THE ORGANIC RESEARCH CENTRE

ELM FARM

In this issue:

Cover photo

Martin Wolfe stands proudly beside a crop of ORC Wakelyns Population wheat, grown on-farm (see p3 and pp12-13)

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Organic Research Centre

Bulletin

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News in brief

Improving organic animal farming

A new book *Improving organic animal farming* has been published by Burleigh Dodds Science Publishing Limited. The book, edited by Mette Vaarst of Aarhus University in Denmark and Steven Roderick of Duchy Colege, pays particular attention to the role organic animal farming will play in the face of key environmental issues. It contains a chapter written by ORC's Susanne Padel on *The principles of organic livestock farming,* a chapter by Laurence Smith (now ex ORC) on *The effects of organic management on greenhouse gas emissions and energy efficiency in livestock production* (with AG Williams of Cranfield University), and a chapter by ORC's Lindsay Whistance on *Enhancing naturalness and human care in organic animal farming*. Lindsay also contributed to a chapter on Integrated crop–livestock systems with agroforestry to improve organic animal farming.

Sharing knowledge and tools for organic farming

The Organic Farm Knowledge platform hosts a wide range of practical knowledge and tools for organic farmers and advisers that help improve farming practices. A new version of the online platform covering more themes and a new design was launched at BIOFACH 2019. A first version of the platform – focusing on organic arable cropping – was launched in October 2016. FiBL (Research Institute of Organic Agriculture), IFOAM EU and ICROFS (International Centre for Research in Organic Food Systems) have taken the platform to a higher level with new themes such as animal husbandry and organic plant breeding. A new design and more content, including a news and events section, complete the update. https://organic-farmknowledge.org/

Soil analysis and management

Mark Measures has completed his final report *Soil Management for Sustainable Food Production and Environmental Protection* following his travels as part of his Winston Churchill Memorial Trust Fellowship, visiting farmers, advisers and researchers in the USA, Denmark and Switzerland. The Fellowship provided an opportunity for Mark to study new methods of soil analysis and management and to assess the potential of different farming systems and practices to deliver more sustainable food production and beneficial environmental outcomes. A common theme was the recognition that better soil management is needed, that soil biology should play a much greater role than in the past and that improved soil analysis methods are needed to support that management. The Fellowship identified a number of farming techniques and systems which have a critically important role to play in food and farming in the future.

What organic farming does for environment and society

A new report from the Thünen Institute provides a comprehensive evaluation of scientific publications on the public goods provided by organic farming. Organic farming gets support as it is a sustainable land-use system. Although the social and environmental benefits of organic farming are widely recognised, the potential of organic farming to solve the environmental and resource challenges of our time are still assessed differently. In order to get a good overview of the current state of knowledge and to evaluate the public goods provided by organic farming, the Thünen Institute in Germany, jointly with other research partners and funded by the Federal Ministry of Food and Agriculture (BMEL), evaluated the scientific literature on the topic. Particular attention was paid to the areas of water conservation, soil fertility, biodiversity, climate change mitigation and adaptation, resource efficiency and animal welfare. The study evaluated 528 publications and considered 33 parameters comparing organic and conventional farms. This resulted in more than 2,800 individual comparisons. Based on this the study concluded that organic farming can make a relevant contribution to solving the contemporary environmental and resource challenges and is rightly considered a key technology for sustainable land use.

SustainFARM Public Goods Tool

The SustainFARM Public Goods Tool, developed from the Public Goods Tool created by ORC, is a sustainability assessment for farms that combine food and non-food production. The Tool helps farmers assess the sustainability of their farming system within a 12-month period. It can also be used as a decision support tool for farmers and land managers, to help them to identify the possible impacts of changing their system on performance across the full range of sustainability indicators. The assessment takes a broad approach, using information that a farmer would have in their farm records already. It takes between 30 minutes and an hour to complete, depending on the complexity of the farm. It assesses a farm on a number of areas (spurs) which may be impacted by agricultural management practices and are related to public goods such as water quality, air quality, etc. The SustainFARM PG Tool, user guide and case studies can all be found at http://tinyurl.com/SustainFARM-PGtool

Objections to GM potato crop trial

Thirty-one organisations, including ORC along with some of the UK's biggest environmental organisations, as well as farmers, scientists, seed distributors, and retailers, lodged a formal objection in April to the Sainsbury Laboratory's plans for a new field trial of GM potatoes on farms in Suffolk and Cambridge. The potatoes contain several different added genes that work in different ways to control different biological functions, but the application does not consider possible interactions between these stacked traits. The proposed trial also uses gene silencing techniques to 'switch off' the function of particular genes. Like all forms of genetic modification this can lead to off-target effects and unintended impacts. There is no agreed protocol for assessing the risk to people or animals who may accidentally or deliberately consume plants modified in this way

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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: Professor Martin Wolfe (1937–2019)

We were sad to hear of the recent death of our colleague and friend Professor Martin Wolfe. Martin was an integral part of the team at ORC for over 25 years, where he pioneered the development and organic systems through scientific research as well as the practical example of farming at Wakelyns Agroforestry that he established and ran in partnership with late wife, Ann and their family.

Professor of Plant Pathology Martin worked for 28 years at the Plant Breeding Institute (PBI) in Cambridge, followed by nine years in Switzerland and since 1998 and 'retirement' worked for the ORC and latterly Coventry University. Since 1997 he, his late wife Ann, and his family have been partners in and run Wakelyns Agroforestry, a highly innovative, integrated (organic) agroforestry farm in Suffolk.

Martin had a B.Sc. (Hons Agric. Bot.) University of Reading, 1960 and a Ph.D. University of Cambridge, 1963 and a life dedicated to the pursuit of knowledge. It was a career of research in and into agricultural systems. Martin was a pioneer in working in multi-disciplinary contexts and in an agroecological framework, with first-hand experience of both crop and livestock research as well as farm management and the environment. This came together, and can be seen in his legacy, in his passion for an equitable and sustainable food system and on the ground at Wakelyns.

Martin's great passion was diversification of food and farming systems. From his early work at PBI through to the research he undertook right up to his death, being carried out both on Wakelyns and with the numerous research projects he engaged with, Martin championed population breeding and composite cross populations. This has its roots in landraces and he is clearly the 'father' of the 1st population to be marketed in the EU under the recent marketing experiment – fittingly named the ORC Wakelyns Population. Thanks to Martin's outstanding capabilities in inspiring students and collaborators to think independently and out of the box, the population and cross breeding work has by now also created a scientifically and practically rooted 'Composite Cross Community' throughout Europe dedicated to agroecology based on diversity at all levels from the microorganisms up to humans and landscapes.

