All toolbars can be camera-guided and this is common practice now, giving extra precision even if GPS is available. Pre- and post-emergent weed control with a weed strike using mechanical and/or flame weeders is standard practice. There is a willingness to use repeated passes with the flame weeder, despite the substantial gas use, as the cost is more than compensated by the savings in hand labour.

Another farm has developed a machine for placing a 3 - 4 cm line of sieved green waste compost above the drill of small seeds such as carrots or onions. The trials with carrots undertaken over the last year or two show savings in hand weeding of 50 – 80 hours per hectare.

Drilling carrots with a compost strip

Non-inversion tillage

The farms developing new ideas and techniques were particularly interesting. Non-inversion tillage systems are fashionable now, for all sorts of good reasons – soil organisms and organic matter really are better left undisturbed and near the surface. Several of the farms have gone for 10 years without ploughing. Experience in the UK, however, is variable with a few farms successfully operating systems based on shallow L-blades and deeper tined machines. Use of the EcoDyn on Cotswold clay loam has shown up some problems with soil structure and poor nitrogen supply. This contrasts with the exceptional soil structure, good weed control and crops that are found on some farms in the Netherlands and the farm at the home of

The Steketee shallow eco-plough

the EcoDyn in Germany. The reason may be something to do with the soil type, or perhaps more significantly the fact that where non-inversion-tillage systems are working well there is much more emphasis on the use of green manures and the incorporation of very large quantities of organic matter. Whatever the reason, it does feel right to have soils that allow you to plunge your hand in to a depth of 6 or 8 inches. You don't get that with a ploughed and power harrowed soil. At Steketee we saw their shallow Eco-plough: that might be a better way forward for many farms.

Farms on heavier land face the same problem as in the UK: how to create a seedbed without having to plough before Christmas in order to get frost action and weathering? Some are improving soil structure with non-inversion tillage; others are experimenting with later ploughing and use of green manures.

Controlled traffic farming

GPS is fitted to 80% of new tractors now; it allows the development of controlled traffic farming systems, particularly important for field-scale vegetable production, but there is potential for organic arable production as well. None of the farms we saw has succeeded in extending controlled traffic to forage harvesting but the problem of soil compaction at this point in the rotation urgently needs to be addressed. Wide beds with tractor wheels set at 3.2 metres help to reduce compaction.

Spot the driver!

Soil nutrient management

In my experience soil nutrient management remains the key to improving crop yields and the success of the Dutch farms is undoubtedly partly due their rotations, with at least 30 to 50% fertility building and attention to soil nutrient levels. They, too, have found that diverse leys with three of four legumes are more effective than simple mixtures.

Diverse ley including lucerne, red and white clover and grasses

Soil analysis prior to all crops is routine on most farms, although there was some over-reliance on the use of nutrient budgeting in the mistaken belief that organic farming should necessarily aim for always returning the same quantity of nutrients taken off by the crop in the form of brought-in manures or mineral fertilisers. Interestingly there is no use of alternative analytical techniques such as Base Cation Exchange Ratio or Soil Life. Mineral fertilisers are used and there is great emphasis on the precise use and timing of manure and slurry. There does not seem to be the same draconian and unwarranted control over the gap between manure application and crop harvest that is imposed in the UK. The farms visited are predominantly arable farms, but they all had arrangements with nearby livestock farms; supplying them with forage, and getting FYM and/or slurry in return. Composted manure and in some cases green waste compost is applied in the spring prior to ploughing or cultivations. Slurry is applied by slot applicators and umbilical systems to growing cereal crops in the spring. This is probably the single most important reason that cereal yields are consistently so much higher in the Netherlands and Denmark than in the UK. Why don't UK farms with access to slurry follow suit?

Potatoes and carrots

Niek Vos has spent his life breeding blight-resistant potatoes, supported by the Louis Bolk Institute. Bionica and Sevilla have good flavour and have found widespread acceptance in the multiples. Other farms are using Agrico's Carolus. For many years there has been a ban on copper for blight control in the Netherlands; this has been watched with incredulity from the UK, it turns out that some farms are evading the ban by applying copper for 'soil nutrition' reasons but this is no longer tolerated by consumers. Farmers are leading the call for stronger enforcement and putting more effort into getting universal acceptance of resistant varieties.

A recent development is the use of onion oil in pellets as a means of carrot fly control. We hope to get access to that in the UK this year. And another is the use of mint oil as a sprout suppressant in potato stores.

Other gleanings

A diversion from soil and weed management was the grain mill shown by man@machine with models' ouput ranging from 100 – 1,000 kg/hour. The interesting characteristic is that the machine cuts rather than grinds the grain with the consequence that the flour is more uniform, there is no dust and less heat is created than with either stone or steel milling, hence improved nutritional quality – maintaining oils, enzymes and proteins.

However good these farms are at growing they don't leave much room for wildlife conservation. There is certainly potential for greater integration of wildlife generally and specifically encouragement of natural predators through planting and natural regeneration.

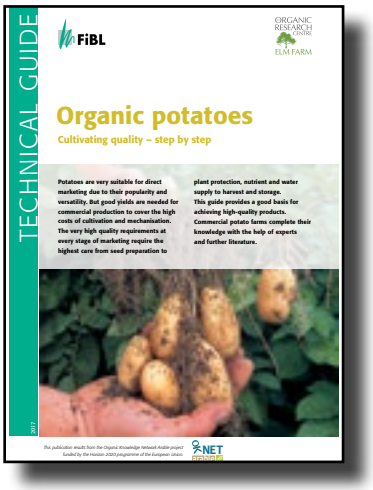
The Dutch have always led the way in organic crop management, new ideas are still coming forward and their level of optimism and willingness to invest is really encouraging.

More on Man@Machine at http://manatmachine.com/

Organic potatoes: Cultivating quality – step by step

A new technical guide on potato production, from FiBL in Switzerland, focusing on achieving quality end-product, has been translated into English. The adaptation of the publication into an English version has been enabled by the Organic Knowledge Network Arable (OK-NET) project and coordinated by ORC. The guide provides a fresh perspective on potato growing and challenges some widespread practices in UK production. ***Phil Sumption*** *and* ***Dominic Amos*** *of ORC discuss the guide's recommendations and the implications.*

Position in rotation



There is some useful guidance on managing potatoes within a rotation. Due to the high nutritional requirements of potatoes, particularly for nutrients to be available shortly after emergence, the recommendation is for preceding crops that support the looseness and structure of the soil and leave a high amount of easily degradable organic material. Suitable preceding crops include a one-year grass/clover ley, one-year fodder and grain legumes (field beans/peas with a cover crop, field vegetables/roots, cereals with legume cover crops). Longer grass/clover leys may promote wireworm, scab, dry core and slugs and the breakdown of the residue is slower than a one-year ley.

If early tillage is needed to prepare for potato planting, cover crops that are killed by frost in winter should be cultivated. The succeeding crop should be one that utilises the available nitrogen in the autumn such as winter cereals, brassicas or green manure such as rye. Minimal tillage will preserve the soil structure and allow frosting of remaining tubers, to avoid volunteers (provided the winter is hard enough).

Nutrient supply

The importance of getting the nutrient supply right is emphasised for quality production. Examples are:

- To prevent *Rhizoctonia* (Black scurf), use only well-rotted manure and apply it in the autumn on the preceding or catch crop. Composted plant material applied in the planting furrows can also reduce *Rhizoctonia* infestation.
- A good supply of potassium and magnesium increases the quality, prevents damage and internal bruises and improves shelf life. Excessive fertilising with manure leads to a decrease of starch and dry matter in the tubers.
- Too much nitrogen can create large, dense foliage which delays tuber formation and decreases growth rates. Early infestations of potato blight could result in losses in yield/revenue.
- Liming before or during the cultivation of potatoes increases the risk of scab infection.
- A high nitrogen supply in late summer can have a negative effect on dry matter and nitrogen content, and hence on flavour. It can also increase susceptibility to damage, and to discolouration, as well as reducing storability.

Potatoes at Wakelyns - June 2014

Fred Bonestroo – Close Farm, Tetbury

At the heart of my late blight limitation strategy is the selection of resistant varieties. I grow six main varieties that all offer reliability and security. I grow four of the most blight-resistant potato varieties available: Allouette, Cara, Carolus, and Toluca. I also grow Agria because of its all-round use and great yield even though it's not very blight resistant but is manageable. I grew Rudolph for the first time this year which looks to be a nice potato, but I will try something different next year. Agrico run field days with trial plots of blight resistant varieties that allow me to select what to grow. Each year I try out new varieties and will give out free samples of these to the box schemes to help introduce them to the consumer.

Measures combined for late blight control:

- Number one is selecting resistant varieties, either from Bioselect or from the Sarvari Trust.
- I try to plant as early as possible as I can't extend the growing season at the other end due to the risk from blight. I do chit very early potatoes but as a small grower don't have the time, facilities or labour to chit the maincrop.
- I use wider in-row spacing (approx. 41cm) to decrease the competition between crop rows and also get more air circulating around the foliage.
- I've stopped cropping the headlands as this is often compacted and the area where the crops struggle and are least healthy.
- I don't apply too much farmyard manure as there is usually enough fertility from the ley, but if I do use it, I make sure it's well composted. I don't believe in pushing the crop too hard. I've found that growth cracks and scab can occur when too much farmyard manure is added, and I prefer a slightly lower yield that stores well and tastes better.
- Once the blight infection has come into the crop, I burn off the foliage of infected plants to prevent the disease spreading to other plants and to the tubers.

Soil and seedbed preparation and planting

Chitting potato tubers before planting is recommended, as it shortens the time to harvest by 10 to 14 days, reducing the risk of late blight infection. Chitting accelerates emergence and thus reduces the likelihood of the sensitive sprouts being infected with *Rhizoctonia* or *Erwinia* (Blackleg). The costs of £500 to £600 per ha are reclaimed through higher yields and yield security, the guide says. Chitted tubers should be planted only with the appropriate technology (rolling-floor planter, belt planters) to prevent breaking off sprouts. Tillage or planting during wet soil conditions leads to clods, deformed tubers and damage during harvest. Cold, wet soils can promote *Rhizoctonia* infection. To improve warming of soils, shallow ridges should be made from the start.

Crop husbandry and weed control

The goal is to create a large, stable, centrally positioned ridge, to open up surface crusts for better aeration and to control weed growth until crop covering. Hoeing damages the delicate root hairs at the side of the ridge, and can also lead to damage on the leaves. Roots and leaves can thus become ways for diseases to enter the plant. A balance is needed between types and number of passes for weed control and avoiding damaging the plants. It will vary by soil type, but alternating harrowing and ridging is recommended, up to a crop height of 10cm (plants bigger than fist size should not be covered).

Protection of leaves from pests and diseases

An integrated systems approach should be taken for leaf and tuber blight. It should integrate the use of:

i. Resistant varieties
ii. Available agronomic control strategies (e.g. chitting, making large ridges without cracks, spatial separation of early and late crops, avoiding excess nitrogen and heavy weed infestations)
iii. Alternative treatments (e.g. organically-based fungicides, plant 'strengtheners' and bio-control agents which can replace synthetic and copper-based fungicides) and
iv. Optimisation of blight control treatments utilising existing blight forecasting systems with the aim of maximising synergistic interactions between (i), (ii) and (iii).

The development of this systems approach took place in the EU project Blight-MOP. More recently the Co-Free project investigated the potential for innovative methods, tools and concepts for the replacement of copper in European organic and low-input production systems (See ORC Bulletin No.121).

Potato Cyst Nematode (PCN) control also requires an integrated approach including choosing resistant or tolerant varieties, removing volunteer potatoes and working within sustainable rotations. Soil sampling should be done regularly to identify and monitor the threat and biofumigant crops such as mustard can be chopped and incorporated into the soil to help kill PCN eggs.

