ORGANIC RESEARCH CENTRE

Bulletin

No. 133 – Spring 2021

News in brief

Why organic – contributing productively to future farming and food policy

A new English Organic Forum (EOF) report presents a clear, consolidated and compelling case for organic farming. Produced as an organic industry-wide blueprint, *Why organic – contributing productively to future farming and food policy* sets out a comprehensive rationale for how and why organic land management should be integrated into English agricultural policy.

EOF's report presents the aligned position of 32 member organisations, including ORC, which seek to influence farming policy decisions in the coming months.

The report identifies key environmental public goods that could be delivered from one million hectares of organic land (approximately 10% of England's agricultural land). These include more than 9.4 million tonnes CO_2 equivalent fewer greenhouse gas emissions and increased carbon sequestration worth over £188 million, annually, in carbon permit trading terms.

Also, a 50,000 tonne reduction in nitrogen surpluses and related losses to water courses, potentially saving up to £100 million in water treatment costs. As well as a 1,700 tonne reduction in pesticide active ingredient applications, with an associated 25% increase in biodiversity.

https://online.flipbuilder.com/exei/xjft/

ORC response to gene editing public consultation

ORC submitted responses to Defra's Consultation on the future of gene editing both as part of the English Organic Forum and in its own right. Informed by the work of EOF and other background briefings we emphasised the importance of two core recommendations with respect to the current consultation, namely that:

1. All forms of gene editing should be subject to robust regulation and risk assessments.
2. Proper recognition and investment should be given to the whole diversity of different available approaches to transforming and delivering a sustainable and healthy food system, including organic and other agroecological farming.

We call on supermarkets to show leadership on GM

A joint letter signed by ORC asks retailers to refuse to stock products made from untested and unregulated genetically engineered plants and animals produced using 'gene editing'. The letter, organised by Beyond GM and Slow Food in the UK, came in the midst of the 10-week public consultation on government plans to remove regulatory controls, including consumer labelling, from plants and animals created using the new and experimental genetic engineering technology. The letter asks supermarkets "to listen to your customers, to be respectful of nature and science, to be mindful of the future and to demonstrate leadership by joining us in opposing the deregulation of genome edited crops and livestock in England and the rest of the UK."

European consumers' willingness to pay for red meat labelling

A new paper co-authored by ORC's Stefano Orsini has been published in *Animals*. This international study, part of the iSAGE project, analyses the European consumer preferences for red meat (beef, lamb and goat) in seven countries: Finland, France, Greece, Italy, Spain, Turkey and the United Kingdom. Through a survey with hypothetical choice situations (choice experiment), 2900 responses were collected. Advanced econometric models were estimated to identify the diversity of preferences among consumers at the country level. The results indicate substantial differences between the most relevant attributes for the average consumer in each country. Nevertheless, national origin and organic labels were highly valued in most countries.

Dudinskaya EC, Naspetti S, Arsenos G, Caramelle-Holtz E, Latvala T, Martin-Collado D, Orsini S, Ozturk E, Zanoli R. European Consumers' Willingness to Pay for Red Meat Labelling Attributes. Animals. 2021; 11(2):556. https://doi.org/10.3390/ani11020556

Measuring the economic performance of small ruminant farms

Stefano Orsini has also co-authored a paper in *Sustainability.* The paper presents a practical method to measure the performance of farm businesses by combining the Balanced Scorecard (BSC) theoretical framework and Importance–Performance Analysis (IPA). The method was applied to small ruminant farm businesses across Europe through visits and interviews as part of the EU Horizon 2020-funded iSAGE project. The study showed that the model could help measure the performance of small farms while allowing detection of the areas of fragility and intervention. Results showed that finance and internal business management were the most relevant farmers' weaknesses, alongside low priority given to innovation. In conclusion, to prevent the potential long-term decline of the sector, the study provided evidence for policy changes needed to support farmers' innovation potential and a higher level of integration in the supply chain.

Gambelli D, Solfanelli F, Orsini S, Zanoli R. Measuring the Economic Performance of Small Ruminant Farms Using Balanced Scorecard and Importance-Performance Analysis: A European Case Study. Sustainability. 2021; 13(6):3321. https://doi.org/10.3390/su13063321

Agroforestry ELM Test project blog

Visit the new blog page on the ORC website to keep up to date on the latest developments of the Agroforestry Environmental Land Management (ELM) Test and Trials project and send us any thoughts or feedback via the comments form.

www.organicresearchcentre.com/agroforestry-elm-test-project-blog/

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

Editorial: 40 years of crop diversity and agronomy

1986 Stockless plot trials

Welcome to the Spring 2021 Bulletin! I hope that this message finds you and your loved ones safe and well and looking forward to the easing of the pandemic lockdown restrictions that we have all endured. I find it hard to believe quite how much our lives have changed over the past year, but as much as it is not without its frustrations, thank heavens for modern technology and video calls which have at least allowed us to stay connected with one another.

As I write this the sun is shining, the daffodils are out and the days are gradually getting longer, which always lifts my spirits, especially when I can get out to enjoy the countryside without being swamped in mud! The theme for this Bulletin is Crop Diversity & Agronomy and features details of a number of our research projects such as our work to evaluate wheat variety performance on organic farms to inform decision making; updates on our research for crop diversity, intercropping and reduced tillage; and also a fantastic blog all about living mulches from our Senior Crops Researcher, Dominic Amos.

We are also taking the opportunity in this edition to highlight the celebrations which will mark the Organic Research Centre's 40th Anniversary year. We were founded in 1980, when David Astor established the Elm Farm Research Centre with Lawrence Woodward, who was our first Chief Executive. Many will be aware that the ORC was founded at a time when the world was in the midst of the oil crisis – as a result David and Lawrence were driven to explore how farming could reduce its dependence on oil. Their research led them to organic agriculture and they saw a real need to provide research, advice and support to British farmers in order to facilitate the transition towards an agroecological approach. I would like to say an enormous thank you to Lawrence, who has kindly written a guest article for this edition to share his experiences during his time developing the organisation.

Over the past 40 years the ORC has been at the forefront of organic research and is the only independent research centre in the UK focused solely on agroecological systems. As a result our archive of research is extensive and in order to celebrate our anniversary we have chosen our most significant pieces of research to be highlighted in a series of factsheets and research digests which are being released every week throughout the year. In addition we have started to create a series of podcasts to tell our story and have a whole programme of exciting activity, announcements and events planned for the year ahead; so for all of this please check out our new 40th Anniversary Hub webpage on the ORC website. www.organicresearchcentre.com/news-events/orc-turns-40/

Finally we are also delighted to welcome three new members of staff to the team: Paul Jenkins who joins as our new Head of Finance; Colin Tosh who joins us as a Senior Researcher in Agroforestry; and Rowan Dumper-Pollard who joins us as a Researcher in our Business & Markets research theme. Colin has been recruited to replace Sally Westaway, who has left the ORC to start her PhD studies at the Royal Agricultural University so we wish her all the best. There is also the opportunity to get to know one member of our team – Katie Bliss – slightly better through a new article 'Ten minutes with' so I hope you enjoy the read!