Bruce Pearce

Martin's career

2009- Principal Scientific Advisor, Organic Research Centre

2017- Professor of Plant Breeding for Sustainable Agriculture Resilience: Centre for Agroecology, Water and Resilience, Coventry University

Previous positions held

1963-1976 Cereal pathologist, Plant Breeding Institute, Cambridge

1976-1988 Head of Plant Pathology and Entomology, Plant Breeding Institute, Cambridge

1988-1997 Professor of Plant Pathology, Swiss Federal Institute of Technology, Zurich, Switzerland

1993-1998 Member of the Board of Trustees of CIAT (International Centre for Tropical Agriculture, Colombia)

1997 Partner in Wakelyns Agroforestry

1998-2009 Research Director, ORC

Other responsibilities

Programme Secretary, Federation of British Plant Pathologists

Founding Member, President (1983) and Honorary Member of British Society for Plant Pathology

Board of Trustees, CIAT

Quinquennial Review team, CIP

Board of Trustees, PAN-UK

Scientific Committee, RHS

Board of Directors, East Anglia Food Link

Founding Member, Eostre Organics Growers' Cooperative

"He was a very visionary person with many ideas that entered into the concept of organic plant breeding. He was the first to define 'organic plant breeding' and 'breeding for organic'. Being an excellent plant pathologist he was very enthusiastic about breeding for diversity starting from mixtures, composite crosses up to agroforestry. We shall keep him in very good memory." Monika Messmer, FiBL

"His revolutionary challenge to conventional farming systems was backed up by practical, yet rigorous research and enthusiastic persuasiveness. His inspiration for greater diversity in the way we produce our food will be sorely missed, but not forgotten." Mark Measures, IOTA/ORC

"Like so many others I and many of my colleagues at the Woodland Trust were truly inspired by Martin's pioneering work especially in the area of agroforestry. In our own small way we will strive to ensure his good work in this area continues and becomes mainstream." Helen Chesshire, Woodland Trust

We will be running a feature in the next Bulletin to highlight the legacy that Martin leaves behind.
See also the article by Charlotte Bickler on page 12 on variety trialling and the ORC Wakelyns Population.

Tree fodder: browsing, preserving and nutrition

*In the third of a short series of articles, written as factsheets for the Agroforestry Innovation Networks (AFINET) project, ORC Livestock Researcher **Lindsay Whistance** looks at how offering access to browse and feeding tree fodder can supplement the diet of domestic animals.*

Why offer animals access to browse?

Key advantages

- Browse and tree fodder are good sources of protein, vitamins and minerals.
- Browse and tree fodder are readily eaten by farm animals.
- Silvopasture is more productive than open pasture
- Animals with nutritional deficiencies can seek out appropriate feed sources in a diverse environment.

The benefits of silvopastoral systems to animals include access to shelter in the winter and shade in the summer. In general, browse and tree fodder are good sources of nutrition and compare favourably with grasses grown in the same environment. Trees are also a good source of micronutrients including vitamins and particularly minerals. Where animals have access to trees or hedgerows, they will readily browse indicating its attractiveness as a feed. Browse intake for cattle, sheep and goats can range from 12-55 %, 20-76 % and 60-93 % respectively. Goats tolerate high levels of browse in the diet with saliva that can bind tannins and a large liver that effectively processes tannins. Although the gastrointestinal tract of cattle is well adapted to a grass diet, it does not inhibit efficient digestion of browse. Browse is accessible to a height of 2 m for cattle and 1.2 m for sheep. Goats are termed vertical browsers, having no meaningful browse height, given their physical agility.

Trees with a clear browse line from cattle in 2017 Stonehenge

The benefits of feeding browse and tree fodder

Sourcing good protein for animal feed is a global issue. Crude and degradable protein levels in tree leaves, particularly in ash, lime and mulberry, compare well with levels found in alfalfa and ryegrass. Additionally, although condensed tannins in browse inhibit normal digestion of protein in the rumen, the bonds between tannins and proteins are broken in the abomasum, effectively delivering a good-quality rumen bypass protein to the small intestine. Mineral content in browse can also be high and hazel and beech are good sources of copper, offering animals some protection against gastrointestinal parasites. Zinc plays a role in important biological functions and promotes the efficient metabolism of protein and carbohydrates. Selenium deficiency is common in natural grazing systems. Selenium and zinc are abundant in willow. Browse can also be an important source of vitamin E, particularly in dry conditions.

Hereford cattle browsing in a mixed-species hedgerow in 2014, Hereford

Diverse systems promote self-regulation in diet

Overall, silvopasture produces more forage per unit area than pasture alone. With a varied diet, animals tend to eat more of everything, where more palatable plants act as a buffer. Browse can be highly palatable and summer growth offers a good additional feed source to pasture as well as being preserved as tree fodder for winter. Preserving tree fodder by drying or ensiling increases palatability by reducing the bitter taste of tannins.

Through the presence of condensed tannins, good quality protein is available as rumen-bypass protein. Additional protein promotes 1) growth of juveniles, 2) production including improved wool quality, 3) reproduction including improved fertility, and 4) health including an increased resilience to intestinal parasites. However, although condensed tannins at 1-4 % of dry matter intake can be of benefit, beyond 5% they can cause digestibility problems. Animals are considered capable of self-regulating intake, but this is only possible with a diversity of feed sources so that they can avoid excessive intake of single species.

Animals are sensitive to nutrient deficiencies and can seek nutrients out if a defining property (taste or smell) enables learning to occur. The relationship between taste and ingestive

Ewe browsing on hawthorn, Hald Ege, Denmark.

Photos: Lindsay Whistance

processes can alter the palatability of a feed so for animals, suffering from a deficiency, the importance of taste diminishes in favour of other components. In dryland conditions, for example, browse is a good source of vitamin E but also high in bitter tannins. Lambs deficient in vitamin E will nevertheless eat more of a less preferred feed high in vitamin E and do so before any clinical signs of deficiency become apparent.

The content of some minerals is higher in tree fodder than fresh browse, increasing its value as a sustainable source of minerals. Nevertheless, controlling intake is important as excess minerals can be toxic particularly for susceptible breeds.

Browse/tree fodder systems require sufficient yields for all animals to have access. For browsing, controlled defoliation (up to 50%) and sufficient time (around 8 weeks) for regrowth is needed as hard browsing can reduce a tree's ability to regrow. The more palatable a species is, the harder it will be browsed. Establishing silvopasture is a long-term investment and browsing is not recommended until trees are three years old. To function well, silvopastoral systems need to be well-designed and well-managed. The quality of management of both plants and animals is key to success.

Further information

1. Vandermeulen S, Ramírez-Restrepo C A, Beckers Y, Claessens H, Bindelle J. (2018) Agroforestry for ruminants: a review of trees and shrubs as fodder in silvopastoral temperate and tropical production systems. Animal Production Science. 58: 767-777.
2. Villalba J J, Provenza F D. (2009) Learning and dietary choice in herbivores. Rangeland Ecology and Management. 62: 399-406.
3. Waghorn G C, McNabb W C. (2003) Consequences of plant phenolic compounds for productivity and health of ruminants. Proceedings of the Nutrition Society. 62: 383-392.
4. Emile J C, Delagarde R, Barre P, Novak S. (2016) Nutritive value and degradability of leaves from temperate woody resources for feeding ruminants in summer. Proceedings of the 3rd European Agroforestry Conference (EURAF), Montpelier France. 23-25 May 2016. p. 468

Join ORC's Farmer and Business Supporters' Group

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

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

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

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

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

FAB supporters have:

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

Please give us your support and sign up today!

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

£100 (Supporter)

£250 (Bronze)

£500 (Silver)

£1000 (Gold)

£5000 (Platinum/Organic Ambassador)

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

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

UK Organic Congress 2018: Going for Growth

The UK Organic Congress 2018, held 15-16 November at Dunchurch Park Hotel, was a unique event organised jointly by leading organic organisations, including the Organic Research Centre, Landworkers' Alliance, Organic Arable, Organic Farmers & Growers, Organic Growers Alliance, Organic Trade Board, Soil Association and Whole Health Agriculture. ORC staff report back.

A new vision for organic food and farming in the UK

Nic Lampkin opened the event. "The UK led the global movement for organic but we're now well behind our counterparts. As a sector, we've been through a difficult period since the recession but we're now moving in an upward direction, with the domestic market estimated to be worth £2.2 billion and growing." He challenged the sector to create a transition to move things forward. "20% of land is organic in some countries and 10% of the food market; this should be the vision for the UK."(See article p14)

Sue Hayman, Shadow Secretary of State for Food, Environment and Rural Affairs, gave the opening address and said the development of the new Agriculture Bill brings great opportunity for organic. "The Agriculture Bill provides a huge opportunity to integrate environmental and food benefits. We know they're compatible, and we must make sure policy supports this," said Ms Hayman.