Irrigation

The importance of soil moisture at key times is emphasised in the guide. Sufficient moisture at the time of tuber formation (initiation) prevents common scab infection (*Streptomyces scabies*). Sufficient moisture during tuber development reduces secondary growth and growth tears, and leads to uniform cooking quality. Soil that is too wet at tuber initiation can promote powdery scab (*Spongospora subterranea*) infection through lenticels and occasionally through eyes or wounds. For yield the critical period is from three weeks after flowering until maturation.

Haulm removal

Uneven soil conditions and foliar blight of various degrees within a crop often lead to uneven maturation of the tubers. Well-timed haulm removal promotes even maturation as well as early setting of skin and early harvest maturity. Early haulm removal promotes an early harvest and reduces the risk of wireworm and *Rhizoctonia* infestation. Removing haulms on time can reduce the risk of tuber blight in the case of leaf blight. However, late haulm destruction can lead to higher starch contents, better baking properties and an improved flavour. The use of haulm removers that are adapted to the ridge prevents damage on ridges and tubers (green tubers).

Harvest

Before harvesting, the state of maturity, skin stability and tuber quality should be determined. The basic requirement for harvesting (except for early potatoes for certain markets) is set skin. An early harvest reduces the risk of damage from wireworms, slugs, *Rhizoctonia* and silver scurf. Well-matured (set skin) tubers are less sensitive to damage and storage rot. Careful harvesting at temperatures that are not too low, or too high, helps to prevent damage.

Storage

Dry the potatoes off before storage to prevent rot. To avoid susceptibility to damage, warm the potatoes up to at least 10 °C before grading, washing or packing. To avoid spreading diseases, only use clean boxes and expose them to the sun or disinfect them. Clean off fine dust during grading to reduce the spread of silver scurf. Plant tonics such as spearmint oil, citronella, cloves and rapeseed oil are used in Continental Europe to inhibit sprouting of potatoes in storage. Maybe, there's a whole new market for mint-infused potatoes?

Conclusions

The guide contains useful sections on recognising pest and disease damage to tubers and other defects, and how best to prevent them. There is also information on the economics of potato production, marketing and grading. The guide places important emphasis on quality factors throughout, both for cosmetic appearance and cooking ability and taste. Quality defects are more common in organic potatoes compared to non-organic potatoes. The guide should be a helpful tool for organic growers to redress the balance.

Towards farmer principles of health

The four principles of organic agriculture, as laid down by the International Federation of Organic Agriculture Movements (IFOAM, 2005), are not so well known among farmers or scientists, and the understanding and interpretation of these principles is often rather vague. A main statement of the principle of health is, for example, that 'Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible'. One of the aims of our recent HealthNetworks project was to identify which principles farmers have developed that make them successful in developing healthy farming systems. What personal philosophies and visions of best practice do farmers follow to improve the health of soils, plants, animals and humans? ***Anja Vieweger*** *reports on the project's findings.*

Over a period of two years, we have worked with a group of farmers in Austria, Germany and the UK to establish farmers' own principles of health. We evaluated if there are commonalities among different farmers and farming systems, but also between countries, climates, markets and cultures. We aimed to establish an international network of farmers and scientists, to jointly develop new and more holistic approaches to health measurement and health research in organic farming.

Finding farmers for the project

The farmers were selected in a two-step process, initially through an online survey in each country, followed up by talking to experts familiar with the particular farms (advisors or consultants, representatives of farmer organisations, etc.). We have developed a list of criteria for the final selection of five farmers in each country: e.g.

1. They should have a clear vision of the health concepts on their farm (a clear view of what makes the farm healthy);
2. They should be aware of the impact of their actions and practices on health (health effects and outputs of their system); or
3. They should be aware of where there are health deficiencies in the system, and be prepared to continually improve them, etc. The selected farmers (male and female) in Austria, Germany and the UK came from a large variety of agricultural systems (large and small scale, mixed farming, dairy or beef farms, arable and horticulture, organic and biodynamic, etc.) and as such, contributed to the project from diverse perspectives and experiences.

Drafting farmers' philosophies and visions of health

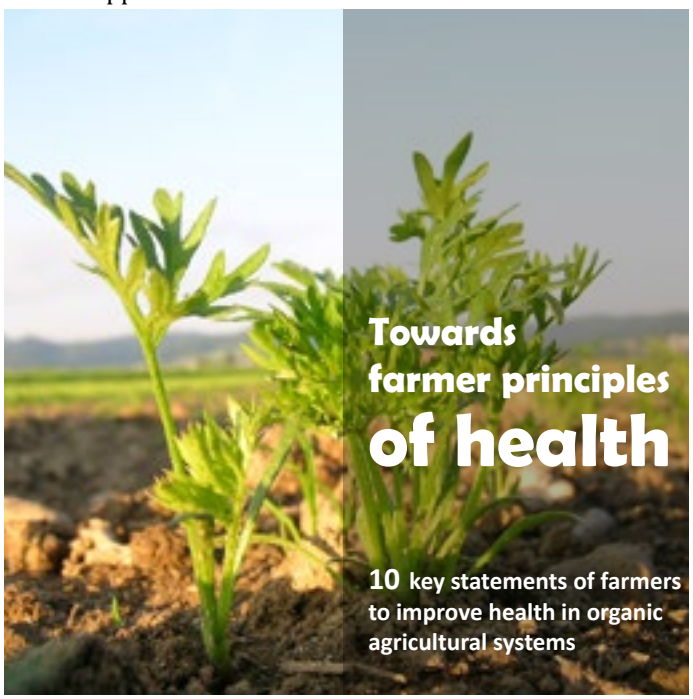
The project team searched the 74 survey responses for patterns, underlying themes and commonalities. It was then possible to recognise the farmers' visions, philosophies and strategies to promote health. This resulted in a list of 12 farmer statements of health, which were presented to the three groups of farmers in the respective countries to see if they could be agreed upon, or if they'd prefer to change or add some statements, or replace them entirely.

Agreeing farmer principles of health

During a series of workshops in Austria, Germany and the UK, organic farmers described and compared their personal visions of making their farm and its outputs healthy, and the individual strategies they follow when promoting health and managing a healthy farming system. After discussing the 12 farmer statements in each country individually, in February 2016 we organised an international workshop which brought the 15 farmers together to try and agree on a list of joint principles that could be transferable to other farmers.

Group discussion with farmers and scientists

Some statements were agreed relatively quickly as they were broadly aligned with the perspectives of all the farmers (e.g. that soil health is central, and the basis for health in all other domains of the farm). However, several 'new' principles were defined by the farmer groups of the project, principles which are normally not often addressed and spoken about in the sector, and which are not yet communicated and explicitly stated as guidelines for organic farmers. These were identified by the farmers to be of particular importance and they include 'softer' and more holistic approaches such as:



- Developing intuition and the ability for self-observation and self-reflection (and taking time to do so);
- Knowing one's own resources and those of the farm;
- The responsible organisation of capacities on the farm, taking its complexity and different processes into account, sharing responsibilities; or
- Awareness that best health is achieved when soils, plants, animals and humans are all considered and integrated in the (health-) management of the farm.

Discussions around intuition and awareness

The importance of intuition, self-awareness, self-reflection and the ability to listen to gut feelings was first raised in the German workshop. Being aware of gut feelings, but then trusting them and daring to listen to them and follow through, regardless of 'what the neighbours might think' was described as a crucial component of running a healthy farming system. The discussions around several of the other statements often came back to intuition and awareness, one farmer stating that "we're always talking about things that are not actually tangible in almost every point. Today we have so many people looking for numbers and measurements, but this is something older, something that we have almost lost, like intuition. It is clear that this plays a role. This inner voice, intuition, awareness, a feeling. In my mind it should be the first point concerning the importance for health". The group of German farmers then decided to add a new statement to the list, describing this overarching principle of intuition.

A similar discussion occurred in the Austrian farmer workshop, where the importance of self-reflection and self-awareness was also highlighted. The ability of the farmer to know his/her own strengths and weaknesses and actively building on this knowledge when managing the farm system was seen as highly important; as well as knowing one's own resources and those of the farm – knowing and respecting the boundaries of the system. The Austrian group also added this as an additional statement to their list.

For the international workshop, these two additional statements were combined and discussed jointly. During this exchange, the UK farmers realised that they too had addressed and evaluated such underlying principles of trust, intuition and self-awareness in their individual national meeting, but somehow hadn't put it into words or included it as an additional statement. They wholeheartedly agreed with it though as many aspects of their discussions about running a healthy farm, from making strategic business decisions to soil management or animal husbandry were related to these 'softer' principles of intuition, self-observation and awareness. They stated, for example. that having the confidence or the "ability to take a step back and let nature and biodiversity sort things out" was in their opinion highly relevant for a healthy farm.

Results - farmers' principles of health

Below we present a selection of these ten jointly agreed farmers' principles of health; the direct outcome of the workshops developed by the farmer groups. The full list of ten statements is freely available online as a booklet *Towards farmer principles of health – 10 key statements of farmers to improve health in organic agricultural systems*. If you are mailed the Bulletin you will have received a hard copy.

- Farmers who aim to run healthy farming systems develop the intuition and ability for self-observation (e.g. (dare to listen to) inner voice, gut-feeling) as part of the observation process of the farm; and they are aware of their own strengths and weaknesses and know their own resources and those of the farm (e.g. social network, basic trust).
- Farmers who aim to run healthy farming systems ensure the manageability and overview of land and processes (diversity, integrity and sustainability), their responsible organisation (design) and optimal organisation of capacities on the farm, so that the complexity and size of the farm does not negatively affect health (also social and societal health). Different scale farms require different processes and organisational structures to achieve health.
- The main goals of farmers who aim to run healthy farming systems shift away from mass production towards quality production. In place of maximising productivity (e.g. with high performance breeds), optimal yields are aimed for. By selecting appropriate breeds and varieties suitable for the site and the farm, qualitative values and multiple outcomes can be achieved; such as quality, optimum yields, resilience, animal welfare, biodiversity, etc. Aiming for high productivity when it comes to achieving multiple outcomes.
- Farmers who aim to run healthy farming systems are aware that they not only contribute to human health through their high quality food products, but that they also deliver highly valuable outputs in other areas (e.g. environment protection, public goods, cultural landscape, water quality, etc.). They get across the story and value of the product and the farm through close communication with, and involvement of customers, consumers, retailers, processors, etc.

Next steps

And finally, in September 2016, a second international workshop was organised, this time linking the farmers with scientists and advisers from a wide variety of disciplines (e.g. soil science, veterinary science, cropping systems, phytopathology, nutrition, social sciences etc.). The aim was to discuss the ten farmer health principles, and to establish the implications and possible next steps for new and interdisciplinary approaches for health research and implementation of the principles in organic agriculture. Together, a variety of research needs emerged and new project ideas for future collaboration within this international and interdisciplinary network were identified during this meeting.

During these discussions, for example, one Austrian farmer commented: "These living principles were formed out of a creatively enriching farmer group, they are very well matured and all farmers that were present are behind the wording and formulations. I am not sure that all scientists can fully share this vitality with us farmers (and they don't have to, they are scientists and not philosophers!)." Another German farmer stated: "The most interesting thing for me is that these 16 farmers have been able to talk about these things in the first place, and that they were able to write them down. For me, these statements are there now, as they are, as developed by the farmers, and they are very important. I think that farmers see themselves in a process of being more and more aware, looking at things differently

and gaining more knowledge and experience. So this is a completely 'floating experience thing' and it is nothing that you can tear apart or build a thesis around."