Lucy MacLennan

About us

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

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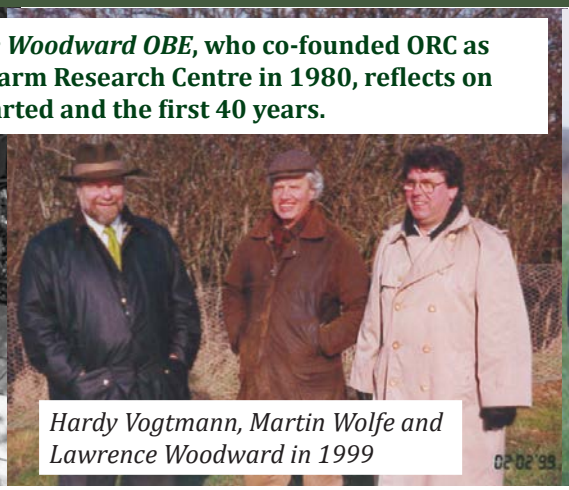
Cover photo: Living mulch. Dominic Amos

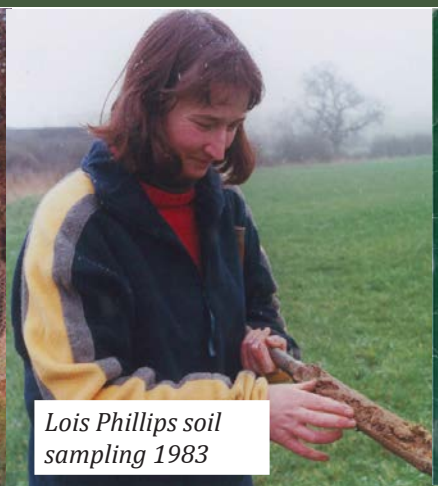
Researching how to change the World

***Lawrence Woodward OBE*, who co-founded ORC as the Elm Farm Research Centre in 1980, reflects on how it started and the first 40 years.**

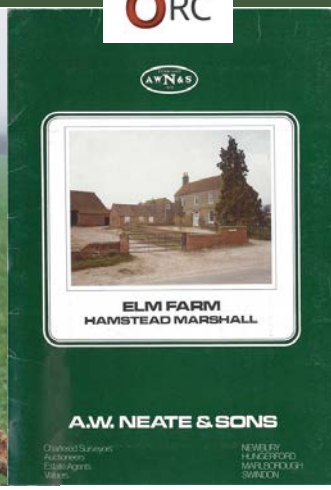
David and Bridget Astor in 1980



Hardy Vogtmann, Martin Wolfe and Lawrence Woodward in 1999



Lois Phillips soil sampling 1983



I'm writing this at the end of March 2021. 40 years ago, probably to the day, I was writing a report of a meeting of a group of farmers and researchers from the UK, Switzerland, Germany and France who had gathered together for two days to determine the 'Research Needs of Biological Agriculture in Great Britain'. This was the first event organised by Elm Farm Research Centre.

The meeting took place at David Astor's house near Abingdon but it included a 50 miles roundtrip down the A34 to Elm Farm near Newbury. This intensive dairy farm of nearly 240 acres, with functional farm buildings adjacent to a traditional but neglected traditional farm house had been recently purchased by the EFRC Trust to be the base of our future activities.

It was a grey and wet day. Elm Farm looked drab and the task of converting this rather sorry looking piece of land to a commercially viable, organic dairy and cropping farm looked daunting. Some of the distinguished visitors were glad it wasn't their challenge but wished us well as they left, leaving behind plenty of goodwill, enthusiasm, stimulation, ideas and a lot of notes to turn into EFRC's first publication.

The research needs set out in that document have been revisited many times, by many bodies over the years since. At a headline level the identified needs haven't changed much, even though details, methodologies and budgets have. Some things have been added to the list but the quintessential questions about how to marry and manage the natural biological and ecological cycles of soil, plants, animal and man in a productive, healthy farming and food system remain.

Finding the fit: can do better, must do better

For all of its success, organic farming is still inconsistent and variable in productivity, in internal and external quality and in its impact on society. Its success has been massive – of itself and how it has influenced conventional farming and food – but its 'school report' would be dogged by 'must do better', 'can do better', 'should do better'.

These sorts of comments on my school reports had me responding 'would do better if school was run differently'. The comparison is apt because one of the early conclusions of the team that evolved over the years at EFRC was that ecological cycles often do not fit well with the systems and structures society (as farmers, processors, retailers and consumers) tries to impose on them.

To give a specific example; one of the first research programmes EFRC undertook was looking at the provision and dynamic of nitrogen in organic farming. Without the option of using outside and synthetic nitrogen inputs, the organic farmer has to rely on biologically fixed nitrogen and the dynamics of soil to release it to growing crops. This dynamic is hugely variable, from year to year, farm to farm, field to field, crop to crop, variety to variety – and rarely does it match the crop's requirements, which are largely determined by an agronomy governed by society's structures (markets being the obvious ones but there are others).

Natural cycles simply do not care about what society's unecological demands are, irrespective of whether society is being represented by the farmer, the processor, the retailer, the banker, the consumer and even the environmentally aware citizen.

The road to Damascus via Germany and Switzerland

Our collective failure to recognise that, is what Lady Eve Balfour called 'a failure to think ecologically'. The consequence of that failure can be seen everywhere. We, society, has not found a way to live equitably and ecologically on this planet of finite and diminishing resources and so, from soil, to plant, to animal and to man we are suffering from it.

I can't honestly say that David Astor, Alice Astor and I articulated it like that in 1974/75, when the journey that takes us to the 40th Anniversary of Organic Research Centre started. But what we were saying and thinking then was a reasonable approximation.

Discussions with Fritz Schumacher, a friend of David's who had written the iconic book 'Small is Beautiful' and founded the Intermediate Technology Development Group refined the approximation and by 1976 we had begun the conversion to organic of a 245 acre farm in Dorset for which we had notions of developing into a facility for organic farming and appropriate technology.

By 1979 we were aware that progress towards our lofty goals was stalling and we began to look around for help and ideas. A chance meeting with Prof. Dr Hardy Vogtmann in Kassel in Germany – where he was about to become the world's first Professor of Organic Agriculture – led us to visit his research centre – The Research Institute for

Biological Agriculture (FiBL) in Switzerland, where they had established what is now the longest running scientific trial comparing organic, biodynamic and conventional method in the world.

Three things happened on that visit: one was confirmation of the decision we had been formulating to create an educational charity to undertake R&D in organic farming and appropriate technology (recruiting Hardy Vogtmann as a trustee in the process); another was a plan to copy or replicate much of the research work of FiBL and others under UK conditions; but the most critical was the realisation that we specifically, and the organic sector in the UK generally, had been focusing too much on inputs and the 'law of return' and not enough on biological and ecological cycles.