She said there are clear benefits to organic methods of farming and questioned why, when organic delivers in so many areas of national policy including food and public health, environmental protection and climate change mitigation, government has failed to recognise the merits of organic, unlike other countries. "The development of a post-Brexit UK agricultural policy is a seminal moment and talking proactively is very important. Sustainability must be at the forefront of a thriving British farming, food and drink sector," said Ms Hayman. "Shifting public support from land-based payments to the delivery of public and environmental benefits is a welcome move, but there's a need for a strategy that also safeguards food security."

Policy development sessions

The Congress included several sessions related to policy themes, reflecting informal consultations that were part of the English Organic Action Plan. These included; *Initiatives to support small-scale production and short supply chains*, *UK organic regulations and equivalence*, *Co-ordinating organic information and advice*, *Citizen access and engagement—routes to future success*, *Future trade opportunities* and *Making it happen at home*.

Novel breeding techniques

Bruce Pearce (right) and Charlotte Bickler of ORC, with Pat Thomas of Beyond GM, ran a practical session reviewing the outputs of a workshop (prompted by the English Organic Forum) held at Elm Farm in October on what opportunities and threats new gene-editing technologies pose for the UK organic sector. There were useful discussions on organic breeding and the potential implications of the techniques.

Agroforestry

The agroforestry team organised two popular sessions. The first session explored the practicalities of establishing and managing an agroforestry system, with a panel of agroforestry practitioners and advisors sharing key tips on the success stories and disastrous decisions of their agroforestry journeys. The second session looked at three examples of new business opportunities in agroforestry.

Triodos Bank Closing plenary: Transforming organic food and farming in Denmark and the UK

Paul Holmbeck

The scope for growth in UK organic was reinforced by Paul Holmbeck, Political Director of Organic Denmark, who presented the remarkable progress of the organic sector in Denmark. "Organic food now accounts for 13.3% of the total food market in Denmark and over 30% of the total market for eggs, milk, flour and bananas. More than 90% of public procurement of food in Copenhagen is now organic, with 60% an overall target for the country," said Mr Holmbeck.

Roger Kerr, CEO of OF&G, concluded the closing plenary by calling for more efforts for greater unity in the UK, and for the positive achievements of organic farming to be emphasised without denigrating others.

Reports, presentations and videos at: http://tinyurl.com/OrganicCongress18

Staff news at ORC

Nic Lampkin

On 31st January 2019, Nic Lampkin stepped down as Chief Executive Officer of the Organic Research Centre. Nic has played a critical role in steering ORC through challenging times since he took over from Lawrence Woodward in 2010. During his term, ORC was successfully re-established as the UK's leading independent research organisation in the field of organic farming and agroecology, with significant increases in project (in particular from EU sources) and unrestricted donation income achieved.

Nic has worked tirelessly for the good of the organisation and of the organic movement, leading the establishment of and chairing the English Organic Forum, securing significant increases in organic payments under the English and Welsh rural development programmes from 2015, and more recently leading the development of an industry-led Organic Action Plan for England under the auspices of the Defra/ EOF Organic Roundtable which he has chaired.

Nic's work has been widely recognised externally, including his appointment as Visiting Professor at the University of Reading from 2010-2012 and his appointment as Associate of the Royal Agricultural Societies (ARAgS) in 2016. He also served as a full member of the European Commission's Expert Group on Technical Aspects of Organic Production, from 2011-2017, contributing to the setting of legal standards for organic farming in the EU.

He led the production of a landmark report on the Role of Agroecology in Sustainable Intensification for the Land Use Policy Group of the UK Nature Conservation Agencies, which has been widely recognised for its balanced coverage of the evidence on the impacts of organic farming and other agroecological approaches and their potential contribution to future UK agriculture.

Commenting, Nic said: "I am proud of the way that ORC has grown in reach and reputation during my time at the helm. This is a critical time for the future of ORC, with the implications of Brexit (or not) still so uncertain. I am now looking forward to a fresh start as an independent consultant focusing on organic policy, business and research issues in Europe (including the UK!). I'm very open to new opportunities and look forward to working with at least some of you in the future." See http://niclampkin.eu/

Mike Turnbull, Chair of the Trustees' Council of Management, acknowledged: "I take this opportunity to recognise and thank Nic for his dedication and commitment to the ORC during his tenure as Chief Executive. Nic's knowledge, his networks and the well-merited esteem of his peers have played a big part in securing for ORC the valued position it holds in the UK organic world. I am pleased that Nic will continue to support the work of the Organic Research Centre as we seek a sustainable way forward."

Farewell to Laurence Smith

We also said goodbye to Senior Sustainabilty Researcher Dr. Laurence Smith, also after 10 years at ORC, who started as Lecturer in Agroecology at the Royal Agricultural University in Cirencester, in January. Laurence successfully completed his PhD on *The Environmental Impacts of a Large Scale Conversion to Organic Farming* (funded by The Engineering and Physical Sciences Research Council) at Cranfied University and graduated last year. During his time at ORC he led the Environment, Sustainability and Health Programme and helped to develop a farm-level assessment to evaluate multiple dimensions of sustainability, the Public Goods Tool.

Welcome to Stuart Rogers

ORC is pleased to announce the appointment of Stuart Rogers as our Interim CEO. Stuart comes from a background of senior leadership and management in the private and charity sectors, having most recently led strategic change for a national charity. Stuart will develop and initiate the delivery of a new Business Plan and then transfer leadership of the organisation to a permanent CEO. We look forward to developing this plan and affirming the ongoing vision for ORC. To allow this to happen over a relatively short period of time, Bruce Pearce (Director of Research & Innovation) and Richard Holmes (Director of Finance and Resources) will continue to run the organisation on a day to day basis.

Abel Villa

Dr Abel Villa joined us in April as Agricultural Supply Chains Researcher. His PhD at the University of Edinburgh focused on the social learning of smallholder farmers in Mexico to develop producer capabilities in the context of global value chains. Before that, he worked as a sales and logistics manager for an for an organic start-up company in Mexico. Abel will work on the DiverIMPACTS and CERERE projects. He enjoys travelling, cycling and is passionate about aviation. He will also embrace new challenges; gliding and kite-surfing.

Chiari Tuoni

Chiara joined ORC at the start of April as Livestock Research Communicator. She is working with the livestock team, to design and communicate their research projects, particularly focusing on iSAGE, through social media, events and other communication channels. She aims to bring every step of a research project to life in a visual and targeted-oriented synthesis. She arrived from Italy with a Postgraduate Certificate in Environmental Certification and a life in communications in fields as different as fashion, public institutions and agricultural and environmental charities. She is interested in ethical communication as means to communicate brands clearly, for real identity.

In the face of adversity, what are farmers doing to be more resilient?

British farming businesses are facing a number of challenges, such as the weather, volatile markets and uncertainty about the future of support. The Secretary of State for Environment, Food and Rural Affairs, the Rt Hon Michael Gove MP, has set out ambitions for the UK to be a world-leading food and farming nation that provides a cleaner and heathier environment, benefiting the economy. A consortium of farming organisations led by the Organic Research Centre (with Game & Wildlife Conservation Trust, SRUC, LEAF, OF&G, Soil Association and Agricology) came together to explore the extent to which the application of agroecological techniques, widely adopted in organic agriculture, can help to achieve these goals. ***Laurence Smith*** *and* ***Susanne Padel*** *reflect on the project outcomes.*

The Defra-funded project *Opportunities, barriers and constraints in organic techniques helping to improve the sustainability of conventional farming* has shown that the UK has an excellent opportunity to drive the uptake of practices that can enhance the production efficiency and resilience of farming systems. The project investigated the viability of transferring agroecological practices more widely across UK agriculture.