A scientist added during the final workshop: "I think it is very important to connect with official organic movement representatives for this. But at the same time, I feel there is, as with every movement and sub-movement, a certain risk involved. If you roll this out, if you expand it, it will be diluted as you include more people. Because in the end, the original principles that were identified here, might lose their value if they are shared with so many new people, with completely different ideas and interpretations of what the principles might mean; diluting their idea and perhaps their power."
The discussions during this meeting highlighted that the ten health statements and their validation for a wider application in the farming sector need to be 'rolled out' very carefully and slowly, step by step; first to smaller groups of farmers, understanding and testing the principles in practice, and then steadily expanding to a wider group and other stakeholders.

This project had set out to increase the collaboration and networking among farmers and scientists to jointly think about and create new, more holistic approaches to health measurement and health research in ecological agriculture. The research needs and project ideas from the final workshop are seen as a successful first step in developing this interdisciplinary network of farmers and scientists to jointly design such improved approaches. Through the identification of farmers' own principles of health (in their own words), the project has provided a sound basis for such new 'thinking-patterns' and was able to stimulate and inspire a wide range of farmers and scientists to review and challenge their own philosophies and sometimes unconscious perspectives of health. The collaboration between farmer groups from different countries was particularly fruitful, as the exchange and detailed discussion, comparison and matching of their own personal perspectives with colleagues in the same country, but also with those from different countries, from different backgrounds and farming environments, was seen as highly inspiring and thought-provoking.

Feedback from the UK farmer group

"Since being involved in the HealthNetworks project and the subsequent publication of the booklet, *Towards farmer principles of health*, I have found myself referencing the booklet on several occasions when making important short, medium and long term changes to our farming practices to investigate whether or not they satisfy the statements that we as a group agreed were important to the general principles of farm health. I have found this incredibly useful, especially when making long term decisions about how we manage our soil and how we conduct ourselves on the farm, as well as how we treat employees or contractors who are part of our farming family."
John Pawsey, Shimpling Park Farm, Suffolk

"I enjoyed taking part in the HealthNetworks project. It made me think hard about my business, and about the organic movement in general; it was fascinating to meet farmers from other parts of the EU and hear their opinions, and get an understanding of their motivation also."
Adrian Steele, Chapel Farm, Worcs

"The focus on health has been inspirational; indeed everything that we do on the farm can be condensed down to one word - health."
Richard Gantlett, Yatesbury House Farm, Wilts

"The process of reflection, and doing a presentation of our farming at Cow Hall was useful; and while not resulting in changes as a direct result, has strengthened our perspective and ambition for the health of the livestock and the environment. As an adviser, I am always conscious that there are many ways in which a farm, with its particular system and practices, can deliver the core principles defined by organic farming. However, the concept of health should feature much more strongly in our understanding of those core principles and consequently influence farming."
Mark Measures, Cow Hall, Shropshire

"I have enjoyed being a part of the project and I think I now think of health in a much wider context. It has been very encouraging to share thoughts and concerns from a UK perspective and then hearing the same sorts of things from our European neighbours. It has also highlighted the difficulty of coming up with a definitive list of things to do to achieve the health outcomes we all are striving for. It has made us as a farm more aware of what we contribute to the local environment and community and we will continue to build on what we are doing."
John Newman, Abbey Home Farm

Acknowledgements

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Project partners were: Rebecca Paxton and Milena Klimek, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria; Ralf Bloch and Johann Bachinger, Leibniz Centre for Agricultural Landscape Research (ZALF), Müncheberg, Germany; Thomas F. Döring, Humboldt University Berlin, Berlin, Germany; and Lawrence Woodward (ORC).

Organic Roundtable to develop new Organic Action Plan for England

Organic organisations met with Defra officials, including the new head of the organic unit Kathleen Kelliher, on 29th June for the first meeting of the new Organic Roundtable formed by Defra and the English Organic Forum.

The meeting started the process of developing an industry-led organic action plan for England. The aim is to launch the new action plan early in 2018. Roundtable meetings will take place quarterly in the meantime, with subgroups working on specific elements. The initial areas to be developed will include future conversion and maintenance support payments; international trade; research and information; organic food including procurement; regulations and equivalency; and small-scale/short supply chain approaches.

The Roundtable and the action plan development will provide an important opportunity to engage with Brexit policy discussions as preparations for the Repeal Bill, which will incorporate the EU Organic Regulation into UK law, and the new Agriculture Bill, which will set out the basis for future agricultural and agri-environmental support are made.

The Organic Roundtable has been established as a joint initiative between Defra and the English Organic Forum, which is co-ordinated by the Organic Research Centre and represents all the organic organisations, including Biodynamic Association, Garden Organic, Landworkers' Alliance, NFU Organic Forum, Organic Arable, Organic Farmers and Growers, Organic Food Federation, Organic Growers Alliance, Organic Milk Suppliers Co-operative, Organic Trade Board, Soil Association, as well as Abacus, Triodos Bank, Future Sustainability and ECOS consultancy.

The development of an industry-led organic action plan for England will build on previous experiences in England and Wales, as well as the Scottish Organic Action plan launched in 2016[1]. ORC contributed to a review of the current status of organic action plans in Europe for the IFOAM EU Group[2] and is currently advising an Interreg project, SME Organics[3] to develop regional action plans in eight European regions. The SME Organics project will also produce an updated version of a manual on Organic Action Plan Development originally published in 2005[4].

If you'd like to be involved with the action plan development process, please contact Nic Lampkin (nic.l@organicresearchcentre.com). ORC would also welcome financial support for the work that will be needed to develop the action plan and engage with the ongoing Brexit policy debate – if you can help, please get in touch!

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One step closer to a new Organic Regulation – or is it?

On the 28th of June 2017, the Triologue of three key EU institutions (Commission, Parliament and Council of Ministers) reached a political compromise agreement on the main text of the new main Organic Regulation. The compromise text is subject to subject to some technical and legal checks and still needs to be endorsed by the Council and then by both the Parliament's Committee on Agriculture and Rural Development and the Parliament's plenary.

Trying to sum up key differences to the current Regulation is not so easy, as many issues changed during the negotiation period up to the last minute. Defra believes that there have been some gains from a UK perspective. ORC and other UK organic organisations are involved in working through the detailed text for technical consistency, and to explore the impact the new regulation will have on organic operators and the control procedures, as well as how this can and will be incorporated into UK law after Brexit.

If all this happens as planned, a new Organic Regulation will replace the current Regulation (EC) No 834/2007 and is likely to apply from 2020 onwards. From September 2017 on, the institutions and the organic stakeholders will start focusing on the implementation part of the new Regulation: the delegated and implementing acts which would replace the current Regulations (EC) No 889/2008 and (EC) No 1235/2008.

SME ORGANICS
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However, the process may still not be a smooth one. The Council of Ministers was due to endorse the Trilogue outcomes at the AGRI Council meeting on 17th July, but the item was pulled from the agenda at the last minute, suggesting that there may have been concerns that the necessary endorsement from Member States would not be forthcoming. From the IFOAM EU Group's perspective, even though the last compromise text took several of the organic movement's concerns into account, it continues to present a number of potential implementation problems.

These issues will need to be solved before the final official approval by the 28 National Agriculture Ministers in Council, now expected in October, and of both the Parliament's Agriculture Committee, also expected in October, and of the whole Parliament, which is expected at the end of the year/ beginning of 2018.

This long process shows the complexity of the EU law-making process based on the Treaty of Lisbon that involves many institutions and actors, partly with divergent positions, needs and requests that all have to be considered in the negotiations.

Organic farm incomes in England – 2015/16 data published

The latest report from Rural Business Research at Newcastle University, published in April 2017, has analysed the results from 147 organic farms recorded as part of the Farm Business Survey. This article been extracted from the Executive Summary of ***Charles Scott's*** *report.*

In 2015/16, all organic farm types recorded a greater farm business income (FBI) per ha than their non-organic counterparts and these differences were statistically significant for three of the six farm types. At the farm level the organic dairy, LFA grazing, and lowland grazing farm groups also recorded a significantly higher FBI than the non-organic farms.

With the exception of the LFA grazing group, the higher FBI is universally due to a lower expenditure on costs, and despite an overall lower farm output (FBO). The organic LFA grazing group has both a greater farm output and a greater expenditure on costs than the non-organic LFA grazing farms. On a year-on-year basis, FBI has increased for all organic farm types except dairy and LFA grazing farms.

Organic cropping farms earned on average an FBI of £240/ha, £39/ha more than the non-organic cropping farms, but at the farm level the organic cropping farms recorded a slightly lower FBI than the non-organics. These differences are not significant at either the per hectare or the farm level. The higher FBI/ha was due to a lower expenditure on costs per hectare (£1,095/ha versus £1,303/ha) and despite a lower total farm output per hectare (£1,345 versus £1,498). Organic cropping farms saw an average increase in FBI/ha of 4% between 2014/15 and 2015/16. This increase in profitability was due to an 6% increase in total output to £1,341/ha and despite a 5% increase in total costs to £1,099/ha.

Organic dairy farms recorded an FBI of £405/ha, a significant £125/ha more than the non-organic dairy farms. Total farm output was £470/ha lower on the organic dairy farms, but their costs were £600/ha lower. Organic dairy farms were typically smaller with an average of 183.6 Grazing Livestock Units (GLU) on 146.4ha compared to 261.1 GLU on 261.2ha for the non-organics. Between 2014/15 and 2015/16 the FBI/ha on organic dairy farms fell by 19%; this due to a 10% increase in total costs at a time when total output only increased by 4%.

In 2015/16 organic lowland grazing farms recorded an average FBI of £219/ha compared to their non-organic counterparts' £116/ha – this difference was significant (at both the farm and the per hectare level). The average FBO/ha for organic farms was £46/ha less than the FBO/ha for the non-organics, primarily due to a lower output from agriculture, but organic farms had lower total costs by £148/ha. The profitability of organic lowland grazing farms in 2015/16 was 16% higher than in 2014/15 with the identical sample achieving an FBI of £193/ha in 2015/16. This increase was due to a 10% reduction in costs and despite total farm output falling by 6% to £915/ha.

As has been the case for some years organic LFA grazing farms remained more profitable than their non-organic counterparts with an average FBI of £36,036/farm, £17,308 more than similar non-organic farms. This difference is significant at the farm level but not at the per hectare level (where the difference is £30/ha). This was due to the greater output of organic farms across all cost centres, despite a considerably higher total costs figure.

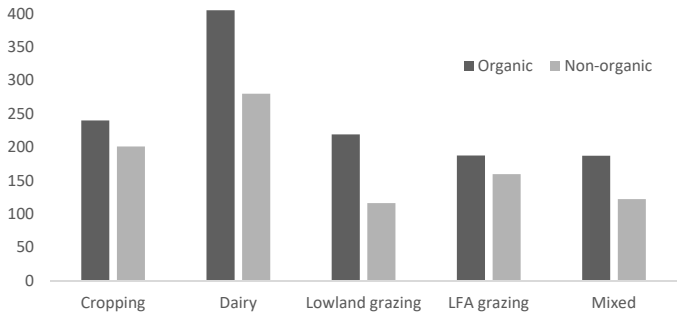


Figure 1: Farm Business Income (£/ha) by farm type England, 2015/16

The average size of an organic LFA grazing farm is 192.3 adjusted hectares (adj. ha) carrying 136.7 GLU whereas a non-organic farm is typically 119.1 adj. ha and carries 86.3 GLU. Organic LFA grazing farms saw a 14% fall in FBI/ha between 2014/15 and 2015/16 – down to a 6% fall in total output (including a 30% fall in agri-environment type revenues) and despite a 3% decrease in total costs.