Discovering how to think ecologically

There is not enough space here to go into 'whys', 'hows' and details of this but the terminology gives an indication: in the English Speaking World we were using the word organic, in Germany, Switzerland, France and other countries they were using words like biological and ecological; they were talking about systems and cycles whilst we were concerned with organic inputs to replace chemical ones; they were concerned with whole farms, whole systems and organisms whilst we were focused on enterprises and crops; they talked about internal management of processes linked together through cropping, compost, tillage, cover crops and green manures in rotational system management, while we focussed on getting premium cropping; they talked about soil analysis and conversion planning to optimise this management whilst we concerned ourselves with how many years you had to leave the land without chemicals.

I'm simplifying and exaggerating this to highlight the impact this realisation had on me and how it influenced EFRC/ORC for almost all of its existence. Not just me and this institution though; this insight brought by Hardy and the colleagues he introduced us to and channelled through EFRC was a major influence on the development of the organic movement and sector in the UK.

A study group from the United States Department of Agriculture overlapped with our visits to Hardy's network and they too produced a 'Report and Recommendations on Organic Farming'. The money spent on it and the production quality made our version look rather homespun but the substance, definitions and recommendations were closely aligned.

A significant one was that these farming systems 'involve unknown or poorly understood chemical and microbial interactions…..A holistic research approach which may involve the development of new methodologies, is needed to thoroughly investigate these interactions'.

Beyond sustainability

This insight has been a key driver of EFRC/ORC's R&D and advisory work ever since then,

The following year we brought together organic researchers from Europe and the US, with researchers from the UK to analyse research projects and approaches. The meeting led to the creation of an international research group within the organic movement and formal collaborations together with conventional researchers in the UK, the US and the Nordic countries and boosted the already existing collaborations in Germany and Switzerland.

A key outcome of the meeting was a document which set out the Principles and Practices of Alternative Agriculture (the word organic was already becoming a political issue in the US) from a research and advisory perspective. This document was never widely published outside of the group but it set the agenda for collaborations and R&D development in all parts of the world. It contained one of the earliest declarations about 'regeneration', stating that 'High productivity is sought by methods…which promote, not simply sustainability, but also the regeneration of nature'.

So, from 1982 the research areas, goals and drivers for EFRC were set and these have largely been followed ever since. Of course, the emphasis has changed from time to time as funding and specific targets have changed. Some new areas have also evolved – notably agroforestry and more socio-economic focus. The specific research areas and projects can be viewed in various publications including the Bulletin and on the ORC website.

Changing the world organically

I have focused here on research but a key to understanding the role and development of EFRC/ORC is to grasp that we have never been just a 'research centre'. We were founded with the understanding that R&D is a tool to be used in the business we have always really been in – the changing the world business.

Which is why our activities have always been broad and innovative, encompassing; advisory work; participatory on farm research and demonstration; a wide range of education activities to wide groups of people; spin-off companies and associations such as OMSCo, Organic Arable, Organic Seed Producers, The European Consortium of Organic Plant Breeders, an award winning household waste composting initiative; policy and certification work which shaped UK government policies on organic support payments and standards; and critically, nurturing and developing young researchers, advisors and farmers.

Organic is still the only farming system built on a concept of health; the practical implementation of organic principles is the most tried, tested and proven way of delivering a wide range of biodiversity and conservation benefits along with healthy, quality food; any evidence of the success of alternative farming methods largely consists of examples and data from organic farms; and organic farm and food businesses are the most successful vehicles and means of connecting citizens to healthy foods, healthy animals and healthy environments.

None of this existed 40 years ago when EFRC/ORC started. There were glimmers and this institution has been a prime mover in turning those glimmers into beacons. There is much more to do to turn the beacons into the full light of day. So, the institution has to stick to the task – broad, visionary and innovative – of the business of changing the world.

Farm-based organic variety trials

ORC's Deputy Head of Research and Crops Team Leader *Ambrogio Costanzo* reflects on the collective experiment running since 2017 in which wheat varieties were tested by a network of organic farmers at a commercial field scale.

Figure 1: Different weed suppressive ability by a modern (left) and a historic (right) wheat variety grown in the same field.

Photo: Mark Lea

Understanding varietal performance

Crop performance in organic farming is in part limited by use of inappropriate varieties. As a matter of fact, varietal evaluation is critical to match the most appropriate variety to a farm's conditions and needs, yet it requires complex and resource-intensive organisation. Organic farming adds further difficulties to the task for three reasons. First, different varieties perform differently whether they are grown in a conventional or in an organic farm[1]. Second, with minimal or no use of external inputs (herbicides, mineral fertilisers, pesticides), organic farms tend to differ from one another more than conventional farms do[2]. Third, observations from experimental plots can be less reliable in organic than in conventional farming to predict how a crop performs at a field-scale[3]. With the whole of agriculture aiming to reduce the use of external inputs, understanding varietal performance in organic farming can be of high strategic importance well beyond the organic sector.

A collective experiment with an organic farmers network

ORC started testing winter wheat varieties at a field-scale in 2017/18, with a network of seven farmers from Dorset to Lincolnshire, which expanded to 13 farms in 2018/19 and tested 12 varieties. These included commercial varieties, as well as the historic cv. Maris Widgeon and the Yield-Quality Composite Cross Population (YQCCP) known officially as 'ORC Wakelyns Population'. (See facing page and ORC 40 Factsheet No. 3 "(R)evolutionary wheat populations".

At least three varieties were drilled as strips in each farm's main wheat field, according to an experimental design which allows robust statistical comparisons. Crop cover, height, ear density, severity of foliar diseases, weed abundance and community composition were measured during the growing season. Farmers measured the yield of their strips and provided a grain sample for quality analysis, after which they used the harvest for sale or for on-farm feed use.

Varieties tended to cluster in two groups: one with a high yield potential (4-5 t/ha) but low protein content, and one with high protein potential (10-11.5 %) and slightly lower yields (3-4 t/ha) (Figure 2). The historic variety Maris Widgeon and the ORC Wakelyns Population, which are not officially classified in end-use categories, positioned themselves in the high protein group, suggesting their suitability for the milling market.

Two weed management strategies emerged across the participating farms: one based on spring-tine harrowing on wheat sown in 10-15 cm rows; and one, more intensive, relying on power hoeing on wheat sown in 20-25 cm rows. The second showed less abundant, but less diverse, weed communities than the first. This evidence, coupled with observed varietal effects on weed abundance, can inform integrated weed management strategies.

Lastly, integrating such a real-farm crop performance dataset with climatic data over several years will provide precious information to improve resilience to climatic unpredictability. For example, data from the 2017/18 growing season, which had a dry and hot spring and summer, can be a snapshot of the more drought-prone climate that is forecast for the second half of the century[4].