In total, 110 techniques were identified and reviewed, whilst 15 practices were further evaluated for their potential to improve soil quality, nutrient use efficiency, water quality, biodiversity, and greenhouse gas efficiencies. These practices have been summarised in factsheets published by Agricology for dissemination and engagement across a wide community of farmers.

Agroecological techniques are not exclusive to organic systems and are increasingly being applied by progressive farmers in the non-organic sector. For example, leys are being incorporated within conventional arable crop-rotations to help control blackgrass.

Phil Jarvis farms in Loddington, Leicestershire, and is using several practices. He has integrated leys in the rotation, has moved to a no-till system using cover crops and is establishing a silvopastoral agroforestry system. He says: "We need to look how we can transition from systems based on chemistry to systems based on biology – there are lots of things in nature that can help us. We may not get there as quick as we would like but we need to be patient with it. We have to increase our knowledge and see what is best for the land on our own farms. It is not really learning anything new, just the fundamentals of agronomy and livestock husbandry and using that knowledge to increase production efficiencies and resilience."

The outcomes of the stakeholder consultation indicated that a lack of information is a major factor limiting the current uptake of organic management techniques. There is a clear demand for applied research alongside practical training and advice to demonstrate the potential benefits of the management techniques considered here, and how they can be realised on farm. Individual practices studied as part of this project and effective combinations demonstrate the value of existing system-level approaches, such as organic farming, Integrated Farm Management and conservation agriculture.

Changing attitudes across the supply chain is also key to improve the uptake of sustainable practices within the farming sector. This requires active participation from multiple stakeholders, alongside the demonstration of best practice, improved on-farm advice and farmer-to-farmer knowledge exchange.

Benefits from organic management

Results from the project highlight the substantial benefits that can accrue from organic management techniques in terms of environmental performance. In particular, this applies for the impact categories of soil quality (likely positive impact from 13/15 practices), non-renewable resource-use efficiency (likely positive impact from 13/15 practices) and biodiversity (likely positive impact from 13/15 practices). Some management practices can lead to lower yields compared to high-input/output approaches, which can result in less positive environmental impact indicators, when compared per unit of product. Conversely, systems applying such management practices will generally perform better when comparisons are made on a unit of land-area basis.

Practice abstracts

Fifteen practice abstracts (factsheets) have been produced for the following 'organic practices' identified within the project:

1. Mixed farming
2. Use of diverse crop rotations
3. Manure and compost as a fertiliser
4. Ruminants predominantly forage fed
5. Use of mechanical weed control
6. Biological control (indoors)
7. Use of leys in arable rotations
8. Encouraging natural predators (outdoors)
9. Use of green waste compost
10. Animals provided with maximum outdoor access (see p10)
11. Diverse/herbal sward mixtures
12. Increasing use of legumes in crop rotation
13. Novel forages (e.g. chicory)
14. Use of complementary therapies
15. Under-sowing of leys in crops

Each practice abstract consists of no more than four A4 pages, with pictures and graphical material. They serve as sign-posts to existing resources (e.g. technical guides, videos) and include profiles of conventional and/or organic farmers that are using these practices.

The format is an extended version of the practice abstract format developed by EIP- AGRI.

Table 1: Combined environmental impact assessment for 15 shortlisted organic management techniques

No.	Practice name	Soil quality	Nutrient use efficiency (NPK)	Water quality	Use of manufactured inputs	Biodiversity	Greenhouse gases (GHGs)	Key assumptions
1	Mixed farming	↑↑	↑↑↑ / *	↑↑	↓↓↓ /*	↑↑	↓↓ / *	Collaboration between crop and livestock enterprises leading to reduced use of manufactured fertiliser through use of manure on holding and enhanced system diversity
2	Use of diverse rotations	↑↑	↑↑↑	↑↑	↓↓	↑↑↑	↓	A range of crop types used to promote soil health by improving the diversity of root architecture and reduce disease/pest burdens
3	Manure and compost as fertiliser	↑↑	↑	?	↓↓	↑	↓↓	Home-produced manure and compost replacing manufactured NPK fertiliser
4	Ruminants predominantly forage fed	↑↑↑	↑	↑	↓↓	↑↑	*	Assumes forage-based diet for ruminants (e.g. grass and clover), i.e. feeding less/minimal amounts of grain or compound feed
5	Mechanical weed control	↓	↑	↑	↓↓	↑↑	*	Removing weeds by soil surface cultivation. Includes spring-tine harrowing, inter-row cultivation, finger weeding
6	Use of biological control (indoors)	↑	?	↑	↓↓	↑↑	↓	For pest and disease control only
7	Use of leys in arable rotations	↑↑	↑↑↑	↑	↓↓	↑↑	↓↓	Inclusion of a 1-3 year legume or grass ley in the arable rotation to build soil fertility and biological activity
8	Encouraging natural predators (outdoors)	↑	↑↑	↑↑	↓↓	↑↑↑	*	Devotion of farm area(s) to conservation for promotion of natural predators. Includes planting/maintaining wildlife areas (e.g. beetle banks, species-rich field margins) to encourage natural predators for pest control.
9	Use of green waste compost	↑↑↑	↑	↑↑	↓↓	↑	↓↓	Compost produced from landscaping and garden green waste applied to fields as a soil amendment, reducing fertiliser use and improving soil health, whilst also reducing landfill.
10	Animals provided with maximum possible outdoor access year-round	↓	↑	↑	↓↓	↑	↑	Outdoor access year-round for livestock – includes grazing, loafing yards and sacrifice fields
11	Diverse/herbal sward mixtures	↑↑↑	↑↑	↑↑	↓↓	↑↑↑	↓↓	Use of diverse species mixes in grassland. Could include: clovers, lucerne, sainfoin, legumes, ryegrass, timothy, cocksfoot, fescue and chicory, among others
12	Increasing the use of legumes in crop rotations	↑↑	↑↑↑	↑	↓↓↓	~	↓↓	There are two main types of legumes: seed/grain legumes and perennial forages as green manure. The impacts within this assessment are focussed on the former category, i.e. the use of grain/seed legumes in crop rotations. (see also No.2)
13	Novel forages (e.g. chicory)	↑↑	↑↑	↑↑	↓↓	↑↑	?	Inclusion of forage crops such as lucerne, sainfoin and chicory within pasture areas on livestock farms.
14	Use of complementary therapies over other medications	↑↑	?	?	↓↓	↑↑	?	Includes use of homeopathy and herbal remedies.
15	Under-sowing of leys in crops	↑	↑	↑	↓	↑↑↑	~	Sowing a ley sward during or after the sowing of a crop, usually cereal, allowing the ley to establish while the main crop is still in the ground.

~ None ↓ Low ↓↓ Moderate ↓↓↓ High ? Unknown * Context/system boundary specific

The direction of the arrow indicates an increase (↑) or decrease (↓) in the specified impact

The most advantageous practices from a financial point of view were those associated with a decrease in variable costs (green waste compost application, forage-based diets for ruminants, and the use of diverse/herbal sward mixtures in pastures). However, three financially advantageous practices (mechanical weed control, inclusion of grass leys in arable rotations [if used by livestock] and encouraging natural predators) are likely to require substantial initial investments.

Analysis of LEAF and Farm Practice Survey (FPS) data found that some organic management techniques are already being applied in the non-organic sector. Practices that already achieve high uptake among non-organic farmers are manure use, mechanical weed control, encouragement of predators outdoors, routine outdoor access for livestock and the use of cover crops. Leys are also increasingly being used in arable crop-rotations, in particular to help control blackgrass and improve soil quality. The recognition of the benefits of some organic management techniques were confirmed by the stakeholder engagement interviews and workshops.