Organic mixed farms had a significantly higher FBI/ha (of £187/ha) than their non-organic equivalents (of £122/ha). While organic mixed farms earned £221/ha less in total farm output they also spent £293/ha less in total costs. Organic mixed farms saw a 31% rise in FBI from 2014/15 to 2015/16 to £151/ha. This was due to a 1% increase in FBO to £1,294/ha, and a 2% or £25/ha reduction in total costs to £1,142/ha.

Data are also available for horticulture, though not included in the Figure for presentational reasons. The FBI/ha for organic horticulture farms of £1,430/ha was greater than that of the non-organics by £255/ha (although not significant). Non-organic horticulture farms operated a much more intensive operation than organic horticulture farms, FBO being £11,693/ha for non-organics versus £3,912/ha for organic farms. The total costs for non-organic horticulture farms were £10,528/ha but £2,483/ha for organic farms. The FBI/ha on an identical sample of organic horticulture farms increased between 2014/15 and 2015/16. This due to a 10% increase in total output and despite a 4% increase in costs. The small sample size of the identical sample (of 9 farms) means that some care must be taken in interpreting the year-on-year results.

The full report, Organic Farming in England 2015/16 (ISBN: 978-0-903698-65-8), is available from RBR at Newcastle University, School of Agriculture, Food & Rural Development, Newcastle University, Newcastle upon Tyne, NE1 7RU. Reports are also available for the previous three years.

Previous years' Farm Business Survey data for England and Wales combined have also been analysed by the Organic Research Centre and Aberystwyth University, and the reports can be found at: http://tinyurl.com/OFIreports. The Newcastle report's results are consistent with these analyses, although a different basis for comparison with non-organic farms has been used.

Detailed enterprise costings and an analysis of the 2014/15 data by ORC can be found in the 2017 Organic Farm Management Handbook published by ORC and available to order online at: www.organicresearchcentre.com.

ORC at National Organic Combinable Crops 2017

We are partners in NOCC 2017 - National Organic Combinable Crops - OF&G's flagship event, which is the largest UK on-farm event in the organic calendar. We were lucky that this year it was held just down the road from us at Fullerton Farms Partnership, near Andover in Hampshire. That meant that we were able to be more involved than ever, bringing our expertise on intercropping, cereal diversity, use of on-farm woody resources, and measuring the life in your soil to the event. ***Phil Sumption*** *rounds up our activity at NOCC 2017.*

Martin Wolfe on the morning's panel, chaired by Charlotte Smith, on 'Seed quality: breeding and selection and harvest'.

ORC stand

Nic Lampkin makes a point in the morning's discussion

Trees and hedges can present management challenges for farmers, but could be an untapped resource. Sally Westaway from the agroforestry team at the ORC was joined by William Hamer, forestry consultant and director of Hampshire Woodfuel Cooperative, to discuss the pros and cons of managing on-farm woody resources including hedges and small woodlands as a productive part of the farm enterprise.

Katie Bliss flies the banner for Agricology

Principal Crop Researcher Ambrogio Costanzo with a sample of ORC Wakelyns Population. Ambro took attendees through a history of wheat breeding with examples of ancient cereals to modern day.

ORC researcher Anja Vieweger demonstrating practical soil assessment methods indicative of soil biology including, simple spade tests, visual soil assessment (colour, smell etc.), and earthworm counts.

Crops Researcher Dominic Amos explains the intercropping trials

ORC staff enjoying a NOCC breakfast!

Retro wheats for food diversity in organic systems

Wheat is the most common of all cereals and you would be forgiven for thinking that only one species exists, especially since it accounts for about 95% of the wheat grown[1]. Actually, there are several members of the genus Triticum that have been cultivated over the last 10,000 years but many of these 'ancient' types have been forgotten. Einkorn, emmer and rivet were all once widely grown and now, as part of the Diversifood project, ORC is undertaking research into these ancient wheat species to evaluate their suitability for organic production in the UK. ***Dominic Amos*** *takes up the story, re-told in plots at NOCC 2017.*

The wheat we grow now, *Triticum aestivum,* is the result of a natural hybridisation between two wild species of grass, emmer (*Triticum dicoccoides*) and goat grass (*Aegilops tauschii*), 10,000 years ago. The origin of cultivated wheat began with einkorn (*T. monococcum*) with other types such as emmer (*T. dicoccum*) and durum (*T. turgidum* subsp. *durum*) occurring through further hybridisations and natural genetic differentiation.

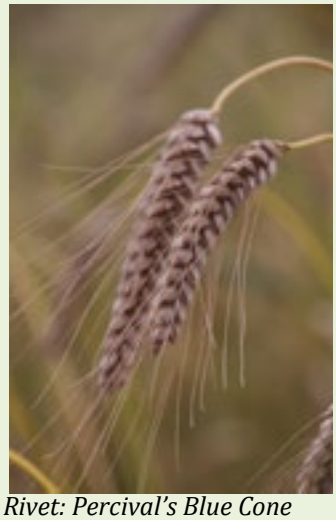
Over centuries of selective breeding, and the last few decades of modern industrialised agriculture, we are left with one dominant type of wheat, commonly known as 'bread wheat', although spelt and durum do have their place.

Exploring the agronomic characteristics of these ancient wheats for their potential in organic systems is one of the tasks of the Diversifood project. The aim is to increase the diversity of crops on farm and, as a result, the diversity of food on our plate. It's also important to recognise the heritage and traditions surrounding many of these crops which were widely grown by our ancestors. For example, several recipes still exist though are no longer used. Furthermore, these species represent a broad genepool with huge potential for further breeding improvement in wheat in general.

ORC has been growing several accessions of einkorn, emmer and rivet at Doves Farm for the last two years. Doves is known for its speciality flours and in fact grows its own emmer and einkorn, making it an ideal partner given the whole chain approach focus of the Diversifood project. The varieties grown commercially at Doves have come from the Hungarian Academy of Sciences and are the result of an organic breeding programme to develop suitable einkorn and emmer crops for low input systems. Actually, the crops are already suited to low-input agriculture, having not undergone the same extreme selection under high-input conditions as our modern bread wheats. Many of the varieties we're growing in our experiment have been sourced from gene banks across Europe. Most of the einkorns and emmers are from Hungary and several rivets have come from ITAB in France, although we're growing two old English landraces (Bluecone and Rampton) that were sourced from the John Innes Centre Germplasm Resource Unit.

Agronomically speaking, einkorn looks to be the most promising species for UK cultivation, with its strong ability to tiller and to mine nutrients, its disease resistance and its competitiveness. In our trials at Doves farm the ancient wheats have outperformed the bread wheats in almost every category. What remains to be seen is whether this will translate into higher yields, especially since due to the much taller nature of the ancient wheats, lodging can be an issue.

Experience has shown that some of these accessions could be very useful as a second or third cereal in a rotation or for areas of the farm where soil conditions are poor.



Rivet: Percival's Blue Cone

Something else we have learnt this year is that on higher fertility land, the risk of lodging is high and if seed rates aren't adjusted accordingly then the ancient wheats can fall down. This year for NOCC, we drilled plots of einkorn, emmer and rivet but unfortunately, as a result of high fertility in the field, slightly high seed rates and wet and windy weather in mid-June these have all lodged. We have even seen lodging in the Wakelyns Population, which no-one at ORC has encountered before. What this does highlight is that species and variety selection should be farm specific and what may prosper somewhere will not necessarily perform in other environments. In fact, for the demo plots at this year's NOCC event, the best looking crops are unsurprisingly the crops the farmer has in his rotation, showing there's no substitute for trial and error and your own experience.

One aspect that will be explored by Diversifood project partners is the nutritional and nutriceutical properties of the grains, with some research already suggesting increased levels of phytochemicals beneficial for health including antioxidants such as phenolics, flavonoids and carotenoids[2,3]. In fact the flour of both einkorn and emmer is a creamy yellowish hue due to the high carotenoid content. The einkorn flour can be used in bread but is of particular interest for malting to make beer. Emmer flour can be used in bread, biscuits and cakes. Rivet wheat, a close relative of durum, and believed to have been brought over to Britain by the Normans, is being grown with the expectation that it can be used to provide a source of flour for British grown pasta. The straw is also strong and can be used for thatching. Rivet wheat is free threshing and therefore doesn't pose the processing issues that hulled wheats like spelt, einkorn and emmer do.

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'Better together!'

*We know from plant ecology that in nature diverse communities generally work better than uniform ones[1,2]. These benefits can also be obtained in agroecosystems where the growing of two or more crops together simultaneously in the same piece of land has been shown to be beneficial in terms of yield stability, increase in total yield, pest and disease management, weed management, erosion control, and soil fertility[3,4,5]. **Dominic Amos** reports on work investigating the potential of intercropping as a practice for building resilient cropping systems, as part of the Diversifood project.*

Trials are being carried out at the University of Reading Sonning Farm looking at spring wheat and beans in combination, with different spatial arrangements (alternate or mixed rows), throught the EU Horizon 2020-funded Diversifood project. A spring version of the ORC Wakelyns population is also being tested, to compare its performance in an intercropping situation compared to a standard elite line, and also to apply a selection pressure in order to encourage adaptation as an intercropping component. The Spring population has been developed by continued spring sowing of the winter population which has selected for genotypes with a lower vernalisation requirement and a shorter growing season. Plots that include both a bean and a wheat population will continue to be grown each season to monitor both adaptability and yield stability. Results from this experiment will be available in the next Bulletin.

As well as the trial at Reading, various intercropped plots were drilled for NOCC 2017 and were on show for visitors to view. Various wheat and bean mixtures (all mixed rows) have been sown, including two elite bean cultivars, Vertigo and Fuego, and a bean composite cross population developed in the SOLIBAM project. We've again included a spring wheat population as well as the two elite wheat lines, Mulika and Paragon. The idea is to look at how varietal selection can make a difference when designing crop partnerships and to think about some of the other key considerations including spatial arrangement, drilling rates and canopy height.

Intercropping spring beans and wheat trials at Sonning Farm

Research has shown that a 50:50 mix does not always perform best. We also included plots of various spring cereals (wheat, barley, oats and triticale) and pea mixes from Western Seeds Combicrop blends, although unfortunately at the time of writing the peas had failed to come through due to the incredibly dry spring. It could be argued that this is one of the benefits of an intercrop as risk is spread so that if one crop fails a second is able to take its place and continue to provide the farmer with a crop.

The idea behind mixing a cereal and grain legume is to provide a feed high in both protein and starch, giving a boost to protein by up to 50% above that of a straight cereal. Foliar disease risk in the cereal is reduced, and residual nitrogen is left by the peas for the following crop. The cereal-legume canopy architecture is complementary, with the cereal providing support for the pea to climb. Peas will ripen a little earlier than the wheat or oats but will hold on until the cereal component is ready to harvest. The peas and barley should come at the same time. These cereal/pea blends can be combined dry, crimped or wholecropped, and the straw is also very palatable. Growing these mixes could help reduce or even eliminate the need for bought-in concentrate.

Finally, although not part of the intercropping showcase, a plot of Carlin peas, also known as Black peas or black badger peas has been drilled, and despite the dry conditions has come through very well. Carlin peas (*Pisum sativum* var. *arvense*) are being grown by Hodmedod's, the innovative British pulse and grain retailer, and can provide a very suitable British-grown substitute to both chickpeas and lentils.

An intercropping event was held at the beginning of June at Shimpling Park Farm, as part of the OK-Net knowledge exchange project, with farmers from France experienced in intercropping practice sharing their experiences.

A new project focusing on intercropping called Diversify has just started and will explore the practice in depth over the next few years (see p18).

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ORC Wakelyns Population

Harvesting ORC Wakelyns Population. Photo: Mark Lea

Seed of the **ORC Wakelyns Population** is on sale for this autumn. This is a good opportunity to get a new concept of wheat into your field.