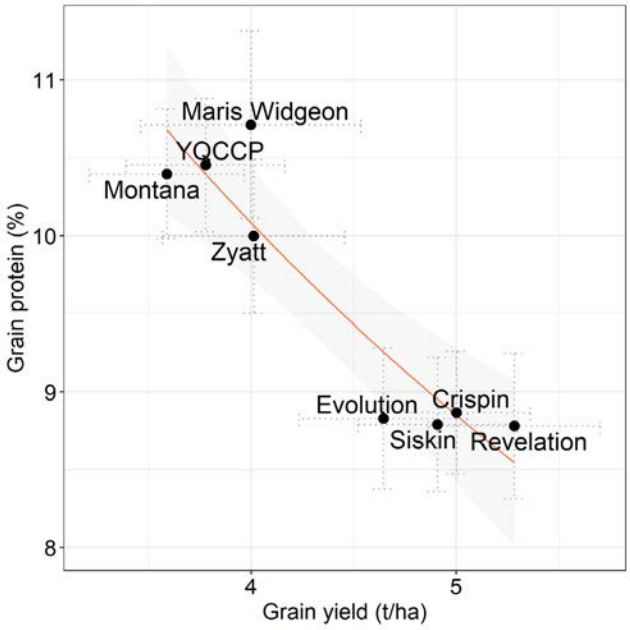


Figure 2: Grain yield and protein content measured across a network of farms in 2017/18 for eight selected winter wheat varieties, averaged over farm and year.

Conclusions

As of the 2020/21 growing season, the collective experiment is continuing and expanding, with more varieties tested and more farmers involved, including non-organic farms. We aim to build a comprehensive dataset of wheat performance that will inform farmers, breeders and scientists on the interactions between genetics (the varieties), environment (climate, soil) and management. Moreover, the work on varieties can be a starting point to shed light on bigger, highly strategic questions such as crop adaptation and resilience to climate change, dynamics and assembly of weed communities and their effects on cropping system performance and sustainability.

So far, this work is a successful proof of concept of how farmers, in collaboration with research, can generate the evidence they need to support their decision making. In fact, with some attention to experimental design, participatory research can generate robust data whilst being easily accessible to farmers and ultimately empowering them to improve their adaptive capacity and consequently foster the transition towards more sustainable food systems.

Published online as:

Costanzo A (2021) Farm-based organic variety trials: A collective experiment with an organic farmers network. ORC Factsheet No. 2 - January 2021
https://tinyurl.com/ORC40-F2-var

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1. Murphy K et al. (2007) Evidence of varietal adaptation to organic farming systems. https://doi.org/10.1016/j.fcr.2007.03.011
2. Wolfe MS, Baresel JP, Desclaux D. et al. Developments in breeding cereals for organic agriculture. Euphytica 163, 323 (2008). https://doi.org/10.1007/s10681-008-9690-9
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4. MetOffice (2019) UK Climate Projections: https://tinyurl.com/yxw3mvev

www.liveseed.eu

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Adaptable, stable, or both?

Photo: Thomas Döring

Two plants from the same population

Wheat cropping forms an important component of organic rotations and it is therefore critical to identify varieties that are well adapted to organic growing conditions. However, organic conditions among farms are notoriously varied, and climate change adds further to this variability. A potential solution to these challenges is to grow crops with a high genetic diversity, composed of many different types of plants, as opposed to commonly used varieties in which every plant is virtually the same. Thanks to their diversity, these crops, called 'populations', can buffer against the environmental variability through compensatory processes as well as adapt to differentiated conditions by natural selection over time. In 2001 ORC started testing and developing this concept with a set of initially three winter wheat populations. These were made from crossing various varieties; the crossing resulted in three genetically diverse composite cross populations (CCPs), designed for high baking quality (Q), high yield (Y), or as an all-rounder (YQ). Initial field trials demonstrated a small yield advantage of the CCPs over the mean of the parent varieties, and a gain in yield stability. Several farmers, bakers, and breeders were involved in the research, and their enthusiasm for this approach led to a substantial expansion of the experimental CCPs grown in the UK. In response to this development and similar pressures on the continent, a derogation of European seed legislation was allowed for a temporary experiment on the marketing of seed of heterogeneous cereals. This experiment has led to the recognition of organic heterogeneous material within the new European Organic Regulation 2018/848.

For more, read:

Döring T (2021) (R)evolutionary wheat populations: Adapatable, stable, or both? ORC Factsheet No. 3 - January 2021
https://tinyurl.com/ORC40-F3-rev

Resilience: a lush YQCCP crop surrounds a failed crop of a commercial variety, in a field sown in suboptimal conditions

Crop diversity, intercropping and reduced tillage

Matchmaking for legumes – Mixing the right species for multifunctional leys

Forage legumes are indispensable components of organic rotations. White and red clover are the most widely used; however there are many different legume species available. Two ideas came together in a series of research projects at ORC: (i) to expand the range of species used by organic farmers, showing which species grow best under which conditions, and (ii) using multiple species in mixtures to combine the different properties and advantages that these species offer.

Field trials were set up at six sites across the UK, including English, Welsh and Scottish locations, to test different legume species with a range of traits. In addition, a mixture of nearly all of these species was grown on more than 30 organic farms alongside a farmer-chosen control ley.

Results showed that some not so well-known species, such as black medic (*Medicago lupulina*) have a strong multifunctional performance under various environmental conditions and may have been underrated by farmers and growers. Also, the optimal species composition of mixtures was dependent on the site.

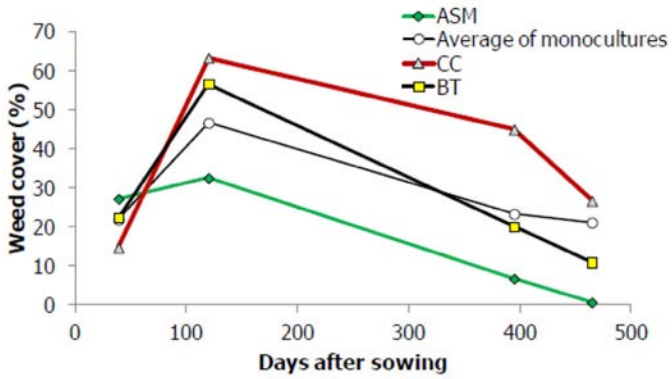

Figure 1: Weed cover for two selected legume species, the all species mix and the average of the monocultures. CC - Crimson Clover, BT - Birdsfoot Trefoil, ASM - All Species Mix

The OSCAR project (below) went on to show that several rarer legume species have good potential to be grown in organic rotations.

Döring T (2021) Matchmaking for legumes. ORC Factsheet No. 6 - January 2021 https://tinyurl.com/ORC40-F6-Leg

Using subsidiary crops to optimal effect

Maintaining ground cover via techniques such as using cover crops and living mulches has several benefits, including preventing soil erosion, conserving soil moisture, adding soil organic matter, reducing external inputs, and increasing soil biodiversity.

Following on from research on optimal use of species-rich legume-based leys in varied local environmental conditions, ORC was the UK partner in the OSCAR (Optimising Subsidiary Crop Applications in Rotations) research project. In multi-environment experimental trials across 12 different climates, it was found that the performance of subsidiary - cover crop and living mulch - crop species on soil quality improvement strongly related to climate; hence choice of species based on environmental conditions is essential. Although use of subsidiary crops reduced weed growth in most cases, satisfactory weed control remained a challenge, which further emphasised the importance of good crop choice.

