



Soil health and circular economy: a sustainable future for agriculture

FRIDAY 13 NOVEMBER 2020



SARIC • SUSTAINABLE AGRICULTURE RESEARCH & INNOVATION CLUB





Soil health and circular economy: a sustainable future for agriculture

British agriculture is being increasingly pressurised by wetter winters and hotter summers. Summer rainfall patterns are also expected to shift, making extremes of drought and downfall increasingly likely. Research at NIAB is currently developing the tools British farming needs to face this adversity, and to continue producing food in a sustainable manner.

These talks outline the breadth of this research, from large scale field-based agronomic field trials, to novel salad production using hydroponics, to collaboration with businesses working in the circular economy.

Programme

- 10:00 *Introduction: Use of farm waste, valorising for farm, soil inputs*
Lydia Smith, Head of NIAB Innovation Farm and the Eastern Agri-Tech Innovation Hub
- 10:10 *Keynote: Benchmarking your farm – where are the pinch points?*
Adrian Collins, Professor of Hydrology, Head of Department – Sustainable Agricultural Sciences, North Wyke and Sustainable Agriculture Sciences, Rothamsted Research
- 10:30 *Effects of organic soil amendments on crop pests and diseases*
Ralph Noble, Technical Director, Microbiotech Ltd
- 10:50 *Herbal leys and animal grazing for improving arable soil – emerging knowledge from an ongoing trial at Duxford, Cambridgeshire*
Patrick McKenna, Postdoctoral Research Associate, NIAB (BBSRC – SARIC project)
- 11:10 *Working with a complex variable soil – how to mix up treatments and amendments*
Craig Livingstone, Farm and Estate Manager, Lockerley Estate
- 10:20 *Panel question and answer session*
Chaired by Lydia Smith, NIAB
- 11:30 *Break*
- 11:40 *Cover crops to optimise the use of digestate*
Laura Bouvet, Agri-Tech East
- 11:45 *Introduction to the EU funded project Hy4Dense technology to understand soil/monitoring*
Graham Taylor, Research Scientist, NIAB
- 11:55 *PlantWorks bacterial consortium mixes inoculum to use on farm*
Natalia Gulbis, Technical and Arable Farming Lead, PlantWorks Ltd
- 12:02 *Recycling waste minerals to provide sustainable crop nutrition*
David Harrod, Payne Crop Nutrition Ltd
- 12:09 *Salad/soil activities challenges and resolutions*
Adam Lockwood, Managing Director, Lockwood Salads Ltd
- 12:16 *Panel question and answer session*
Chaired by Lydia Smith, NIAB
- 12:30 *End*



Speakers

Dr Lydia Smith

Head of NIAB Innovation Farm

Head of Eastern Agri-Tech Innovation Hub

Lydia Smith is Head of NIAB Innovation Farm and Eastern Agri-Tech Innovation Hub at NIAB in Cambridge UK, where she has been based since 1997. She leads Interactive farmer-facing research into sustainable farming; especially soil health, crop genetic improvement and waste minimisation. Her first roles in research were in plant pathology at ADAS and East Malling Research Station. Following a doctorate in plant microbial ecology, she subsequently lectured in soil science, crop microbial interactions, environmental biology and land reclamation at the Universities of East London and Luton.

At NIAB, Lydia's research initially centred on improvement of plant genetic resources and new methods for their utilisation and characterisation, building a portfolio of projects in Novel and Non-food Crop portfolio over 12 years. Innovation Farm was conceived and set up by Lydia, to provide a practical, grower-facing research facility, with knowledge exchange for end-users at its core.

Since 2016, she has built up the Eastern Agri-Tech Innovation Hub (www.innovationhubuk.co.uk), providing a pilot study resource to minimise waste in farming, or to reuse selected waste for new, higher value products. She remains committed to soil structure and health, specialising in crop microbial interactions of forage legumes with probiotic applications.