Outdoor access for all animals all year round

For most of the species we keep as farm animals, being outside is their natural habitat. Animals that have maximum outdoor access are able to express much of their natural behaviour that can be more restricted in housed conditions, such as foraging, exploring and developing social contacts. This leads to improved animal welfare. Grazed forages are cheap feed resources which contribute directly through nutrient recycling. Specific positive outcomes for pigs and poultry include a beneficial effect on their diet intake and digestibility and the prevention of behavioural problems such as feather pecking and tail biting. ***Susanne Padel*** *wrote the factsheet for The Organic Management Techniques project, which looks at the opportunities, barriers and constraints of the practice to improve the sustainability of non-organic farming.*

Implementation

- Outdoor access is best achieved through grazing
- Integration of trees in outdoor areas provides shelter for livestock
- Where and when grazing is impossible, exercise yards could be provided
- For poultry, verandas can be very useful to allow them to sand bathe. Feeding some part of the ration outdoors and providing shelter encourages the birds to make use of the outdoor space.
- For pigs, suitable sites need to be found that will help prevent cold stress and unsuitable underfoot conditions. A light, free-draining soil type free of sharp stones is important to avoid lameness and stress and to guarantee all year round access. Regularly moving stock, for example through integration with the crop rotation, can help avoid problems of overstocking.

Benefits of implementation

- Economic: Grazed forages are a cheap feed resource for many animals
- Social: Keeping animals outdoors will help meet consumer's expectations of how animals should be kept

Drawbacks of implementation

- Environmental: Overstocking of small areas over a long period of time (e.g. for pigs and poultry) can lead to nutrient overloading; rotational systems should be used where possible.
- Economic: Additional investment potentially for water points and fences. Potentially reduced growth rates during cold weather periods and because of energy used for exercising.
- Social: Increased labour required for stock monitoring if they are further away from the farm.

Barriers and risks

- Outdoor areas can encourage *E. coli*
- More weeds on poached land
- Having enough room around sheds; space limitations

Relevant legislation and current incentives

- NVZ implications need to be considered where a farm is in the NVZ legislative framework and infrastructure

Case study: Jonty and Mel Brunyee, Conygree Farm

Location: Gloucestershire

Size: 75 hectares

Enterprises: Sheep and beef with permanent pasture, herb rich leys and some arable (currently growing wild bird feed). Also finish a small number of pigs each year

"We keep rare breed Cotswold sheep, Traditional Hereford cattle and native breed pigs. Our free-range cattle and sheep are reared on a natural organic diet of grass, wildflowers and herbs all year round.

"Our pasture fed ethos (assured by the Pasture-Fed Livestock Association) means that our animals eat a natural diet of grass, wildflowers and herbs - never any grains or imported soya. We sell most of our lamb, pork and beef direct to the consumer from the farm gate. We are also fully organic (assured by OF&G). Income is supplemented by a small DIY livery on the farm and educational activity."

https://www.agricology.co.uk/field/farmer-profiles/jonty-mel-brunyee

APPLICABILITY

Applicable production types

Application time: All year round

Required time: Varies from farm to farm

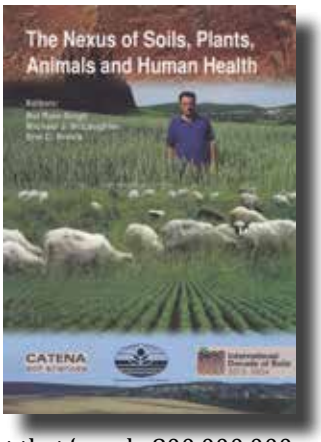
Equipment/resource required

Walkways, fences and water troughs

Exercise yards or verandas if no access to pasture

Book review: The Nexus of Soils, Plants, Animals and Human Health

Singh BR, McLaughlin MJ, Brevik EC (eds) 2017 The Nexus of Soils, Plants, Animals and Human Health. Catena-Schweizerbart, Stuttgart



This book demands your attention! It starts off with the statement 'soil and human health are interconnected' because 'healthy soils produce healthy crops that in turn nourish humans and animals allowing for their health and productivity'. It goes on to point out that 'nearly 800,000,000 people are undernourished and nearly 40% of the world's population are suffering from micronutrient deficiencies'.

Initiated by the International Union of Soil Science the book provides an overview of the linkages between soil and plant and animal and human health. It is the third in a series of publications produced each year for the Decade of the Soil 2015-2024. It consists of chapters contributed by specialists throughout the world dealing with individual aspects of soil health. With a strong research and science-oriented approach, the editors set it clearly within the principles established by the founders of the organic movement in the UK; 'the health of soil, plant, animal and human is one and indivisible'.

The first three chapters take a holistic perspective of the role of soil in terms of plant and animal and human health and consider the historical perspective of the principle. It faces head-on the challenge set by our far-sighted forebears in the organic movement, Balfour, Howard and McCarrison, who in turn follow millennia of commentators concerned with farming and human health, stretching back to Hippocrates and Moses.

It identifies the role of soil in terms of nutrient supply, food production and nutrient content, the importance of soil biodiversity and the wider environmental relationships. It acknowledges the decline in food quality with the increase in yields resulting from conventional inputs and the effect on soil organic matter. As well as the need to ensure adequate trace elements it highlights the problems of soil pathogens and excess heavy metals.

Subsequent chapters are contributions from scientists who take a narrower or more reductionist view of the links, including the impact of soil structure and microbial processes on macro- and micro-nutrients, the role of genetic engineering and the relationship of soil organic matter to crop production and climate change.

This book focuses on nutrients and minerals, ensuring that there is neither excess nor deficiency of the plant or animal's needs. It deals specifically with issues of protein supply. It considers nutrient supply from the soil and recycling through organic matter, the action of soil organisms making nutrients more available and the need to avoid excesses, which may inhibit uptake or utilisation by the plant or animal.

The book does not address some of the more subtle aspects of food quality and health, sometimes described as 'life force' or 'vitality'. It doesn't deal with some essential soil-related qualities of food such as taste or 'terroir', which undoubtedly have some impact on human health, nor the biological qualities e.g., antioxidants, which affect the immune system, or the impact on the maintenance of a healthy gut flora. It does not consider the benefits to human health of working with the soil.

It puts considerable emphasis on some negative impacts of the soil on human health, such as soil pathogens and soil-borne diseases.

It leads on to the concept of soil health and the need to ensure that this recognises the impact of soil on the health of plants and the animals and people that eat them. Soil health is now widely advocated in farm, research and policy circles but in my experience this newfound thinking does not generally go beyond the functioning of the soil and rarely does it recognise the interconnections with human health.

This very well-referenced book shows that many of the problems of human health can be addressed by the way we manage the soil; we might not always agree with some of the means advocated and it does not provide any radical new insight into the concept of health, but it does set out the science in the context of a comprehensive awareness of the issues and the inter-connections between soils, plants, animals and humans.

It sets out the principles, which of course are all too familiar to those of us involved with organic farming. It provides an invaluable research perspective on aspects of soil nutrient management. You may therefore wonder why I haven't mentioned organic farming in this review; that's because this book only makes a cursory mention of organic farming, and that in an historical context. Is this another example of a deliberate attempt to avoid the 'O' word for fear of frightening the horses? Or are the editors really unaware of the worldwide organic movement that has been putting the all-important principle of the link between soils, plants and humans into practice for nearly a century?