Resultantly, a decision support tool was developed by ORC. It was based on a database of trial results from across the different climates included in the project and gave an overview of individual subsidiary crop species traits as well as the possibility to filter results in relation to site-specific performance factors such as pH range or winter hardiness. This allowed farmers to explore the potential performance of different crop species according to geographic location and taking into account their on-farm growing conditions, e.g. soil type.

Presenting experimental data in a format that encourages uptake remains a key part of ORC's work. The OSCAR toolbox enabled farmers to identify suitable subsidiary crop species, varieties and appropriate species mixtures and access practical management advice. The online toolbox is now available via the Subsidiary Crop Database, which is part of the AgroDiversity Toolbox wiki site.

Bickler C (2021) Using subsidiary crops to optimal effect. ORC Research Digest No. 3 - February 2021 https://tinyurl.com/ORC40-R3-subs

Intercropping pulses and cereals – Experiences from research and practice

Growing pulses in organic and low input systems can be challenging due to weed pressures and risk of lodging. Can intercropping pulses with a cereal help solve these problems?

- Intercropping is a tool for integrated weed management. Trials at Wakelyns in 2012 showed that weed abundance was negatively correlated to the sowing density of wheat intercropped with field beans. On-farm trials on an organic farm in Wiltshire demonstrated that weed biomass (mostly wild oat) was reduced by over 70% in wheat-bean intercrops compared to monocrop beans in 2017/18 (175 kg/ha beans and 125 kg/ha wheat) and in 2018/19 (200 kg/ha beans and 100 kg/ha wheat). The interpretation is that wheat fills the niche of the weed whilst being less competitive against the pulse.
- Cereals can provide scaffolding to prevent pulses from lodging and enhance harvestability. On-farm trials in Shropshire in 2017/18 compared different relative densities (RD) of triticale (10, 20 and 30% of the monocrop sowing density) with 200 kg/ha carlin peas. Although in low lodging season, harvestability was notably better in the 30% RD triticale. Similar results were obtained with lentils and oats in Kent in 2019/20: oats drilled at 30 plants/m^2 significantly reduced lodging and combine losses of lentils. The intercrop also halved the harvest costs, as monocrop lentils required two passes.
- Other benefits observed include greater yield stability – likely due to the lower weed burden, increased land use efficiency (Land Equivalent Ratio of one or greater) and improved cereal grain quality (protein content and Hagberg falling number).

Photo: Andy Howard

Harvesting lentils and oats at Bockhanger Farms

Intercropping a cereal with the pulses can, thus, reduce weed pressure and enhance harvestability of the pulse. These benefits can be optimised by acting on sowing rates and variety selection.

Bliss K (2021) Intercropping pulses and cereals. ORC Research Digest No. 2 - Feb 2021. https://tinyurl.com/ORC40-R2-inter

Diversifying wheat in organic farming

Many types of wheat, now forgotten, may prove well suited to organic and low-input agriculture today. We explored three 'forgotten' relatives of wheat: einkorn, emmer and rivet. Various accessions, including landraces, old and, where available, modern varieties of each species were grown and observed under organic conditions in the UK.

- Einkorn (*Triticum monococcum*) was the first type of wheat ever domesticated. Its hulled grains are known for their high nutritional value. A tiny plant in its early stages, it grows vigorously to produce a high number of tiny ears. Quasi-immune to diseases, it can grow very tall and be subject to lodging. However, modern, short varieties, were not as competitive and productive as old, longer-strawed landraces.
- Emmer (*Triticum turgidum* ssp. *dicoccum*) is another ancient relative of wheat with hulled grains, recently rediscovered in Europe thanks to its nutritional value and flavour. A vigorous plant from the early stages of development, it showed the highest incidence of foliar diseases in our trials, although with important differences across accessions.

Left to right: miracle rivet, emmer, einkorn, rivet, bread wheat

- Rivet (*Triticum turgidum* ssp. *turgidum*) is a close relative of durum wheat, but well adapted to cool climates, and was in fact widely used in the British Isles in the past. Quasi-immune to diseases, and very vigorous and competitive throughout the whole cycle, it is very tall, thus subject to lodging. However, it showed the highest productivity in our trials, mostly linked to its big ears and large grains.

All three species thrived in environments where modern wheat varieties failed. Selected accessions were further tested in different rotational position and tillage systems. We found that these minor cereals can be sown as second cereal and/or under reduced tillage and grow shorter, i.e., less prone to lodging, without yield penalties.

Amos D (2021) Diversifying wheat in organic farming. ORC Research Digest No. 1 - Feb 2021. https://tinyurl.com/ORC40-R1-div

Reduced tillage in organic farming

Reduced tillage can lead to improvements in soil health and enhance ecosystem services including carbon sequestration, reducing soil erosion, improving soil fertility and biodiversity, whilst reducing CO_2 and N_2O emissions from soils and decreasing energy usage. However, some consider it incompatible with organic farming, stemming from concerns around weed control, nutrient availability, and ley incorporation, as well as insufficient equipment and knowledge to make the system work. ORC took part in the *Reduced tillage and green manures for sustainable organic cropping systems* – TILMAN-ORG project where these issues were investigated.

The results of this project showed that organic farmers can consider reduced tillage through a pragmatic site-specific approach: they can strategically employ occasional shallow inversion tillage or even shallow non-inversion tillage to realise some of the benefits of reduced tillage without significant yield loss. Specifically, the field trials conducted by ORC showed shifts in the weed communities, improvements in crop establishment and only moderate effects on crop yield over three cropping cycles.

Further research and development needs that were identified related to synchronisation of nutrient supply and demand, machinery improvements and adaptation of farm-specific reduced tillage systems to keep weeds controlled in the long-term. ORC is currently exploring combining reduced tillage with green manures, to improve nitrogen provision and weed control as a promising option for UK arable cropping systems. Adopting living mulches, i.e. cover crops grown simultaneously with the main cash crop, can potentially enable further reductions in tillage, or even organic no-till systems.

Amos D (2021) Reduced tillage in organic farming. ORC Factsheet No. 5 - January 2021. https://tinyurl.com/ORC40-F5-til

Please go to the 40th anniversary communication hub for more factsheets, Research digests, podcasts, videos and more! www.organicresearchcentre.com/news-events/orc-turns-40/

Ten minutes with Katie Bliss

What is your job role at ORC?

Researcher - Agroecology and Knowledge Exchange

How long have you worked at ORC?

I started in September 2016

What is your background

I grew up on an arable farm in the East Anglian Fens, where we have been working towards an agroecological approach, collaborating with other local farmers to integrate leys and livestock into the rotation. I live in Falmouth, Cornwall, where I am part of our local food coop and working with others to establish a community growing project.

How did you get involved in the organic industry?