What is it? It is not a variety, as individual plants are not identical, and it is not a mixture either. Think of it as a crowd, in which each plant is different from each other. It is the outcome of 107 crosses between 20 parents, selected to be either high quality or high yielding, bulked and reproduced year after year in organic farms.

How does it work? Its performance builds upon 'four Cs': **Capacity,** as it has high phenotypic variation; **Complementation**, as different individuals can complement each other; **Compensation**, as, if some fail, others will take their place and the whole will recover, and **Change**, as evolutionary changes make the best performing types to be prevalent in response to environmental selection.

How does it grow? Thanks to the 'four Cs it performs well in organic farms, because that's where it has been reproduced, being productive, stable and resilient. In fact, the Wakelyns population is able to withstand stresses thanks to its diversity. For instance, it has resistances to pests and diseases for two reasons: first, being a crowd of different types, it does not offer a uniform breeding ground for pests and diseases to spread; second, having been reproduced in organic farms in the UK, it 'knows' the local pests and diseases it has been exposed to better than us, as it selected itself to be resistant to them. It is also able to withstand all those unpredictable stresses that commonly threaten the performance of common varieties. Several times we have seen it performing very well when sown in suboptimal conditions, e.g. much later than recommended, whereas common, uniform varieties sown in the same place and in the same way have completely failed.

How does it taste? It has a good baking quality, it is as nutritious as most common milling varieties and it is suitable for animal feed as well. As for all organic wheat, it is difficult to standardise a bread-making process, and it is more relevant to know the flour and build the processing on this knowledge. That is what some innovative bakers have done, with tasting of products available at NOCC 2017 (see opposite).

How do I get it?
Contact: crops@organicresearchcentre.com

Baking the story

ORC Wakelyns Population flour is giving a Nottinghamshire baker a unique chance to strengthen relationships across the supply chain and produce a more sustainable loaf of bread.

Thanks to her links with BBC Food and Farming nominees, Hodmedod's, Kimberley Bell of the Small Food Bakery in Nottingham is using flour from the Organic Research Centre's Wakelyns Population wheat to bake a very special variety of sourdough bread. Now ORC is working with Kimberley to find out how easy the crop's resulting flour is to bake with, and whether it results in a tasty loaf which has a strong story to tell consumers about how their bread was produced.

"I started using the Wakelyns flour after Hodmedod's sent me a bag," says Kimberley. "When I tried it I realised that it might be an interesting type of grain from its flavour, so I asked Hodmedod's what it was, and that's when I discovered its incredible story."

For Kimberley, aside from the flavour, the flour from the Wakelyns Population connects heavily with her bakery's ethos to produce better-tasting food which is not only more sustainable for the environment, but has strong links to primary producers. By ensuring her farmer suppliers are given fairer prices for their produce, Kimberley wants to help shorten supply chains and build relationships with growers so that her customers can get a better understanding of where their food comes from.

"The Wakelyns wheat has the most incredible set of credentials," she adds. "People often argue that wheat production can never be sustainable, but the Wakelyns wheat seems to be part of the solution to our environmental problems of mono-cropping and using so many inputs.

"Our customers have been really interested in the story behind it too, and anything which helps connect people to their food is fantastic."
(Source: OF&G)

Kimberley Bell offers samples of sourdough bread and cookies made with ORC Wakelyns Population flour to delegates at NOCC 2017

New trustees at ORC

Tim Bennett

Tim farms with his wife Susan in Carmarthenshire, West Wales. The farm is mainly organic and grassland-based with some woodland. Tim is Chairman of CIEL the agri-tech centre for Livestock innovations and also of the Farmers Club in London. Tim is a former Chairman of the Food Standards Agency, former President of the NFU and of DairyCo (now AHDB Dairy). He has held many other roles in the Industry including governor of the Institute of Ggrassland and Environmental Research and is a member of the Welsh Land tribunal. He is a Fellow of the Royal Agricultural Society and of the Institute of Grocery Distribution.

Adrian Blackshaw

Adrian is Chairman of the Organic Trade Board (OTB). He is also a partner in a commercial organic apple and walnut business. He was previously Chairman of Herefordshire Food Partnership and Herefordshire Tourism Company. He has had Board involvement with Herefordshire-based organisations, including executive responsibility in Herefordshire for economic regeneration, and is a past Business Ambassador for the new emerging Hereford University. Adrian has had a varied business background in a number of industry sectors, including medical product development, electronic publishing and as an investment banker. He gained considerable City experience with the Financial Times and as a Director of two quoted companies. He was vice-Chairman of West Mercia/ Warwickshire joint Police Audit Committee, majoring on Treasury & Risk Management, scrutinising operational, financial and reputational risk.

Donald Peck

Donald is a retired emerging markets economist, who spent much of his career in South Asia and South America as a business adviser and investor. He worked for the World Bank Group in Washington DC, and then for CDC, the South Asia and Africa investment arm of DFID; later spending 12 years in India investing in businesses large and small. In 2005 he helped found Lok Capital, an initiative in India investing in social enterprise with funds under management totaling over £100m. He advises Paul Hamlyn Foundation on their India grants programme and other investors on social enterprise and impact investment in emerging markets. Since 1994 he has been a trustee and, since 2010, Chair of the UK Foundation Rachel & Pamela Schiele (FRPS), which runs a significant organic farming business in Argentina. He is also a treasurer (since 2009) of the Institute for Public Policy Research, and a trustee of St John's Smith Square and ThinkAhead and a member of the board of an Indian infrastructure finance company, IDFC Ltd.

Andrea Stewart

Andrea has 18 years experience working in advocacy, communications and marketing. At Berry Bros. & Rudd, Andrea promoted pioneering biodynamic and organic European wine producers. In India, Andrea worked on sustainable development and advocacy programmes in rural communities. Andrea worked with NGO's including CARE and Oxfam on an innovative collaboration to improve disaster coordination, risk reduction and accountability practices. Andrea is currently Head of Advocacy & Communications for a large network at the Centre for Tropical Medicine & Global Health at Oxford University. Andrea studied International Relations, Politics and Economics and completed postgraduate studies with the Chartered Institute of Marketing (CIM). Andrea is a keen champion of organic principles and practice, and is delighted to support ORC's communications and advocacy initiatives.

Margaret Wagner

Margaret has worked in marketing for more than 20 years. Her focus is on brand building and driving new revenue streams for large, multi-nationals, including. Samsung, Citibank and Jaguar Land Rover. Originally from Connecticut, she worked in the marketing field for 15 years before creating her own start up in the retail sector. Margaret moved to London 7 years ago to focus on corporate development, building up a European service offering for a large US-based marketing agency. She has a passion for Corporate Responsibility and has led programmes in sustainability, women in leadership and corporate recycling. She is a strong advocate of organic and local farming and is passionate about taking both her marketing and business skills to this community to drive more sustainable and profitable commercial relationships.

Christine Watson

Christine is Professor of Agricultural Systems at SRUC and a Guest Researcher at the Department of Crop Production Ecology at SLU (Swedish University of Agricultural Sciences). Christine leads a team of soil scientists working across the biology, physics and chemistry of soils. Her own research focuses on the management of micro and macro nutrients in organic and conventional agricultural systems. From 2003-2010 she served as a member of the Advisory Committee on Organic Standards (ACOS) and also chaired their R&D Subcommittee. Christine is a member of the Scottish Organic Forum and helped develop Organic Ambitions (Scottish Organic Action Plan 2016). She is involved in managing and teaching the SRUC MSc in Organic Farming which is now delivered in partnership with ORC. Christine was President of the European Society for Agronomy (2014-2016), and is currently President of the Association of Applied Biologists and an Associate of the Royal Agricultural Societies.

Ned Westaway

Ned is a specialist barrister who practices at Francis Taylor Building in London. He is rated as a leading junior by Chambers & Partners in three areas: planning, environment and agricultural & rural affairs. He is on the Attorney General's Panel of London counsel, is a trustee of the United Kingdom Environmental Law Association and is standing counsel for the Campaign for National Parks.

Project news

DiverIMPACTS

ORC is a partner in a new five year crop diversification project under the EU Horizon 2020 programme, called DiverIMPACTS (Agreement No. 727482). The project is led by INRA (France) and aims to realise the full potential of crop diversification through rotation, intercropping and multiple cropping. The work aims to demonstrate clear technical, economic and environmental benefits of crop diversification for farmers, value chains and society. It also aims to provide key tools, strategies and innovations to remove any barriers and ensure uptake of practices and subsequent benefits at farm, value chain and regional levels.

ORC will carry out three case studies with UK businesses/farms and their value chains who have successfully adopted crop diversification. In each system a large variety of indicators will be monitored over 3-4 years (including water use, soil health, species diversity, material and energy use, stability of production and market, value creation and benefits for local communities, quality of life and public health). We will also work with an external expert group from relevant sectors (farming, processing, regional and EU policy makers, education and supporting industries) to develop strategies and recommendations for the various actors along the value chains.

ORC contact: anja.v@organicresearchcentre.com

Plant Teams

The four year Horizon 2020-funded DIVERSify project (No. 727284) 'Designing InnoVative plant teams for Ecosystem Resilience and agricultural Sustainability', led by Scotland's James Hutton Institute, is set to explore innovative mixed-species crop systems, or 'plant teams'. The adoption of such plant teams requires crop scientists to devise novel cropping systems for farmers to increase resource-use efficiency and reduce nutrient loss to groundwater, provide new knowledge and tools for crop breeders to develop suitable varieties, and provide information for agronomists to optimise management on-farm.

The DIVERSify consortium, which includes ORC, comprises 23 partner organisations, representing scientists, farmers, advisers, breeders and technology providers, from 14 countries in Europe and worldwide. ORC will work with stakeholders, through a series of meetings (see back page), to identify tacit knowledge, bottom-up innovations and strategies for best practice, and develop knowledge exchange to promote the adoption of successful plant teams.

The project will also develop a suite of tools to aid adoption of plant teams. These include a novel modelling tool for design of innovative plant teams, and agronomic specifications for plant teams, including farm machinery adaptations. A web-based and mobile-phone friendly decision aid will be produced for practitioners to select suitable plant teams in different regions and farm types.

Contact: diversify@organicresearchcentre.com
https://www.plant-teams.eu/

LIVESEED—boosting organic seed

This 4-year EU Horizon 2020-funded project (Agreement No. 727230) aims to boost organic seed and plant breeding efforts, and increase the availability of cultivars adapted to organic growing conditions. The project will help to establish a level playing field in the organic seed market across Europe, improve the competitiveness of the organic seed and breeding sector, and encourage greater use of organic seeds by farmers. LIVESEED will improve guidelines for cultivar testing and strategies for ensuring seed health. It will develop novel breeding approaches suited for organic farming. Finally, it will investigate socio-economic aspects related to the use and production of organic seed and their interaction with relevant (EU) regulations. The LIVESEED project is coordinated by IFOAM EU and consists of 35 partners from 18 countries.

AFINET

AFINET (Agroforestry Innovation Networks) is a collaborative European project, funded under Horizon 2020 (No. 727872), which aims to support innovation in agroforestry through enhancing knowledge transfer between farmers, foresters, researchers and advisers. In the UK, the project is led by Abacus Agriculture and ORC. As part of this we are forming a new agroforestry innovation group in the UK to improve practice in agroforestry by sharing existing knowledge and by identifying gaps where more information or research would be helpful. As a start we have put together a short survey to establish a list of people interested in finding out more and/or getting involved and to understand a bit more about people's interests and motivations:
www.surveymonkey.co.uk/r/CCNKR7B

The above projects have received funding from the European Union's Horizon 2020 research and innovation programme.