Mark Measures
2017 Winston Churchill Fellow: Soil Management

Blog https://info925698.wixsite.com/mark-measures

Farm focused variety testing: 2017/18 results and looking forward

Last summer the Crops Team, in collaboration with Organic Arable, embarked on a new experimental adventure embracing ecological sampling and analytical techniques to increase our understanding of alternative approaches to variety testing. ***Charlotte Bickler*** *discusses why this work is important and the key findings.*

The context

Varietal choice is a particularly hot topic of conversation when it comes to organic wheat. Land area is reducing for this crop (from 17,900 ha in 2011 to 9,500 ha in 2017 according to Defra[1]). The trend is set to continue with producers citing low and fluctuating yield and quality performance as why they are moving to alternative crops. In past years many players in the organic industry have highlighted sub-optimal variety choice as one of the main drivers of performance shortcomings in wheat.

We were interested in comparing variety performance in plots versus field-scale 'strips', in line with recent research highlighting that plot-scale findings are much less consistent with field-scale performance in organic and low-input compared to conventional input-intensive farming[2]. Furthermore, it is widely accepted that varietal performance will be different in organic than in conventional systems[3]. Therefore, testing under organic conditions is important to inform varietal choice and breeding efforts for organic and low-input systems.

The generation of on-farm trial data that can support the recommended list and enable improved farm-by-farm decision making also has wide-reaching applications that are relevant beyond the scope of organic farming. This is because it can increase our understanding of the environmental component of variety performance, and of how the genetic potential of a variety is likely to manifest itself under real-farm conditions.

What we did

As introduced in Bulletin No. 125 (Summer 2018), ORC worked with a network of seven farmers from Dorset to Lincolnshire in 2017/18 as part of the Liveseed EU project testing seven varieties of winter wheat on organic farms. Three varieties were grown at a field scale by each farmer, following their usual operational procedures, and harvesting the variety strips for sale. Alongside this, varieties were assessed in a fully replicated plot design in our organic field trials at Reading University's Sonning Farm. Varieties were selected based on available breeder's organic plot trial data and farmer preferences. They were Basset, Crispin, Evolution, Montana, Siskin, Spyder and ORC Wakelyns Population (YQ-CCP).

Farmers began to make their own observations of variety performance and collected anecdotal evidence to share with the group and beyond (see figure 1). During June 2018, coinciding with wheat anthesis (flowering), the ORC team visited all seven farms to collect key performance data including canopy cover, weed abundance, disease severity and ear density. At the same time, assessments were made at Sonning with the support of our summer interns Giacomo Accorsi and Rocco Sferrazza from the University of Bologna and Jesse Opdam from Wageningen University.

Ambrogio Costanza has since been crunching the numbers and we were pleased to present preliminary results from the trials at the Organic Congress in November and to the farmer network at a meeting in Warwickshire post-harvest, where we also discussed their opinions of the varieties' performance and the experiment. It is important to note that this is only one year's data, and an exceptional year at that, so we do not see the results as a test of individual variety performance *per se* but as proof-of-concept of an alternative model to gain the information that farmers need to optimise decision-making when it comes to varietal choice.

What we found

Grain yield varied from farm-to-farm but by performing regression analysis using a mixed-effects model, thanks to the 'incomplete blocks' experimental design, it was possible to test for differences between varieties even when they were not grown at each site. Indeed, significant difference between varieties in grain yield was found ($p = 0.03$). Figure 2 shows that when comparing the variety yield against farm average yields on individual farms, we can detect above average performers (e.g. Crispin), below average performers (e.g. Montana) and varieties that perform better on some types of farms than others. For example, Evolution performed above average on high performing farms and below average on low performing farms (Figure 2; green line), whilst ORC Wakelyns Population (YQ-CCP) performed above average on low performing farms and below average on high performing farms (Figure 2; pink line). This is interesting as it shows a potential genotype by environment interaction and highlights that it is possible to give farm-focused performance information for varieties following the field-scale experimental protocol.

Comparing results in grain yield from the farm network with those from the parallel plot-scale experiment held at Sonning, the yield ranking of the seven varieties changed, with some results showing contrasting performance (results not shown). This is not surprising when you consider the variation in performance across different environments (Figure 2). Being a single plot experiment rather than a multi-location farm experiment, these data do not allow robust considerations about comparing plots versus strips. What is certain, is that the comparison between the farm network and the parallel plot trial shows the risks and shortcomings of relying on a single approach and on a single site to determine varietal performance, which is the only option for organic farmers at present.

When exploring the performance indicators of varieties across the farm network some more, we found a negative correlation between protein content, an indicator of baking quality, and grain yield but this was not significant (Figure 3). It is interesting to note however that ORC Wakelyns Population (YQ-CCP) showed a deviation from this trend. It had a higher than average protein content whilst maintaining an average yield.

Figure 1: Observation of increased weed competitiveness of ORC Wakelyns Population (left) in comparison to Siskin (right) in June 2018 on one of the seven farms. Increasing weed abundance was found to have a negative correlation with grain yield, with height and canopy cover having a positive association.

ORC Wakelyns Population is a genetically diverse population (that is classified as 'heterogeneous material' rather than a 'variety') and this diversity can have important buffering and complementary benefits. Its performance in the 2017/18 trials highlights how diversity can enable an all-round performance, which is especially apparent in challenging conditions. On the other hand, more specialised varieties are likely to outperform such material in what they are bred to maximise. For example, Crispin, which is a group 4 feed wheat, was generally the best performing variety when it came to yield and Montana, which is a group 1 milling wheat, was generally the best performing variety when it came to protein content.

Varieties also showed significant differences in height, canopy cover and weed abundance ($p < 0.001$, $p = 0.004$, $p = 0.01$, respectively). When the relationship between all the performance indicators was assessed via multivariate analysis, we found that canopy cover was the variable most strongly associated with yield ($r = 0.84$, $p < 0.001$). At the same time, yield was negatively correlated with weed abundance ($r = -0.58$, $p = 0.002$), which was especially true for perennial weeds ($r = -0.58$, $p = 0.001$), whereas association with annual weeds was not significant.

These results highlight that the breeding goals for organic farming are likely to be different to those in conventional systems. Weed pressures are, for example, not the same

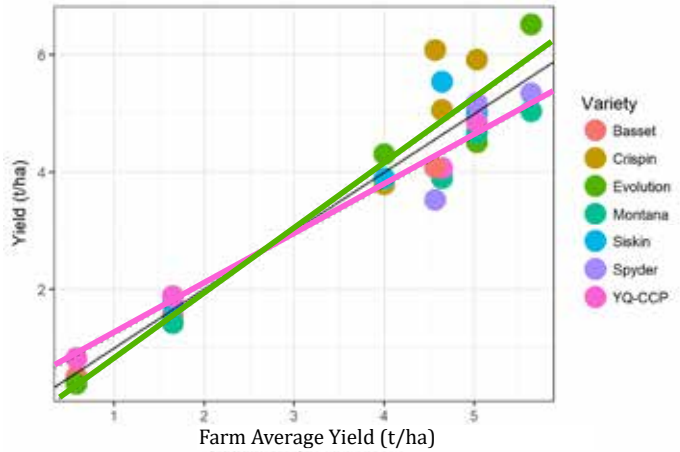


Figure 2: Wheat grain yield of varieties (t/ha) plotted against the farm average yield (t/ha). The black line is the farm average yield (y = x). The pink and green lines are the regression lines of ORC Wakelyns Population and Evolution, respectively, and highlight how varietal performance and ranking can change from farm-to-farm (environment-to-environment).