I became passionate about agriculture at a young age, spending my summers helping with harvest and autumns on the potato harvester! I loved the wild places on the farm – in particular the seasonal wetlands on the Nene washes, an SSSI. However, I became increasingly aware of the environmental impact of farming and was concerned about us being exposed to chemicals and the impact this may be having on wildlife and the environment. I went on to study agriculture, environmental studies and later agroecology.

Prior to working with ORC I worked internationally with small-scale farmers in Nepal, Cambodia, Nicaragua and Guatemala – using participatory methods to identify appropriate agricultural technologies and support farmers to share knowledge on agroecological practices. I learnt a lot from working with these farmers and how they managed their farming systems. In Nicaragua, I was working with Bioversity International in cacao agroforestry systems where farmers were managing very diverse systems, many with over 80 crop species, and many were working to enhance beneficial interactions between them to provide a number of benefits including pest control and reducing soil erosion. On my return I was keen to build both on the learnings from these farmers and the participatory ways of working with them to UK agriculture.

What does your job entail?

My role centres around agroecology: the application of ecological principles to agricultural systems and practices. My core focus is on crop diversity – enabling beneficial interactions at a rotation, field and crop scale to enhance the efficiency and resilience of farming systems.

As part of the DiverIMPACTS project I work with two case studies exploring crop diversity – one focusing on the production of pulses and other novel crops in collaboration with farmers and processors in the Hodmedod's network and the other working with a group of growers looking to enhance diversity in protected cropping. Within this project we are looking at factors to enable crop diversification across the socio-technical system from seed to consumption.

I have a particular interest in intercropping and polycultures and have worked with a group of farmers in the Innovative Farmers Field Lab *Intercropping in arable systems* experimenting with a range of plant teams (see ORC Bulletin No.128).

I also work with the Agricology project, where we aim to support all farmers to transition to agroecological farming systems. I really enjoy hosting discussions with farmers and researchers sharing their experiences with putting agroecology into practice at events and in podcasts.

What are you working on at the moment?

I am really excited to be working with a great group of growers in the DiverIMPACTS project. We are exploring a number of elements of increasing diversity in polytunnels including increasing the number of flowering plants to attract beneficial insects and the potential use of caliente mustard for biofumigation. It is a great opportunity for the growers to share their experiences and bring in specialist researchers in support. With the Hodmedod's case study we are working with the Dark Mountain project to gather the stories of crop diversification from farmers across the network.

We are also just analysing results of a study looking at some social impacts of crop diversification – on elements such as workload, job satisfaction and labour organisation, in order to identify areas for support (see ORC Bulletin No. 132).

Growing beyond monoculture

With Agricology we are just wrapping up an ELMS Test and Trial on videos and podcast (in collaboration with the University of Reading) where we have been looking at the potential for audiovisual knowledge exchange in the transition to ELMS and a post-Covid world.

I am also just starting to work on an intercropping podcast – to share some practical experiences from farmers who are trying it out. We hope to publish on Agricology in April.

What do you enjoy about working at the ORC?

I really enjoy working with farmers, learning from them, sharing ideas and seeking to focus research on their interests and needs. I enjoy being part of a friendly group of passionate researchers and having the potential to pursue more innovative research areas. I also really enjoy being part of a wider community of passionate people in the Agricology community and the wider European research network.

What do you think the ORC's biggest achievement over the last 40 years has been?

ORC has been pioneering farmer led applied research in agroecological farming practices such as intercropping, agroforestry and soil health for the last 40 years. In particular, I think some of our biggest achievements relate to the work of our dear friend the late Martin Wolfe. Martin was exploring innovative ideas around crop diversity including agroforestry and composite cross populations over 20 years ago. In the past some of these ideas may have been considered a little radical but it feels like these concepts are now making a big impact on the wider sector.

What do you see as the future of farming and what role does the ORC play in this?

With radical changes happening in the agricultural sector I believe our role is to support all farmers and growers to transition to agroecological farming systems which enhance resilience, resource efficiency and sustainability. Advancing learning in how we can best apply agroecological practices, led by the questions raised by farmers.

Is there anything exciting we should keep our eyes out for over the next couple of months?

As part of the A Team project we are developing a series of videos on different agroforestry practices and themes in collaboration with the Woodland Trust and the Game & Wildlife Conservation Trust. Also look out for the intercropping podcast!

Later on in the year, Covid restrictions allowing, we hope to arrange a workshop with people from across the food and farming system to explore the potential for enhancing crop diversity in order to build on learnings from the DiverIMPACTS project.

www.diverimpacts.net/
www.agricology.co.uk

As part of the EU Horizon 2020 research project DIVERSify, researchers have been working on investigating the viability of species mixture cropping as an alternative to crop monoculture.

During the project, we have worked with Taskscape Associates Ltd – the DIVERSify Consortium Partner for Communication, Knowledge Exchange and Participation – to create a video web series which explores the practical and theoretical considerations of mixed cropping and the ecosystem services that they can provide. The series explains where innovations have led to progress but also further opportunities still to be realised and future research and development needs.

This final episode in the web series, which was released in January, aims to highlight the project's key findings. These have been generated over four years of research trials and are combined with feedback from farmers and other stakeholders on the potential challenges, benefits and learnings on mixture cropping throughout the project. Most importantly, the final episode summarises the project's overall recommendations about the opportunities for using mixed cropping in farming and downstream value chains.

Dr Alison Karley, co-ordinator of the DIVERSify project, explains: "The final episode in the DIVERSify web-series summarises recommendations about the use of mixed cropping, based on our research trials across Europe and North Africa. It also highlights how decision-makers could provide financial and policy support for mixed cropping and recommends ways to ensure that intercropping knowledge is shared across agricultural communities."

The key recommendations from the project so far are built around:

- Reducing Inputs
- Supporting Agrobiodiversity
- Knowledge Sharing
- Diversifying the Cropping Sequence
- Leveraging Opportunities

To find out more on the project and to watch the last episode in the DIVERSify web series, please go to:

www.plant-teams.eu/watch

Living mulches for sustainable cropping systems

Photo: DominicAmos

ORC crops researcher *Dominic Amos* asks if a permanent clover understorey acting as a 'living mulch' – moving towards a perennial soil cover – could be a step towards 'regenerative organic' agriculture in the UK?

This is the question being investigated by a group of arable farmers attempting to implement the system for input reduction through an Innovative Farmers field lab. Inputs in this case could be agrochemicals and fertilisers or tillage and diesel, depending on the current farming system. These are the two starting points of the group, who are either already practising long term conventional no-till looking to reduce chemical inputs or established organic farmers looking to reduce tillage. There is an imperative from both perspectives but whilst both farming systems can learn from each other, the challenges for each of making an alternative system work are quite different due to the respective starting points.

What is a living mulch?