Adrian Collins

Professor of Hydrology

Head of Department, Sustainable Agriculture
Sciences, North Wyke

Sustainable Agriculture Sciences, Rothamsted
Research



Adrian's research interests broadly encompass the sustainability of agriculture. They specifically include a number of themes:

- 1) Characterising pollutant emissions to water and air
- 2) The development and application of pollutant source tracing procedures
- 3) Understanding cross-sector water pollution at different scales and the development of screening tools for contextualising the role of agriculture in water quality problems
- 4) The impacts of agricultural pollution on aquatic ecology
- 5) Measuring and modelling the efficacy of on-farm interventions for managing agricultural sustainability
- 6) Scenario-based evaluation of technically feasible mitigation impacts for policy support. His expertise includes hydro-chemical monitoring at multiple scales, integrating empirical and modelling approaches for scaling up, and pollutant source fingerprinting.

Since 2009, Adrian has been a national PI of the Demonstration Test Catchment (DTC) programme. He is also assistant director of the landscape scale Sustainable Intensification Platform (SIP). His UK research council projects include DIVERSe, a BBSRC programme for testing the impact of different vegetation treatments in riparian buffers on hydrology and water quality; an NERC project developing real-time pesticide risk assessment tools; and the BBSRC-funded Institute Strategic Programme Grant (ISPG) at Rothamsted Research, Soil to Nutrition, in which Adrian leads work on optimising sustainable intensification of agriculture.

Dr Ralph Noble

Microbiotech Ltd

Ralph is the Technical Director of Microbiotech, a research and development company which specialises in the analysis and management of micro-organisms and insect pests in horticultural soils and cropping substrates. He has worked as an applied microbiologist in horticultural crop research since 1984, was the manager of the University of Warwick Bioconversion Unit for seven years, and until 2018 was a Principal Research Scientist at NIAB EMR (formerly East Malling Research). Current and recent research projects include the production of sustainable substrates for growing mushrooms, biocontrol of pests in horticultural crops, the control of fungal and bacterial pathogens in mushroom cultivation, and the suppression of soil-borne plant diseases using organic amendments. Ralph has written over 100 scientific papers, patents and technical articles on his research. Microbiotech is based at Pershore College, Worcestershire and at the Eastern Agri-Tech Innovation Hub, Hasse Fen, Cambridgeshire. www.microbiotech.co.uk.



Patrick McKenna

Postdoctoral Research Associate, NIAB

Patrick McKenna was initially trained as a botanist but became interested in the agricultural sciences whilst working on smallholder organic farms in Kent. He received his PhD in agronomy from the Royal Agricultural University in 2017 and then spent a year doing postdoctoral research in the University of Leeds, studying the potential for global soil improvement using wastewater-derived fertilizers. He came to NIAB in 2019 to take up the position on the impact of herbal leys and grazing on soil fertility and subsequent crop production.



Craig Livingstone

Farm and Estate Manager, Lockerley Estate

Graduating from Scottish Agriculture College at Edinburgh University with a BSc in Agriculture, Craig's early career was spent as a development Farm Manager in South Oxfordshire. He trained as an agronomist and advised on a large portfolio of arable crops across Oxfordshire, Hampshire and Berkshire.

Craig has been Farm and Estate Manager at the Lockerley Estate in Hampshire, owned by the Sainsbury family, for the past five years. His work here brought the award by Farmer's Weekly for "Arable Farmer of the Year" and "Farmer of the Year" 2018.

In 2019 Lockerley Estate became a LEAF demonstration farm. The estate welcomed 1700 visitors in 2019 working with local schools, chefs, Open Farm Sunday, Defra and many more. Lockerley Estate is also a member of the local catchment wide project working with 20 local farms covering 5000 ha responding to catchment wide objectives. In 2020 Craig was asked to join the advisory panel for the national food strategy.

At Lockerley, the arable rotation has been extended to seven years, introducing clover/grass leys, countryside stewardship options, conservation tillage practice, importing compost and FYM, introducing 1200 sheep in partnership and over 200 ha of cover crops. Pesticide and fertiliser use has been reduced by over 30% in the last four years.