Soil biology and soil health partnership

ORC is a partner in the new five year AHDB-funded research project 'Soil Biology & Soil Health Partnership', coordinated by NIAB. Other partners include SRUC, ADAS, FERA and GWCT. The project is covering three work packages:

1. Benchmarking and baseline activities (translating existing knowledge, a soil health score card and scoping molecular approaches for soil health);
2. Measuring and optimising long-term impact of soil management (soil health assessment, soil amendments in horticulture, DNA based assessments etc.) and
3. Co-designed knowledge exchange (on-farm monitoring of soil health and knowledge exchange events).

ORC will contribute to the partnership through on-farm monitoring of soil health and close collaboration with groups of growers, farmers and other stakeholders to ensure the development of useful results and practical applicability of outcomes.

ORC contact: anja.v@organicresearchcentre.com

Staff news at ORC

Charlotte Bickler—Crops Researcher

Charlotte started at ORC in April. Her work focuses on breeding; increasing diversity and resilience in agricultural systems, particularly within crops at a genetic level. She joins us from RBG Kew's Millennium Seed Bank, where she worked on the Adapting Agriculture to Climate Change project, developing methods to characterise crop wild relatives; identifying potentially useful genetic variation for use in breeding of resilient crops, with a focus on wild carrot species. Her PhD at Bristol University explored the role that genes and the environment play in shaping evolutionary responses in the cowslip, *Primula veris*, and how best to conserve such evolutionary potential.

Tegan Gilmore—Crops Technician

Tegan joins us as the new trials technician for the crops team, working predominantly on the Whealbi and Diversifood projects. Previously, she worked for Emorsgate Seed, a company that farms and distributes wildflower seeds for restoration and gardening projects. She has also worked for the National Botanic Garden of Wales, using a genetic identification technique called barcoding to explore the diets of honeybees, and the sapling community of a tropical forest. In her spare time she works as a theatre technician at the Edinburgh Fringe festival, and is a big fan of podcasting.

Richard Holmes—Deputy Director

Richard joined us in July as Deputy Director, Finance and Resources. Prior to this Richard served as Chief Operating Officer for a large shared service centre offering finance and HR services to the Department for Business, Innovation and Skills and the UK Research Councils. He has a background in Engineering and spent 10 years working for British Aerospace, before qualifying as an accountant and working in various managerial and directorial roles in the water industry. He is a Member of the Board of Governors of the University of the West of England and has spent all his adult life volunteering for the Scout Association.

Alexander Jackson—Admin Assistant

Alex joined ORC in March, assisting with enquiries, facilities, events, and other tasks. Alex has a background in music, having completed an undergraduate degree last summer. He enjoys cycling, singing in local choirs, and reading.

Anna Sellars—Business Researcher

Anna joins us from the Technical Centre for Agriculture and Rural Cooperation in the Netherlands. Her role will involve research on developing organic business and market opportunities in the UK, and work on the CERERE, DiverIMPACTS and Diversifood projects. Anna has an MSc in Development Studies from the London School of Economics, and experience of WWOOFing on farms in Ireland and Scotland. Her hobbies include hiking, baking, and playing folk music.

Nicola Smith—Livestock Researcher

Nicola joined us after starting her Master's thesis at ORC a few months ago. Her role as livestock researcher will be focused on the iSAGE project (*Innovation for Sustainable Sheep and Goat production in Europe*). Nicola also works part-time for the National Sheep Association, on research within the sheep sector. Other than managing a small flock of 200 breeding Romney/Lleyn ewes, Nicola fills her free time with rock climbing, mountaineering and triathlon training.

Kevin Waldie—Agroforestry Communicator

Kevin joins the agroforestry team as a research communicator. Kevin has had a long interest and involvement in the rural sector. He worked as a social development adviser for the Department for International Development in Kenya, Nepal and Ghana on a series of rural development projects. Following this, Kevin was a lecturer at the School of Agriculture Policy Development, University of Reading. Kevin is also a film-maker with a Master's degree in Documentary Practice. His recent film, *Belgian Blues*, focuses on the life of a West Berkshire dairy farmer. It was awarded the emerging talent prize at the 2017 Cheap Cuts documentary film festival in London.

Sarah Webb—Finance Officer

Sarah joins us from Stanley Gibbons and previously West Berkshire Council as Finance Officer. When not at ORC she enjoys socialising with friends, visiting National Trust properties, walking, theatre trips and the cinema.....and when she isn't gallivanting around she enjoys gardening and getting absorbed in a good book!

Lindsay Whistance—Livestock Researcher

Lindsay joined ORC in April. After working as a full-time and relief stockperson for several years, Lindsay took a BSc (Hons) in Animal Science (Behaviour) at the University of Lincoln, followed by a PhD (Harper Adams), focusing on the eliminative behaviour of dairy cows. At Foulum AU, in Denmark, Lindsay worked with organic dairy farmers to reduce their use of antibiotics without compromising herd welfare. At Bristol University, she helped to develop a training tool for vets to better assess compliance with legislation on European pig farms. Her work at ORC includes working closely with sheep and goat farmers in case study trials (iSAGE) and investigating the benefits of trees to livestock, particularly as fodder. Outside of work she enjoys walking as well as growing and preserving food.

Goodbyes to Rachel, Margit, Atul and Oliver

Many thanks, goodbye and good luck to: Rachel Lewis, our Communications Assistant on Agricology, who leaves us to take up a career in ecology; Margit Demiriz our Finance Officer takes up a new post; Atul Srivastava, our Major Donor Fundraiser has gone freelance and Oliver Rubinstein, our Business and Markets Researcher leaves us for a postion at RSK ADAS.

Tree to Heat: Making the most of on-farm woody resources

*A workshop based around the journey from 'Tree to Heat' was held at Wakelyns Agroforestry in January 2017. This workshop was part of an EU-funded project, SustainFARM, which aims to investigate the economic and environmental performance of both traditional and innovative agroforestry systems. ORC researchers **Sally Westaway** and **Samantha Mullender** report on an action-packed event which combined machinery trials, demonstrations and a farm tour together with a workshop to help identify sustainability indicators for agroforestry systems.*

On a beautiful cold crisp morning in January 2017 we were greeted by several large machines making their way down the farm track to Wakelyns Agroforestry; they had come to take part in ORC's agroforestry coppicing trials and to give a live demonstration as part of a stakeholder workshop.

Wakelyns, an innovative agroforestry farm in Suffolk, is one of the UK case study farms for the SustainFARM project. The farm, established in 1994, incorporates a mature field boundary hedgerow network, willow and hazel short rotation coppice (SRC), mixed timber and fruit trees intercropped with organic arable crops and vegetables. This diversity makes Wakelyns an ideal trial site for investigating the management and production of multiple non-food products from a range of different agroforestry systems. The aims of this trial were to compare the different agroforestry systems in terms of the logistics of woodfuel production, including appropriate machinery and methods; the length of rotations, cutting age and the productivity of different tree species/systems; and to investigate methods of increasing woodfuel quality.

Three agroforestry types were included in the trial. These include both traditional systems, managed primarily to produce food but with the potential to produce non-food biomass, for example, wood fuel from boundary hedgerows; and innovative systems, multifunctional systems where food production is fully integrated with, for example, the production of biomass as a renewable energy source. The Wakelyns systems are:

1. Traditional boundary hedge: an unmanaged mature mixed species hedge last cut approximately 21 years ago.
2. Hazel SRC: originally planted in 1995 the hazel stools are grown in double rows in an alley cropping agroforestry system and coppiced on a 5-year rotation.
3. Pollards: a selection of trees in the timber rows have been pollarded two and three years ago at various heights, more have been pollarded this year as part of these trials. The trees are pollarded at c.20-22 years.

The machines used to harvest material from these systems include a set of 360 degree tree shears mounted on 7.5 tonne excavator, operated by Nigel Stimson; and a Bracke C16.c accumulating felling head with a circular saw cutting blade mounted on a purpose built Valmet 901.4 operated by Martyn Neve of Even Forestry. In addition, the pollards were cut manually using a chainsaw and some of the SRC was also cut using a tractor mounted circular saw. After cutting, material was left to dry in the field, to be chipped/processed in summer 2017.

Data collection from the different systems and ongoing monitoring is being carried out with the aim of building up a complete picture of the practicalities and economics of managing on-farm woody resources as a source of bioenergy and offering guidelines for farmers and land managers on their options when it comes to on farm woodfuel production. Assessments include:

- The speed of operation of each machine was recorded as the length of hedge or SRC coppiced in a 30 minute period. The cleanness of cut and any damage to the stools was also recorded along with overall fuel use and any comments from the contractors and workshop attendees.
- Re-growth of the hedge and SRC coppice stools and the pollards will be monitored at the end of the 2017 growing season and repeated annually for the next three years.
- Samples of the chip from the both the hedge material and the SRC will be collected post-drying and tested for particle size distribution, ash content and total calorific value. The differences in quality can then be assessed against the costs of each operation.
- The volume of chip produced from the hedge and SRC will be calculated when it is chipped to give a measure of productivity of each of the systems. The quantity of material cut from the pollards will also be measured.
- An economic analysis of woodfuel production for each different harvesting method and agroforestry type will also be carried out.

Which machine is best?

The Bracke felling head coppiced the hedge nearly twice as fast as the tree shears, but as a specialised machine it was approximately twice the cost of the tree shears, excluding haulage. The Bracke also struggled a bit to cut the larger hedge trees and had a tendency to uproot smaller single stemmed trees. However it was quick and efficient at cutting the SRC and had the advantage over the tractor mounted circular saw usually used on the farm as it was able to place the material in neat piles to be collected up and chipped at a later date.

The tree shears, although working more slowly, managed to coppice most of the hedge trees well; due to some stem splitting there was a need to go through the hedge after coppicing to 'tidy up' the stumps manually with a chainsaw. However, the shears did not cope well with the SRC coppice stools: the diameter of the stool was too wide for the shears and there was concern that the coppice stool root ball was being moved around and might be damaged, so the trial was abandoned after cutting 10 stools.

Bracke felling head in action on the SRC

Neither of the bigger machines were used for the pollards due to concerns over unnecessary damage to the ground caused by manoeuvring to individual trees and the need to tidy the trees up afterwards with a chainsaw anyway. Instead, the pollards were cut by hand with a chainsaw.

In some situations, and where volumes of material to be cut are small, nothing is going to beat the flexibility and cost of manual cutting using a chainsaw. With any bigger machine haulage adds a significant amount to the cost of the operation and the decision as to when the more expensive equipment becomes cost effective will come down to the scale and location. If the Bracke was relatively local it could be moved on the road with a tractor legally, so subject to distance this may make it more cost effective.

Next steps and outputs

Data collected from the different Wakelyns agroforestry systems will be combined with data from the Elm Farm SustainFARM trials and with previous trial data to help build up a more complete picture of the economics of different on-farm wood fuel production methods from different agroforestry types. Regrowth and yield data from the three agroforestry systems will be combined with existing data to produce productivity curves under different conditions and a set of guidelines for farmers on how to maximise production.

Stakeholder workshop

Alongside the trials we ran an event for stakeholders and the general public. The event was an opportunity to see the machinery in action and to meet the contractors and talk to them about practicalities. The day was attended by 27 people from a diverse range of backgrounds and lots of interesting discussion were had.

Tree shears in action on the hedge

In the afternoon a workshop was held to help develop a tool to assess the sustainability of agroforestry systems. The session provoked much discussion of what 'sustainability' means and how best to measure it. The results were combined with those of similar workshops carried out in four other European countries to generate a final online survey. The answers from this will now be used to adapt an assessment tool – the PG Tool – to enable it to carry out sustainability assessments of agroforestry systems.

Agroforestry comes of age

During one of the hottest weeks of the UK summer, our Agroforestry Innovation Networks (AFINET see p18) partners visited a range of local agroforestry systems, including a traditional wood pasture (Hungerford Common), a mature silvopastoral alley cropping site (Bill Acworth at Little Hidden Farm), as well as the inspirational highly diverse organic vegetable system at Tolhurst Organic.