A living mulch (LM) system includes aspects of several common farming practices and concepts such as cover cropping, intercropping, undersowing, and mulching, with the system building upon these approaches with full integration as a cropping system. In practical terms it requires the establishment of a perennial forage legume to provide protection for the soil as a (semi-)permanent ground cover common to perennial cropping systems such as top fruit or viticulture. It is rarely used in annual cropping systems due to the competition with the cash crop so the question is, is it compatible with annual arable cropping? The LM approach differs from the well-known organic reduced tillage systems with the roller crimper pioneered by the Rodale Institute in the US, where the idea is to terminate high biomass cover crops to provide a dead mulch that helps suppress weeds for establishing cash crops. In truth this system relies on certain climatic conditions generally not experienced in the UK.

Services and benefits

The LM system can be expected to deliver a number of key ecological services to the agroecosystem including nitrogen (N) accumulation, weed suppression, enhanced soil physical characteristics (and trafficability), soil protection, catch cropping function, self-regulation of pests and disease, increased soil fertility and increased biological diversity.[1,2,3] At this stage it is also worth considering that many organic farms already have weeds that provide some of the ecosystem services but with less control over species, so the mulch could be thought of as a 'designated weed.'[1]

The two key services that need to be delivered for a LM system to best contribute to agricultural productivity are weed control[4] and N supply.[5] Living mulches offer a potential alternative and sustainable strategy for these two provisions, although the amount of N made available for the cash crop and level of weed control will be greatly influenced by management and by the season. Conventional no-till systems may require supplemental N fertiliser to maintain crop yields.[6] These two services offer an insight into the complexity of the system and the trade-offs (not necessarily unavoidable[3]). There is a strong correlation between the mulch biomass and weed suppression and N accumulation services[7,8,9] but high biomass will offer stronger competition against the cash crop.[10]

This management balancing act between cash and cover crop growth throughout the season is the fundamental challenge to a working LM system - in order to harness the benefits of this permanent cover whilst limiting the risks to productivity. If enhanced soil health, increased biodiversity (above and below ground) and reduced emissions can also be delivered, then a more sustainable and resilient farming system is the prize on offer. There is a word of warning at this point since much of the research[11,12,13] already conducted in this area including recent work at Stockbridge Technology Centre through the DIVERSify and TRUE projects demonstrates large and potentially unsatisfactory grain yield losses from arable LM systems that will require careful thought and management to make successful.

Enhancing beneficial interactions and managing competition

The ecological concepts that underpin the cereal-forage legume system are known as niche complementarity and facilitation and the system works on the principle of functional diversity. In theory this means the two 'parts' of the system work in harmony but in practice, particularly from the organic perspective, making the system work has proved elusive. This is a complex issue but a key factor is the interactions of the cash and the cover crop, and the ability to manage and manipulate the competitive advantage of the cereal. In fact, from an agroecological perspective, boosting the cash crop and weakening the cover crop at key times in the growing season is a real challenge especially since, as previously mentioned, weakening the mulch actually contradicts its key service provisions. Small doses of N fertiliser and herbicides can selectively weaken the clover and hand the competitive

advantage to the cereal but of course these options are unavailable for organic farmers.

Farmer-led trials

There are several areas that are being explored by farmers through the Innovative Farmers field lab:

- Mulch species and establishment
- Cash crop species and establishment
- Mulch management (both externally and in crop)

Mulch and crop species selection

Different combinations of approaches are being tested with the farmers - utilising their knowledge of the context of their farms and systems and taking wider considerations into account to choose the most appropriate options for them. This will facilitate the peer to peer exchange and progress on living mulch best practice.

In the field lab trials the farmers have used a mix of wild white and small-medium leaf clover recommended by Cotswold Seeds, that has been selected to remain prostrate and provide persistence but with limited longer term competition against the crop.[14] The clovers were established through undersowing into cereal crops in spring 2020.

Direct drilling cereal crops into the pre-established stand of clover took place last October with winter oats and rye selected for their competitive abilities.

Mulch management

How and when, or even if, to manage the mulch is a key question being explored. There are opportunities to mow or graze before drilling the cash crop, or even during the foundation phase of cereal growth in the late winter. One of the most interesting questions is whether the mulch needs to be selectively managed later during the growing season and how this might be done? An option being considered is inter-row mowing, though commercial equipment is not yet available.

In conclusion

This fine balance of managing and manipulating the dynamics of a cash and cover crop to the advantage of the cash crop whilst maximising the services from the cover crop is what in the end will determine the successful implementation of what is on paper a sustainable and resilient way to farm the land - albeit one that will require a system redesign approach. In the end the system will rely on the knowledge and ingenuity of the farmers and the peer to peer learning to turn the theory into successful practice.

As well as these farmer-led trials being run through Innovative Farmers, the EU projects DIVERSify and TRUE are investigating the potential for these living mulch systems.

Visit the Innovative Farmers Living Mulch group page for more information or to join the group.
https://tinyurl.com/IF-livingmulch

Watch session at ORFC Global https://youtu.be/1aqvxdE2D-Q

**Special mentions to Cotswold Seeds and Organic Arable who are providing financial and technical support to the field lab.*

Drilling October 2020, Litchfield Farm

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This article was first published as a blog on Agricology:

https://tinyurl.com/Agricology-lm

Staff news at ORC

Welcomes

Colin Tosh

We welcome Colin Tosh to our research team as Senior Agroforestry Researcher. Colin grew up in a farming community in Eastern Scotland and joins us from Newcastle University. He is based in the North East. Colin is principally responsible for project delivery and development in the area of agroforestry and is currently working on the Agroforestry ELM Test and Trial, and the AGROMIX (AGROforestry and MIXed farming systems) project. Colin's research interests include agroforestry, agroecology, insect-plant interactions, cognitive ecology and evolution of behaviour. Outside of work coastal sea fishing, writing stories, video games and organic growing and gardening keep him busy.

Paul Jenkins

Paul joins us as our Head of Finance to provide full accounting support to the Board of Trustees and CEO as well as managing and developing the finance function within the organisation. Paul's main interest outside of work involves keeping fit through running as well as long distance hiking/ walking across the UK in order to allow him to fully enjoy good food and wine.

Rowan Dumper-Pollard

Rowan is our new Organic Business and Markets Researcher primarily in the Business and Markets Research Team on AGROMIX. The project is European wide and investigates the key barriers to and innovation opportunities for sustainable value chain networks in mixed farming and agroforestry systems. Rowan is interested in the interaction between different urban food strategies and existing agricultural and food production systems. Also, the role of transdisciplinary research and the co-production of knowledge in assisting the transition to sustainable food and farm systems.

Pip Robb

Pip Robb joins us as interim Project Manager for the Knowledge Exchange platform, Agricology, which aims to inspire farmers to transition to more sustainable farming practices by providing knowledge and evidence from industry experts and respected peers. Pip said "I am thrilled to have the chance to be involved in helping farmers meet the ongoing ecological and economic challenges they face."

Farewells

Sally Westaway

In December we bade farewell to Sally Westaway. Sally had worked within the ORC's agroforestry team on a range of projects since 2013. She led an EIP Operational Group looking at using woodchip for soil health as one method of integrating trees and hedges into farms. She is the secretary of the Farm Woodland Forum (www.agroforestry.ac.uk) and a member of the Hedgelink committee (www.hedgelink.org.uk/).