Laura Bouvet

Agri-Tech East

Laura has a background in crop science and cereal pathology, having recently completed her PhD on wheat yellow rust resistance at the University of Cambridge and NIAB. She joined Agri-Tech East and AHDB in 2018

in a unique dual role as Knowledge and Innovation Facilitator. At Agri-Tech East, she is the project manager of the Innovative Farmers Field lab 'Increasing nutrient efficiency from anaerobic digestate', in which NIAB is the lead academic partner. Her work at AHDB is focused on knowledge exchange in potato storage.



Graham Taylor

Research Scientist, NIAB

Graham joined NIAB in 2019 as a research scientist specialising in protected horticulture. His PhD was undertaken with the Horticulture and Plant Product Physiology Group at Wageningen University in the Netherlands, focusing on improving C3 photosynthesis to increase crop yields. Graham has more than 15 years of experience in academic research in diverse areas of seed, plant and soil science, as well as silviculture. He has designed and constructed hydroponic systems and high-output LED arrays for Universities in South Africa and the Netherlands. At NIAB, Graham is currently focused on conducting research on hydroponics systems and leafy salad crops for the EU Interreg project *Hy4Dense*, which involves growers and academic partners across the UK, Belgium and the Netherlands.



Natalia Gulbis BSc (Hons), MSc

Technical and Arable Farming Lead,
PlantWorks Ltd

Natalia has worked in the field of soil microbes with a focus of mycorrhizal fungi for over 11 years. In 2014 she took on the role of arable farm trials manager and has been jointly involved in the development of the SMART ROTATIONS product portfolio. As Technical and Arable Farming Lead she deals with all enquires in relation to how to apply and manage soil microbes to improve crop efficiency in UK farming.



David Harrod

Payne Crop Nutrition Ltd

David Harrod is a Crop Nutrition Entrepreneur spending over four decades with J & H Bunn of Gt Yarmouth, a National advisory and fertiliser blending business, which was sold in 2011 to Koch Industries of Wichita. David formed his current business Payne Crop Nutrition in 2017 to focus on farmer crop nutrition advice and bespoke fertiliser blending through his factory at Fakenham, Norfolk.

He is now spending more time with global and local focus on circular economy technology bringing sustainable, recycled minerals to agricultural markets while reducing carbon footprints, such as recycling used alkaline batteries into micronutrients products for use on crops and soils.



Adam Lockwood

Managing Director, Lockwood Salads Ltd

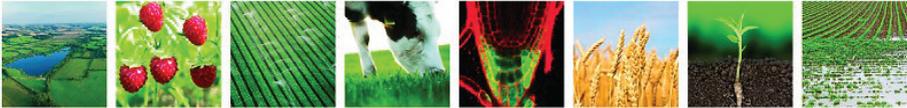
Lockwood Salads is a newly established and developing company producing babyleaf salad crops for retail, food service and wholesale markets. The farm currently produces 90 hectares of baby spinach, red chard, wild rocket, bulls blood, land cress and baby lettuce. Growing on light sandy soils within a current growing operation, they constantly look to farm in harmony with the environment and in a way that enhances the soil for future production while maximising product quality and yield – an ongoing balancing act that can bring both challenges and opportunities.



Eastern Agri-Tech



Innovation Hub



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Eastern Agri-Tech Innovation Hub – linked with SARIC



The Sustainable Agriculture Research and Innovation Club (SARIC) is a joint BBSRC and NERC initiative to support innovative projects that will provide solutions to key challenges affecting the efficiency, productivity and sustainability of the UK crop and livestock sectors. SARIC has made £10 million available for agricultural research in the UK, across themes of resilient crop/livestock systems and the generation of new technologies, products, tools and services. NIAB was awarded a research grant from this portfolio to address the issue of declining soil fertility and low biodiversity in arable farms. The goal is to reintroduce ley periods and sheep grazing in five arable farms around Cambridgeshire, and to cultivate a species-rich mixture of grasses, legumes and forbs as forage, in order to investigate the effects this has on soil quality and subsequent cereal production.