Some AFINET partners then attended the first large-scale UK Agroforestry conference, hosted by Cranfield University, and organised by the Woodland Trust and Soil Association. Attended by around 250 people, including over 130 farmers and foresters, the day featured many inspring presentations, as well as showcasing a range of farmers talking about their reasons for integrating trees into their farming systems. The conference wrapped up with surgery sessions, including one hosted by AFINET partners. Conference delegates were invited on an agroforestry tour of Europe, with the opportunity to sample agroforestry products from nine countries.

The 'Agroforestry tour of Europe' at Agroforestry 2017.
Photo: Kevin Waldie

The agroforestry energy continued the following day with the annual Farm Woodland Forum meeting, hosted by Paul Burgess at Cranfield University. Morning presentations included an overview of agroforestry policy in the UK and Ireland, coordinated by EURAF (European Agroforestry Federation) vice-president Gerry Lawson, and a series of talks exploring different aspects of agroforestry in practice. In the afternoon the group visited the apple silvoarable system of Stephen and Lynn Briggs, on the fenland soils of Cambridgeshire.

All in all, an inspiring week, and one in which the momentum building in the agroforestry movement was tangible.

Tree fodder: food for thought?

ORC recently hosted a workshop to explore the opportunities and challenges of incorporating tree fodder into today's livestock farming. ***Mary Crossland****, agroforestry graduate from Bangor University, ex ORC employee and intern and workshop participant, reports on the outcomes of the day.*

An ancient practice now largely confined to drier regions of the world, tree fodder is one of the lesser-known benefits of incorporating trees on farms. Leaves from certain tree species may offer supplementary sources of dietary protein, trace elements and beneficial compounds such as tannins, helping improve animal welfare and boost production. In the rediscovery of such benefits, there is renewed interest from some farmers in exploiting fodder from existing on-farm trees. But can this traditional practice be integrated into today's ruminant systems in the UK? Bringing together farmers, researchers and woodland advisers, the workshop 'Tree fodder: food for thought?' aimed to explore the opportunities and challenges of using tree fodder within modern farming systems.

The day started with presentations covering current knowledge on the nutritional characteristics of fodder species and personal accounts of tree fodder in practice. Sokratis Stergiadis, from the University of Reading, discussed the potential benefits of tannin-containing fodder for animal production. Able to bind with fibre and proteins within the gut, certain tannins can improve the absorption of amino acids, reduce the production of methane, prevent bloat and may even reduce gastrointestinal parasites. While trees are a rich source of tannins, Sokratis cautioned that some tannins are better than others and that the challenge remains to identify which tree species and varieties provide the best types.

Lindsay Whistance, ORC livestock researcher specialising in animal behaviour, spoke of how providing access to trees can allow for more instinctive behaviours and ultimately lead to happier, healthier animals. Trees such as willow store high quantities of trace elements such as zinc and copper in their foliage, while the trees themselves offer opportunities for livestock to play, seek shelter and perform natural behaviours such as body maintenance.

Emphasising the historical importance of tree fodder, Ted Green and Helen Read from the Ancient Tree Forum enthused us with videos demonstrating the surprising palatability of different tree leaves to both cattle and ponies, and photographs of traditional management practices still used in parts of Europe. We then heard from some innovative farmers currently utilising tree fodder on their

Ted Green with 'tree hay' at Elm Farm. *Photo: Kevin Waldie*

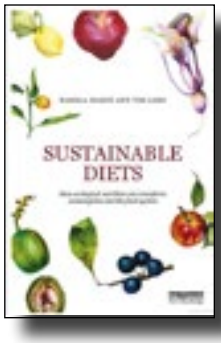
farms: Bill Acworth from Little Hidden Farm in Berkshire, Peter Aspin from The Hollies in Shropshire and Vincent Delobel, a goat farmer based in Belgium. It was fascinating to hear how each farmer had made tree fodder work for their specific management objectives, ranging from agroforestry systems designed specifically with tree fodder in mind, to simply allowing livestock access to existing hedgerows and trees.

After lunch, Jo Smith and Sally Westaway (ORC) showcased the various agroforestry options found on Elm Farm, including hedgerow-planting schemes, a silvopastoral trial integrating livestock with willow and alder short rotation coppice, and managing existing hedgerows for wood fuel. While tree fodder was not the sole objective of the plantings, they offer examples of how trees can be incorporated within different niches of a farm and the potential to adapt current systems for tree fodder through appropriate species selection and alternative silvicultural practices.

The day finished with a lively workshop led by Sally and Ian Knight from Abacus Agri Ltd. The aim was to discuss and identify the barriers and opportunities to using tree fodder and how to take this novel practice forward. Key discussions included market opportunities, such as selling tree fodder as a premium product to horse owners, the mechanisation of harvesting, and the potential trade-offs and synergies in managing trees for multiple objectives (i.e., wildlife, fruit, fodder, timber or fuel). Although current research into the benefits of tree fodder is promising, many questions remain. How much tree fodder must a sheep ingest for a meaningful effect on parasites? Which tree species, arrangements and management methods work for different farming systems? What are the nutritional characteristics of different tree species and how does this vary between varieties? And perhaps most importantly, do the potential health benefits translate into an economic advantage?

Under the European project AFINET (Agroforestry Innovation Networks), the next steps following on from this workshop will be to use these discussions to help inform future research and develop a network through which to share practical experiences and existing knowledge on using tree fodder.

Book review



Sustainable Diets: How Ecological Nutrition Can Transform Consumption and the Food System
Pamela Mason and Tim Lang (2017). Routledge

Sustainable Diets addresses a concern currently at the forefront of global thinking – that of sustainable food. The authors – between them with expertise from nutrition to food policy – set out to define the factors that constitute a 'sustainable' diet and to position current diets relative to that goal, concluding with suggestions of how to move closer to a globally sustainable food system. They adopt a six-component framework developed by the UK's Sustainable Development Commission to interpret 'sustainable' in the context of diets: environment, social values and economy alongside governance, quality and health. After beginning with an overview of the reasons for a shift in food systems thinking and the methodologies by which sustainability can be measured, the book considers each component in turn – its meaning for diets, where we are currently and where improvement is needed. It concludes with the authors' suggested approach to moving towards universally sustainable diets.

The book is an accessible and interesting read for both the expert and the interested lay-person. This is despite it being in places perhaps overly fact heavy. This is not helped by over-use of tables and infographics, many of which receive only limited reference in the text and while providing extra information surrounding a particular point, do not provide any real support. While disruptive of the text's flow, however, these features are not overly inhibitory to the readability of the book.

The abundance of facts, all fully referenced and drawing on diverse sources representing numerous cultures, means too that the book is extremely informative and reassuringly evidence based. It therefore presents a clear critical analysis of the meaning of sustainability for diets before it moves on the authors' opinions. This critical analysis is well written, covering a broad range of complex areas in a clear and efficient manner.

The book concludes with a single, short chapter that summarises the authors' suggested route forwards. The strength of the opening chapters and critical analysis is, however, sadly not reflected in these conclusions, which feel to sit completely independent of the rest of the book. The conclusions themselves seem very high level, offering little immediate suggestion as to what action a concerned reader might take, while it is hard to see how such high level suggestions provide a comprehensive solution to a problem so grounded in societies as a whole.

This aside, *Sustainable Diets* is an excellent book and well worth a read. The relatively weak concluding chapter is more than made up for by the eight preceding, which position the reader well to formulate their own ideas to move forwards from the authors' presented, albeit limited, start point. It addresses a timely and highly complex subject in a clear and interesting manner and leaves the reader thoughtful and more informed than before.

Samantha Mullender

SRUC study tour

In June, students from Scotland's Rural College (SRUC) Organic Farming MSc came to Elm Farm to take their exams and take a study tour encompassing some of the leading organic farms in the region. The Organic Farming programme is delivered by SRUC in partnership with ORC on a part-time distance learning basis to allow those in continuing employment or with family commitments to participate. Course participants come from a wide range of backgrounds, and this ensured enthusiastic discussions as the tour proceeded.

At Duchy Home Farm.
Photo: Lindsay Whistance

ORC crop trials, Doves Fm.
Photo: Christine Watson

Antibiotics: can we keep farm animals well without them?

*In 2010, ORC livestock Researcher **Lindsay Whistance** took a trip to Wisconsin, Pennsylvania and New York, USA, to ask some organic dairy farmers about how they managed health and disease in their cows. In contrast to Europe, American organic farmers are not allowed to treat an animal with antibiotics without that animal permanently losing its organic status. That said, US farmers must still use antibiotics where no other treatments exist. Here is her story.*

Much of what the farmers said to me was familiar but, as you will see in the comments below, they all emphasised that doing the 'basics' well was vital for keeping animals healthy. "Some diseases you have to treat," said one farmer, "but many can be avoided." This required a whole system thinking approach which, for the farmers, included:

Managing soil health: "Preventing disease all starts with the soil and micronutrients ending up in the feed. Alternative treatments rely on a healthy immune system to work so cows have to be in good condition to respond well."

Feeding a high forage/low grain diet with adequate supplements: "Getting the digestive system sorted sorts out many other problems." Some of the farmers preferred to restrict access to supplements whilst others believed that the cows were aware of their own health status and could self-regulate intake. This certainly seemed to be the case where bicarbonate of soda was offered as a pH buffer for the gut and intake was noticeably higher during the autumn as cows ate increasingly less grass and more ensiled feed. All herds were offered kelp and mineral salt as a minimum. Several farmers offered kelp to young stock to help manage New Forest disease.

Photos: Lindsay Whistance

Bicarbonate of soda and kelp offered ad lib

A reduced emphasis on yield: "50% of yield and 90% of herd problems have gone with conversion. We were not aware how hard the cows were working in the conventional system. The cows were being driven into the ground." Although this farmer had been organic for 10 years at this point, the health outcomes of reducing milk yield in his formerly intensive, high-yielding herd was the single most important lesson he felt he'd learnt in terms of cow care.

Daily exercise with access to pasture, good trackways and good stockmanship were all considered important for good rumen function, good leg health and low stress respectively. Here, "kindness", being "gentle and patient" and "consistency" were key words for these farmers.

Cows at grass in late October, New York State

Unsurprisingly, clean, comfortable cows and good hygiene during the milking routine were considered vital for minimising the spread of any disease present in the herd and several farmers practised milking 'problem cows' last, with some even allocating specific housing areas, particularly where *Staphylococcus aureus* was a problem.

Housing

Of course, there is no one perfect housing and management system, and several farmers cited their existing housing system as a problem, typically mentioning poor lying comfort and flooring type as issues. Only 2 herds were winter housed in straw yards, and 2 herds in New York state were kept outdoors all year round except in the most severe weather. "Cows are meant to be outside on grass and barns were built for humans." Both farms had a straw yard available but the cows typically chose to go out, even with fields covered in snow. That said, these systems affected treatment choices for sick animals and more time-consuming approaches were less likely to be used when a specific cow had to be isolated or caught for treatment outside of milking.

Farmer observations and treatment strategies

Most of these farmers emphasised that when treating illness, a good knowledge of disease indicators and a quick reaction to initial signs was paramount. "Promptness in treating is essential. You have to be observant since speed of treatment will determine both duration and outcome." They also noted that the duration of treatment is typically longer than with conventional therapy. "The timeline is longer with organic treatments, it takes longer to work but the outcome is the same."

Unsurprisingly, all farms had treatment strategies for udder disease, reproduction problems, and lameness, along with a few experiencing metabolic and respiratory problems.