Sally also acted as the innovation broker for the UK Agroforestry Innovation Network as part of the AFINET project. Past research she was involved with included setting up trials to enhance agronomic, environmental and economic performance of traditional and novel agroforestry systems (SustainFARM); sward development and management in silvopoultry systems as part of the AgFORWARD project; the management of traditional hedges for bioenergy (TWECOM), conservation tillage (TILMAN-ORG), and the use of cover crops in organic rotations (OSCAR).

Fortunately, her work with agroforestry will continue. We wish her luck as she starts a PhD with The Royal Agricultural University – Working title: Spatial modelling of different tree cover scenarios in the agricultural landscape to maximise ecosystem service provision (carbon, food production and biodiversity). We'll miss her!

Tamasin Connett

Tamasin started working at the ORC in July and was with us for 8 months as Head of Finance (replaced by Paul). Her last day was Feb 24th and she now works for the UK Space Agency. We wish her well.

New Projects

Twelve year silvopasture field lab launched

The new Innovative Farmers field lab, involving seven farms in Devon, will be the largest participatory research project to date looking at silvopasture – integrating trees and livestock. The Farming and Wildlife Advisory Group (FWAG South West) are coordinating the group and worked with The Woodland Trust and the farmers to develop silvopasture planting designs. FWAG South West will be monitoring biodiversity on the farms with Rothamsted Research North Wyke researching changes to soil biology, health, in particular soil carbon, and ORC are providing expertise in silvopasture design and research to optimise livestock health and welfare. Baseline soil sampling by Rothamsted has already begun on the farms with tree planting commencing at the end of February supported by The Woodland Trust. FWAG will start the biodiversity monitoring in May alongside ORC's livestock assessments.

Dartmoor ELMs Test and Trial

ORC is supporting Dartmoor National Park Authority Officers and the Voluntary Advisory Team in the development of a scorecard as part of their Dartmoor Environmental Land Management (ELMs) test and trial. The project provides an opportunity for farmers to be engaged in the design of ELMs to identify what might work on Dartmoor. ORC will support the development of a scorecard for Public Goods delivery on home and common farms that utilises a 'payments by results' approach.

The conservative radical who changed attitudes to organic farming

Barry Wookey: 1924-2020

Before there were international farmer gurus preaching alternative and regenerative agriculture, there was Barry Wookey. He wouldn't travel abroad to talk about his farming but he certainly had international reach. The New York Times in October 1981 carried a feature and his picture, looking every inch the English squire, with the title 'Organic Farm British Style Pays Off'. And it did and everyone wanted to know how he did it.

Barry, who died peacefully, age 96, in December, at home in his beloved Wiltshire was one of this country's most significant farmers of the last 50 years, not just for the organic movement/sector and particularly EFRC/ORC, but as trailblazer for conventional farmers who wanted to get off the chemical treadmill.

He wrote a book 'Rushall: The Story of An Organic Farm' in the mid-1980s, in the hope he could reduce the number of farm visits he was hosting. Not a chance. The 3000 plus acres at Rushall and Upavon (over 1600 organic at that time) was a must place to visit for anyone interested in cutting edge, innovative farming on a size, commercial focus and with methods that could never be dismissed as 'hobby farming' or 'a rich man's plaything'.

Nor could you dismiss Barry Wookey as a 'hobby farmer'. He was a fit for all the 'real farmer' stereotypes of the day: large-scale arable - Justice of the Peace, NFU and CLA stalwart, horses, fishing, tweedy jacket and tie, everything you'd expect.

Except his thinking, which was innovative and challenging; his awareness that things had to change in farming and the countryside; his courage to do something about it; and his business acumen and farming skill to make that something environmentally and commercially successful.

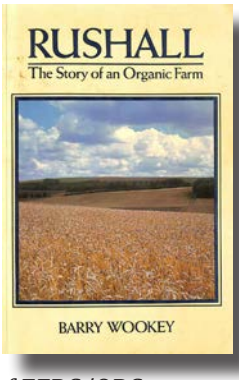
He argued that 'organic farming is not sentimental nonsense reserved for drop-outs or radicals…(it) is a modern, efficient enterprise, and a profitable and successful venture too.' And people – lots of them - wanted to visit and see for themselves, especially other farmers but also researchers, policy makers and politicians who Barry set out to influence and he succeeded – including with the Prince of Wales.

I often claim that Elm Farm was the first organic farm the Prince ever visited. It wasn't, it was Rushall in 1984, when HRH, together with myself and Prof. Hardy Vogtmann, were shown around by Barry before travelling onto Elm Farm Research Centre. It was these visits which propelled the Prince and crucially his advisors, to the decision to convert Duchy Home Farm to organic.

Before then, Barry had become a big supporter of our work. We used his farm for research projects and crucially, working with government research bodies, which was a difficult process at first. The methods and ideas of the researchers we brought in from Germany and Switzerland were sometimes at odds with conventional researchers from the UK. At every stage, Barry supported us and insisted that we had equal status. It was this experience which paved the way and informed the collaborations with mainstream researchers which has been a hallmark of EFRC/ORC throughout its existence.


Organic Farming, British Style, Pays Off

New York Times Archive



Blackwell Publications

Barry Wookey's influence on the development of organic farming in the UK was massive. He might have been an 'establishment figure' but he saw common ground with many 'young radicals' who weren't and he willingly gave support and help – some might say cover – to their initiatives.

He certainly touched and influenced many who were part of his conservative world but it's a nice irony – which I hope he appreciated – that his most significant contribution to improving farming might have been helping the 'sentimental nonsense' of the 'drop-outs' and 'radicals' move into the mainstream.

Lawrence Woodward OBE

Events and announcements - details at www.organicresearchcentre.com

Events

1-2 May 2021: Anglian Agroforestry Farms Open Weekend 2021. Fellows Farm, Fobbing Farm, Shimpling Park Farm, Maple Farm Kelsale, Wakelyns and Whitehall Farm will be welcoming pre-booked visitors. http://www.wakelyns.co.uk/files/2021.pdf

17-19 May 2021: 5th European Agroforestry Conference. Online https://www.euraf2020.eu/

16-18 June 16 2021: European Organic Congress. Organised by IFOAM Organics Europe and AGROBIO. https://europeanorganiccongress.bio/

6 July 2021: National Organic Combinable Crops. OF&G event hosted by John Pawsey, Shimpling Park Farm, Suffolk. ORC's crops team will be involved with LiveWheat and other projects represented. Provisional, dependent on any pandemic and government restrictions. https://ofgorganic.org/

30 August-2 September 2021: 2nd International Conference on Biodynamic Research - Growing beyond resilience. Online. https://tinyurl.com/Biod-res-conf21

6 - 10 September 2021: 20th Organic World Congress. Rennes, France. Planned to be both an in-person and online event. https://owc.ifoam.bio/2021/en

Technical guides/publications

Download only at present! https://tinyurl.com/ORC-pubs