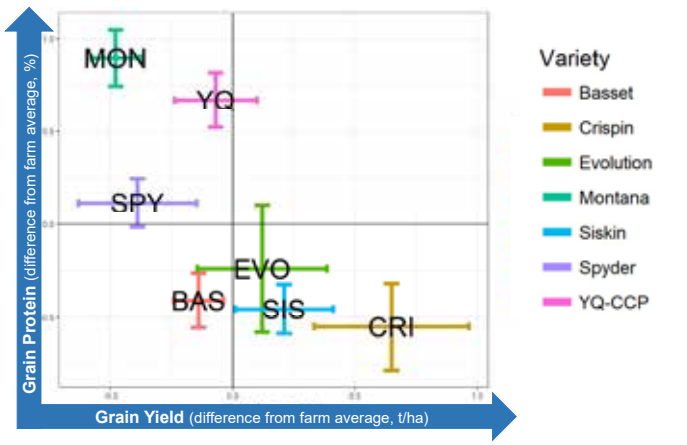


Figure 3: Protein content (%; y axis) versus yield (t/ha; x axis) difference from farm average by varieties (YQ = YQ-CCP/ORC Wakelyns Population). Bars indicate the standard error of the mean differences. A classic trade-off is observed but ORC Wakelyns Population shows a deviation from this trend.

and increased environmental variation on organic farms creates a more complex selection environment which it is more challenging to breed a consistent specialised variety for. This is supported by our work exploring the organic ideotype as part of the Whealbi (Wheat and barley legacy for breeding improvement) EU project which was also reported in Bulletin 125.

What next?

This year we have expanded the network to include ten farmers in two geographical blocks (Eastern and Western England) that will test eight varieties. This once again includes the host farm for the National Organic Combinable Crops event (NOCC 2019) which is being held on July 3rd in Yorkshire. The varieties are Crispin, Ehogold, Evolution, Montana, ORC Wakelyns Population, Revelation, Siskin and Zyatt. These are also being grown in our organic plot trials at Sonning, and an organic plot trial has also been drilled at Bradwell Grove as part of an Innovative Farmers field lab. This includes the same varieties and therefore gives us the chance to explore the differences between plots versus on-farm strips in further detail.

We would like to acknowledge the work of the 'Magnificent Seven' farmers that made this experiment possible, alongside Organic Arable and OF&G for their encouragement and support. This article is based on a larger report produced by Ambrogio Costanzo; please contact ambrogio.c@organicresearchcentre.com if you would like to read the full report, have any questions or are interested in getting involved in the project!

References

1. https://www.gov.uk/government/statistics/organic-farming-statistics-2017
2. Kravchenko AN, Snapp SS, Robertson GP (2017) Field-scale experiments reveal persistent yield gaps in low-input and organic cropping systems. PNAS, vol 114:921
3. Murphy KM, Garland Campbell KA, Lyon SR., Jones SS. (2007). Evidence of varietal adaptation to organic farming systems. Field Crops Research 102:172.

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Global growth of the organic market

Biofach is the largest trade fair for organic agriculture and takes place each year in Nürnberg, Germany. ***Susanne Padel*** *was there and learned about the most recent update on the Global and European organic sector.*

Biofach is the place where the most recent data on the Global and European Organic market are presented. The data are based on the 20th edition of *The World of Organic Agriculture 2019*[1], which was launched there. According to Dr. Monica Rubiolo from the Swiss State Secretariat for Economic Affairs (SECO) and Joseph Wozniak from the International Trade Centre (ITC), "global data on organic production and markets are of high relevance for policy makers and contribute to understanding the importance of organic farming in the different countries."

Global trends

2017 was another good year for organic agriculture globally. Data from 181 countries in the latest FiBL survey show that organically managed farmland increased by 20%, reaching nearly 70 million hectares globally at the end of 2017. The largest organic land share is Oceania (51%), where strong growth was noted between 2016 and 2017, followed by Europe.

The EU countries Spain, Italy, France and Germany are also among the ten countries with largest organic land area. Organic land area in the EU grew by 7%, reaching 7.2 million hectares and an EU average of just over seven percent. This contrasts sharply with the UK average at the end of 2017 that was just over 3% of utilised agricultural area (UAA).

Worldwide, 2.9 million producers farmed organically, an increase of 5% compared with 2016. India continues to be the country with the highest number of organic producers (835,200), followed by Uganda (210,352) and Mexico (210,000). In 14 countries, the share of organic has reached more than 10% with a global average of 1.4%. Countries with the largest organic share of their total farmland are Liechtenstein (37.9%), Samoa (37.6%), and Austria (24%).

The global market was estimated to be worth 97 billion USD, the largest markets per country are in the US, Germany, France and China, and sales are concentrated in the US (52%) and in Europe (39%). The rising number of standards are considered to be problematic, despite the existing or single organic standards in the major trading blocks, such as the US and the EU. New private standards like Regenerative Organics add to the complexity of the standards landscape.

What is happening in Europe?

An overview of the European market in 2017 and key trends from the largest European markets (Germany, France, Italy and the UK) showed that the UK is now clearly being left behind, both in terms of market growth and also in relation to organic land area and the number of organic operators.

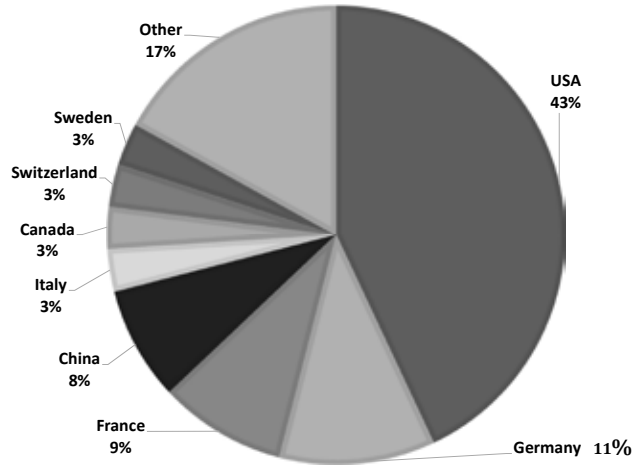


Figure 1: Global market: Distribution of retail sales value by country 2017. Source: FiBL-AMI survey 2019, based on retail sales of organic food

Germany remains the largest market for organic food, but this position may soon be challenged by strong market growth in France (+17% compared to +5.5% in Germany). Diana Schaack from AMI reported growth of 5.5% for the whole German market in 2018, with strongest growth (+ 8.6%) in the multiple retail sector, partly attributed to the competition that the natural food stores are facing from a growing range of organic products in multiples and discounters. This brings the share of organic food in the total food market to more than 5%, with higher shares for eggs, milk and dairy products and some vegetable oils, whereas meat has a much lower share of 1.4%. Interestingly in Germany, in the context of rising food prices in general, growth in organic land area (+8%) led to an improved supply of milk, pig meat and eggs in 2018, but a temporary oversupply of pork. Cooperation has begun between the organic farming association Bioland and the discounter Lidl and between Demeter and Kaufland/Real stores. This encourages the whole German organic industry to reflect on their purchasing and sales strategies.