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Eastern Agri-Tech



Innovation Hub



Eastern Agri-Tech Innovation Hub – linked with Hy4Dense



The Eastern Agri-Tech Innovation Hub is also a major partner in the EU Interreg 2 Seas project Hy4Dense (<https://www.interreg2seas.eu/en/Hy4Dense>). Hy4Dense is investigating how to optimise the yield of densely grown leafy salad crops (Rocket; Corn Salad/Lamb's Lettuce; and Baby Leaf Spinach) by developing a novel hydroponic system, and new production system approaches.

The introduction of novel hydroponic cultivation systems by growers offers much potential to produce high quality crops with reduced environmental impact and longer shelf-life. Hydroponics benefits growers by increased productivity and improved efficiencies of crop cultivation, while controlling diseases that influence yield and revenue. More than 90% of greenhouse cultivation of fruit vegetables has shifted to hydroponics; leafy vegetables grown at low plant density (e.g. lettuce) are starting to implement novel growing systems. However, no straightforward solutions are available for vegetable crops traditionally densely sown in rows in the field such as lamb's lettuce, spinach or rocket, despite these crops being important for the local economies in the 2 Seas programme area.

This 3.5 year project, started in 2019, is the result of close collaboration between our research partners in the UK (Essex University), Belgium (INAGRO and Howest) and the Netherlands (Proeftuin Zwaagdijk). This partnership brings together diverse knowledge and expertise on the broadly similar challenges facing the leafy salad horticultural sector across the region. The development of a novel hydroponic system for densely sown crops in greenhouses will enable producers throughout this region to address the challenges they currently face by achieving efficient management of crop cultivation, and the capacity to deal with diseases that reduce yield/quality and revenue. A key outcome will be the development and improvement of existing basic prototypes into efficient hydroculture systems for densely sown vegetable crops. NIAB will evaluate the way salad varieties respond to the system and whether this is significantly different to responses in the field.

Technological knowledge transfer to growers and manufacturers is being actively undertaken to aid in applying research outcomes to commercial settings. An economic viability assessment will also be done to aid in decision-making for farmers looking to potentially include soilless cultivation in their operations. A pilot demonstration cultivation system arising from this research is planned to be open to visitors at NIAB's Eastern Agri-Tech Innovation Hub in Cambridgeshire towards the end of 2021.

To learn more about Hy4Dense, please contact graham.taylor@niab.com.

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Eastern Agri-Tech Innovation Hub – linked with BioBoost



In addition to supporting SMEs to develop and test solutions for efficient prevention and utilisation of food waste, the Eastern Agri-Tech Innovation Hub is also the lead UK partner in an EU Interreg 2 Seas funded project. BioBoost in its entirety is investigating how best to use waste and crop co-products in horticulture and how to optimise resources (<https://www.bioboosteuropa.com/>).

BioBoost aims to encourage the development of a bio-based, circular economy in horticulture. Triple helix partners from the Netherlands, Belgium and the UK are working together to identify green waste streams, a co-operator to develop new concepts and products that utilise plant resources in more sustainable, efficient, and integrated ways. The potential for these high levels of horticultural residue to have a greater valorisation is being examined by the partners. In the UK the Eastern Agri-Tech Innovation Hub, and NIAB are currently investigating methods of extracting plant pigments such as anthocyanin, converting food waste to high value products using soldier flies and trialling a green pesticide produced from horticultural/agricultural waste.

NIAB in collaboration with BioBoost partners have produced an inventory, strategy documents, case studies, together with project reports on green pesticides and cosmetics, which are published on the Hub website at: <https://www.innovationhubuk.co.uk/publications.html>. Additional publications and information can be found on the BioBoost website: <https://www.bioboosteuropa.com/en/publications>. There is also a new BioBoost Platform which connects biobased horticultural initiatives: <https://www.bioboost-platform.com/>. This initiative can connect the waste producer with the new user and membership is free. The BioBoost platform will continue but the BioBoost project will be ending at the end of 2020. Its aims have helped to give us a better understanding of the potential for waste utilisation within the industry, aiming for a circular economy and how we can turn this waste into new higher value products.

Please email denise.elliott@niab.com if you would like further information.

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BioBoost

Accelerating biobased horticulture



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