Medicine shelf in the milking parlour

Treatment for mastitis included udder mint, and homeopathic preparations. However, treatments did not always act directly upon the disease but were also given to help boost the animal's immune system. These immune-boosting therapies are commercially available in the US and they typically include whey-based immune stimulants, plant extracts, vitamins and minerals. Farmers used these along with pain killers, specifically aspirin, for obviously painful issues including difficult calving, lameness and mastitis. On one farm, where grassland was plentiful, lactating sick cows not responding to early treatment were promptly dried off and put into a hospital paddock until they were fully recovered.

Scours, pneumonia, pink eye, ringworm and internal parasites were treated in young stock. Crushed black walnut shells were also added to milk to help stop scouring. Several farmers gave their calves 10 litres of milk daily and their health and growth rate was strikingly good. These farmers had learned to distinguish between scours from disease and from 'too much' milk and recognised that calves quickly learned to manage intake problems by themselves as long as milk was offered at the correct temperature. When I asked why they fed them so much milk, the farmers said it was so their calves could stay healthy and they enjoyed looking after them much more this way.

Alternative therapies geared toward the treatment of animals are readily available in the US, and on-line catalogues such as the 'Lancaster Agricultural Products' offer a wide range of available supplements and therapies including homeopathic remedies, tinctures and herbs. Some farmers relied on their vets to help but others preferred to treat cows independently, using 'off the shelf' preparations or creating their own treatment plans. The longer the farm had been organic, the more likely farmers were to have detailed treatment plans that were specific to each disease. Notably, farmers kept pretty good records of treatments and outcomes which they used to improve their cow care.

The consensus?

So, is it possible to keep farm animals well without antibiotics? Well, of the 18 farmers visited, 8 had treated an animal with antibiotics after conversion to organic farming, though only 2 farmers said that they missed using antibiotics; one in relation to treating coccidiosis in calves, the other in treating cow lameness. None of the farmers thought that keeping animals in good health was easy, but there was a general belief that farming according to organic principles and standards was beneficial. "… try to farm closer to the old-fashioned way where there is more harmony between everything."

This article first appeared as a blog on www.agricology.co.uk

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.

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gillian.w@organicresearchcentre.com

Ticking the anti-globalisation box

*Last year, PhD research student **Shadi Hashem** spent time at ORC investigating consumer food choices around organic food and box schemes. This involved a survey of box scheme customers to better understand how they make their food shopping decisions.*

Among alternative food networks that operate in the UK, organic box schemes are the most popular and the most successful in carving a niche in the supermarket controlled organic market by holding a 12 percent share of the overall organic market sales, accounting for approximately £236 million in 2016[1].

Photo: Goldhill Organics

This study investigated consumer motives to purchase from local organic box schemes with two main research questions:

1. To examine the relationship between motives and consumer awareness of problems in the agro-food system.
2. To investigate the importance of different motivational factors.

The survey

Detailed face-to-face, semi-structured interviews with 22 UK box-scheme customers were carried out between November 2015 and January 2016. These were customers of ten box schemes delivering in no more than a 60-mile radius from their farms. Also, a structured questionnaire was completed by a self-selecting sample of 416 box scheme customers.

Results

The research shows that box scheme consumers are generally motivated by a variety of factors which are influenced by a range of social, economic and environmental values and moral concepts of food production and consumption. These include environmentally-friendly products, supporting local farmers, supporting small-scale family farms, and building trustworthy relations with farmers. These factors could be broadly considered as altruistic reasons for purchase, as they are not directly translating into personal benefits for the consumers. Other factors that consumers mentioned in their decision to participate in a local box scheme are regarded as personal motives, such as access to more healthy and safe food, high-quality food (in terms of taste, freshness) and convenience such as easy accessibility and availability of wide varieties of vegetables.

The study further revealed that the majority of box scheme consumers have been able to make a distinction between box schemes as a direct local sale channel to the current mainstream structure of food provisioning. They seek to move to local and organic food as they perceive it to be more 'authentic' and 'ethical,' while the 'mainstream' was more based on industrial, and retail interests. In particular, the research identified a number of generic issues of concerns amongst box scheme consumers which covers various ecological, economic, social, and individualistic concerns (Table 1).

Table 1: Box scheme consumers, problem recognition and derived motivation

Issues mentioned		***Issue description***	***Motivation***
Food safety	GM	Concern about the possible impact on health of GM food and on the environment. In particular 'unexpected consequences' of GM.	Eating healthier food by consuming more organic to reduce exposure to toxic substances for themselves and family.
	Pesticides/agro-chemicals	Reliance on synthetic pesticides and fertilizers to maximise production, regardless of environmental and health impacts.	
Economic	Decline of small-scale family farms	Concern about supermarket policies, particularly price squeezes, reliance on cheap imports and specifications that could increase food waste.	Support small-scale organic and local farmers to ensure their viabity by creating more sale opportunities (successful direct sale to food consumer) and a solid customer base.
Environmental	Food miles	Negative environmental issues associated with the major food retail/industrial food sector.	Minimising food miles was central to consumers' decision to participate in local box schemes.
		Negative environmental implications of food trade globalization such as global warming/climate change, which result from the reliance on fossil fuel in transportation.	Eating in season: consumers revealed a strong motivation to eat more in-season food. For environmental reasons and to enhance their sense of pleasure around food consumption.
Social	Disconnection from where food has come from	Concerns about not knowing where their money goes, where food has been grown, and how it has been produced.	Direct contact with food producers (farmers) and the land through farm visits or by knowing where their food has been produced and/or sourced from. Helped consumers to learn about production methods, market issues, access to greater range and new vegetables.
	Disconnection from who produces the food	They stressed that losing the sense of connection by not knowing who is behind their food and where it has been sourced from is the reason why they started to search for more local food to build this sense of connection again with the soil and farms, and the economic and the social conditions of those who take the effort and burden to produce for them.	The consumers' experience of having direct access to food producers and any information that they may require helped consumers to build a trustworthy relation with food producers.

"*This is why I buy from a box scheme: I want to know how my food is produced, and what money goes to actual producers. Being careful who is affected by your shopping, what the value chain looks like and who is involved in production and under which conditions, for that reason I avoid shopping at specific supermarkets and for some products.*" (S, 50, Female)

"*I think that small scale producers are being squeezed, those people who tend to work round the clock actually to produce food for us, these people who enjoy what they do which is farming, they are doing it because they like doing it and that is what impresses me but I feel sorry for them as they don't get adequate returns for their efforts. They tend to be organic farmers and they tend to grow what people want.*" (P, 42 Male)

"*It is great keeping in touch with farmers who are the real people behind the food you eat and I enjoy receiving a direct monthly newsletter from them, going to their website and being always updated about what is going on out there on the farm, learning about the different vegetable varieties growing in each season and having knowledge about it.* "(A, 31, Female)

"*I prefer to buy produce that comes from the local area, as we are conscious of food miles, so I would try not to buy fruit and vegetables that have travelled around the world. That's a core factor really that it has not travelled very far.*" (R, 47, Female)

"*I'm not easy about genetic modification because I don't want species moving around having unexpected effects on each other. I mean with genetic modification you are changing something without being able to predict the consequences.*" (A, 42, Female)

"*Taste is something important to me, taste depends on ripeness and maturity, doesn't it? The best thing about the veggie boxes is that they are picked a day or two before the delivery so they are mature and fully ripened.*" (D, 65, Male)

"*The question is how are we going to achieve any changes? It actually has to start at a grassroots level. If two people in every street in this country said we are not going to buy eventually maybe there would be some impact. But in so many ways the world is so numb. So, yes one has to take an individual stance I think."(J, 60 plus, Male)*

"We are reliant on importing and that is why we are not manufacturing anymore and that's why I care about getting things back to the local scale as far as one can. Maybe that's all one can do? That's very sad. Because if we let things go without fighting , it can drive people out of agriculture." (J, 25, Female)

When the issues identified were tested with a larger sample of box scheme consumers, most were relevant and important to them. However, when questioned about the factors that they are most sensitive about:

- 57% revealed that they would boycott products that have a negative impact on the environment, including products with high food miles and out of season, excluding products that can't be grown in the UK such as bananas, coffee and tea.
- The second most highlighted reason was related to food safety concerns (42%), associated with pesticides and chemicals, processed and GM food.
- In regard to the most importance factor that they would consider to avoid buying at specific food shops or brands; unfair deals to producers were the most stated reason with a share of 53%.

Respondents repeatedly criticised supermarket behaviour; the unclear provenance of food, and low retail prices, as reasons to consider avoiding buying from them (apart from those they perceive to have high sustainability and ethical records). The majority revealed that reducing their dependence on supermarkets was a main reason for buying from small- scale local shops, box schemes, farmers' markets and co-ops.

Discussion and conclusions

The results shows that consumers' decisions to participate and commit to box schemes were informed by a number of discourses ranging simultaneously from political or ethical (public) to individual (private). It was found that in seeking local and organic small-scale production systems, consumers were explicitly addressing their desire to bypass some anxieties they perceived to be largely associated with globalisation and the forces of capitalism.

This suggests that these consumers have deliberately engaged in ethical or political behaviour by participating in a direct sales channel to avoid perceived issues with the mainstream food provisioning, global trade, and the industrial food sector. It appears that consumers were completely aware and interested in knowing the chain through which their food has passed, and willing to commit and continue to support it because it helps in reinforcing their belief in wholesome and authentic food.

Also, consumers were confident in box schemes reviving traditional values around food shopping and food consumption. They believed that their participation could make a difference in regard to various environmental, political and personal issues. Participation in a box scheme could be seen as a response to the perceived ethical, political and environmental implications of food market globalisation and large scale agri-business strategies—a resistance action through consumers 'doing their bit' towards environmental protection by redirecting their custom towards organic local direct food channels[2,3].

References

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Recommendations to box scheme operators:

- Maintain regular communication with your customers.
- Maintain high transparency about your production methods to boost consumers' confidence about authenticity and your own credibility.
- Provide customers with price comparisons to supermarkets.
- Provide customers with information about the role of local, organic production and consumption in reducing negative environmental and economic impacts from agriculture and food trade, improving viability of small British organic farms.
- Continuously review and upgrade your marketing strategies and the services you offer to maximise customer convenience and loyalty in the face of increasing competition.

Events and announcements - details at www.organicresearchcentre.com

Events

19 August 2017: Seed Co-operative AGM and open day. Gosberton Bank Nursery, Lincs.

5-6 September 2017: 11th European Organic Congress. Transforming food & farming – Making it Happen. Tallinn, Estonia.

6 September 2017: Rijk Zwaan - Embracing the Future. Huntstile Organic Farm, Bridgwater. Rijk Zwaan/ Soil Association open day.

15 September 2017: Trees and livestock workshop. Mains of Fincastle Farm, Pitlochry, Perthshire. Farm Woodland Forum/AFINET/ORC event.

19 September 2017: Agroforestry for growers. Tolhurst Organic, Oxon. AFINET/AGFORWARD event.

27 September 2017: ORC Farmer and Business Supporters' Group annual event. Bradwell Grove Farm, Glos. Members only—join now—see p25.

5 October 2017: LEAF Intercropping Workshop. DIVERSify event Overbury Farms, Tewkesbury, Glos.

11 October 2017: STC Intercropping Workshop. DIVERSify intercropping workshop with machinery demo. Stockbridge Technology Centre, Yorkshire.

9-11 Nov 2017: 19th IFOAM Organic World Congress. New Delhi, India.

20 November 2017: Wonderful woodchip! Tolhurst Organic, Oxon. SustainFARM event.

23 November 2017: ORC Winter Organic Cereals event. DIVERSify/CERERE event focusing on intercropping and diverse cereals. Rushall Organics, Pewsey, Wiltshire.

4-5 January 2018: Oxford Real Farming Conference

The ORC annual Organic Producers' Conference is taking a break in 2018, but look out for details of activities planned to coincide with the Oxford Conferences.

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