In France nearly 37,000 farms, compared to about 3500 in the UK, were farmed organically at the end of 2017, an increase of about 15% compared with 2016. This represents approximately 8.3% of all French farms. Dorian Flechet from Agence Bio reported further growth of the commitment of farmers to organic in 2018. A similar increase was also

Table 1: Key indicators of organic sector development comparing the UK with the neighbours

	Land area as % of UAA in 2017	Growth in land area (%) 2016-17	Market value 2017 (bn €)	No of producers (2017)	Consumption per head (€/ person
UK	2.9	+1.5	2,307	34,79	35
EU	7.2	+6.4	34,285	305,903	67
France	6.3	+13.4	7,921	36,691	118
Germany	8.2	+9.7	10,040	29,764	122
Italy	15.4	+6.3	3,137	66,773	52

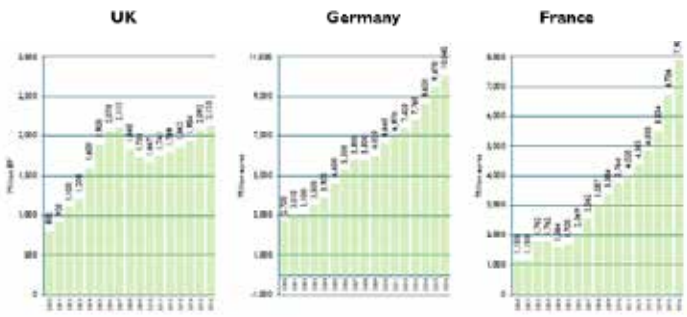


Figure 2: Organic retail sales growth 2000-2017. Retail sales in million EUR. Source FiBL

noted for the number of processors, reaching more than 17,000 and the share of organically farmed land in France had reached nearly 6.5% or 17.4 million hectares at the end of 2017. The French market grew by about 17%.

In Italy, organic land area grew by 6.3%, now reaching 15.4% of agricultural area. Domestic sales grew by 5%, with strongest growth of 11% in supermarkets, whereas the wholefood and natural food shops are growing in number but appear to be declining based on available data in sales. Above average growth was also reported for eggs. However, some caution is required in this data, as sales in natural food stores are notoriously more difficult to capture than in multiples. The Italian organic market continues to be characterised by a plethora of labels; Francesco Solfanelli from Ancona University reported more than 20 organic labels, including supermarket own labels. Exports from Italy have grown by more than 8%, but it was interesting to learn that Italy is now also a substantial importer of fruit and vegetables, and imports of fruit have grown by about 50% and for vegetables by about 30% between 2016 and 2017.

What does this mean for the UK?

The UK, in comparison, barely turns up at the top table of largest organic markets in Europe, although it has experienced continued recent growth in the market place, as was illustrated by the presentation of Martin Sawyer, based on the *2019 organic market report*[3], published by the Soil Assocation . The market in total grew by 5.3% between 2017 and 2018; strongest growth is in home-delivery (+14.8%, now accounting for 14% of all sales) which is different to Germany and France where the multiple retail sector noted strong growth in the same period. Independent retail also grew by 6.25%. A sector with strong growth is produce, particularly for fruit. Martin also reported that the 'free from' sector is very important in the UK as is the trend for alternative products to meat, important for a vegetarian or flexitarian diet. Strong market growth in the other large European markets and globally could challenge the availability of products and raw materials to supply the growing UK market, which in some sectors is quite import dependent.

For the first time for several years the organic land area grew a little bit again (+1.5%) between 2016 and 2017, hopefully a change in the trend indicates that more UK producers are beginning to realise the potential that organic has to offer.

References

1. *The World of Organic Agriculture* is published by FiBL and IFOAM–organics International.The annual survey on organic agriculture worldwide is supported by the Swiss State Secretariat for Economic Affairs (SECO), the International Trade Centre (ITC), the Sustainability Fund of Coop Switzerland, and NürnbergMesse, the organisers of the BIOFACH fair.
2. https://regenorganic.org/
3. https://www.soilassociation.org/certification/market-research-and-data/

Oxford Real Farming Conference

ORC and Agricology kick-started 2019 at the Oxford Real Farming Conference along with around 1000 farmers, growers, researchers and others. Celebrating its tenth year, the sell-out event focused on the opportunities and possible threats surrounding the future of the UK's food and farming sector. The Agriculture Bill and farming post-Brexit were at the top of the agenda and Michael Gove's attendance sparked widespread discussion. Agroforestry – in particular Silvopasture – also proved a popular topic, although throughout the two days the 240 speakers involved and 100 sessions covered a breadth of subjects from sustainable soil management to ecosystems, water management, rewilding, local abattoirs, plastics, pollution and supply chains.

Agricology – in association with the Pasture Fed Livestock Association & Soil Association – hosted a number of sessions with a focus on the practical application of agroecology. The speakers came together from a variety of organisations including ORC, ADAS, Rothamsted Research, AHDB and CEH and there was also a strong representation of farmers and growers including Julian Gold (Hendred Farm), Joe Howard (Little Morton Farm), Jez Taylor (Daylesford Market Garden) and Andrew Howard (Bockhanger Farms).

Lindsay Whistance

Photo: Hugh Warwick

Speakers shared key learnings and case studies from a mixture of research and the practical application of techniques on core topics including: the Ley of the Land, integrating leys in cropping systems, chaired by Samantha Mullender, a very popular session on Silvopasture: Planting for Shelter and Forage with Lindsay Whistance presenting, and a session with Charlotte Bickler presenting on Plant Teams for the Future. We also had some entertaining insights from Jez Taylor on Daylesford's Market Garden on the topic of Plants in the Wrong Place and some brilliant live samples in the session on how to Manage Pests Biologically.
As well as the Farming Practice room Agricology coordinated several breakout sessions for practitioners and scientists to delve deeper into the subject matter and field further questions. All these sessions (along with a number of additional ones) can be found on the Agricology YouTube channel:
http://tinyurl.com/ORFC-Agricology

Events and announcements - details at www.organicresearchcentre.com

DIVERSIFOOD publications

Online at:
www.diversifood.eu/publications-old/booklets-and-reports/

Hedgerow management

New and updated publications on managing productive hedges

Events

4 June 2019: ORC Organic arable research. Field day at Crops Research Unit, University of Reading, Sonning

- Organic variety testing: How to better support informed decisions?
- Underutilised cereals: What are the opportunities from untapped genetic resources?
- Intercropping: What are the benefits of species mixtures?

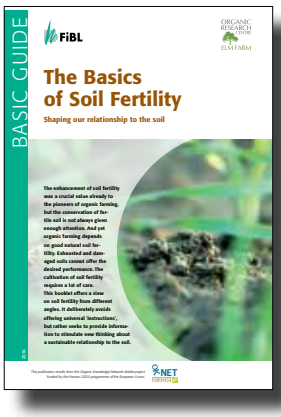
5-6 June 2019: Integrating Farming and Forestry Farm Woodland Forum annual meeting, Battleby, Scotland

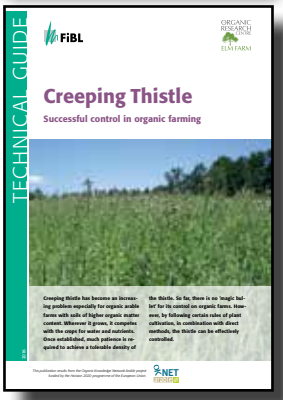
2 July 2019: **Agroforestry Innovation Network meeting of the Trees and Livestock Group** at Claydon Estate, Bucks

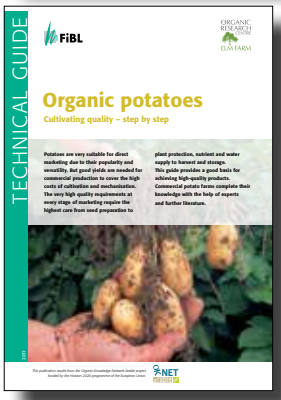
3 July 2019: 2019 OF&G National Organic Combinable Crops. Hosted by Richard and Sue Thompson at York Grounds, Yorkshire. ORC are partners in the event and stops on the farm walk will (tbc) include: variety trials, organic potatoes, bread/biscuit tasting, soil and potentially monogastric feed.

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

ORC/FiBL technical guides







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GREATsoils factsheets

More factsheets from the GREATsoils project have been added to the resources at https://ahdb.org.uk/greatsoils