IAgrE Landwards Conference 2017

Wednesday 11th October 2017
Rothamsted Centre for Research & Enterprise
Harpenden, Hertfordshire AL5 2JQ

Decarbonising UK Agriculture
Perspectives and Policy for Change

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Rothamsted Centre for Research and Enterprise, Harpenden

Decarbonising UK Agriculture
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Conference Programme

Part 1 – The Technical Challenges

0930 - 1000	**Arrival, Registration and Networking**
1000	**Introductory Remarks -** *What are the facts and where are we now? What is the carbon impacts of UK Agriculture? What are the pressure points? How will things look if we don't do anything? Can we reach a view of the true carbon footprint of food production – field to plate? What will happen if we do nothing?* **Dr Robert Merrall – President IAgrE**
1015	**Agriculture and the Low-carbon Economy -** *Setting the scene, reviewing the future of managing agricultural emissions and including the latest developments in battery energy storage and possible vehicle-to-grid applications for farmers. Challenges facing businesses and policy makers* **Dr Jonathan Scurlock, Chief Adviser, Renewable Energy and Climate Change, National Farmers Union**
1045	**The Energy Independent Farm -** *is a new approach, where farmers will be able to generate their own energy to run their farm and agricultural equipment. By using wind systems, solar panels or biomass and biogas processes located right on the farm, the farmer can independently obtain electricity and use it to generate hydrogen to power farm machinery and also to supply electricity.* **Sean Lennon, Head of the Tractor Product Line, New Holland Agriculture** ***NB – Carlo Lambro was called to Brazil on business at short notice so we are very grateful to Sean for stepping in at the eleventh hour***
1115	**Short Coffee Refreshment Break**

Part 1 – The Technical Challenges continued

1130	**Transport Free Supply Chains –** *Is there a different way of producing food closer to its market. Up on the roof, down underground. What about harvesting crops just before the point of sale with no transport. Are we on the verge of a new way of farming and what would be the impact of all of this in reducing the carbon footprint?* **Jonathon Lodge, City Farm Systems**
1200	**Soil! Our Natural Capital -** *The importance of soil has moved up the agenda and it is recognised that it has a vital role to play as a carbon sink and that good soil management will assist in maintaining its ability to continue to act as a carbon sink* **Professor Jane Rickson – Cranfield University**
1230	**Energy Crops and Carbon Reduction -** *will discuss the latest research and how that fits with the BBSRC Strategic Programme on "Cropping Carbon".* **Dr Ian Shield, Agronomist – Rothamsted Research**
1300 - 1345	Lunch & Networking

Part 2 – The Rothamsted Perspective

1345	**What we do at Rothamsted** **Professor Achim Dobermann - Director and Chief Executive, Rothamsted Research**
1400	**Insight into the Work at Rothamsted** *Your opportunity to take a look at some of the cutting edge research being carried out at Rothamsted – please be advised this afternoon's activities involve some walking and we recommend sturdy shoes and clothing appropriate to the weather. For those not wishing to walk far you will be welcome to browse the Archive.* *Groups will be shown round the following areas:* • Energy Crops – Miscanthus & Willow • Bee Radar & Suction Traps • Field Phenotyping Platform • Greenhouses & Growth Houses inc Heat & Energy Exchanger • Rothamsted Archive – 175 years of plant and soil samples **Hosted by Dr Chris Watts, Dr Ian Shield, Dr Jason Lim and others**
1550 - 1600	**Closing Remarks, Refreshments – End of Conference**

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Decarbonising UK Agriculture
Perspectives and policy for change

IAgrE President 2016-18
Dr Robert Merrall MIAgrE

Dr Robert Merrall heads up Merralls Consulting Ltd, focussing on agri-tech innovation and commercialisation.

Rob is well-known in the agri-tech sector, having spent his early career in agricultural engineering research at Cranfield University at Silsoe before working for 5 years with the Renault Group, heading up marketing and technical training for their UK agricultural operation. Since then, Rob has been a director of the Royal Agricultural Society of England and two major UK farm machinery dealerships, and has a thorough understanding of the practical issues in distribution to the rural sector.

Since 2010, Rob has run his own independent consultancy, Merralls Consulting Ltd. Talking about the business he now runs with partner Victoria Cooper, Rob commented "Frequently my input is in project monitoring (delivering funder assurance), but often we act in an advisory, business development or project management capacity for commercial clients. These include local, national and multi-national organisations and we can really help businesses overcome strategic and operational challenges and short-term gaps in capacity."

Recent UK Government investment in Agri-Tech is creating many interesting new possibilities and Rob and Vickie have been involved in the setting up of the new Agri-EPI Centre Ltd hub at Harper Adams University.

Our business has a fantastic team of hard working, motivated individuals who want to make a difference, we take pride in our work and feel a real sense of achievement when our work has a positive impact. Our recent big success story has been helping a collaboration led by CNH Industrial win in excess of £9M of UK Government funding through the Advanced Propulsion Centre at Warwick. This project will see the manufacture of New Holland's proposed methane tractor anchored here in the UK at CNH's Basildon plant.

"As the Institution of Agricultural Engineers, we are very fortunate to have secured input for this conference from a number of like-minded individuals who share a real passion for minimising the environmental impact of food production. In particular, I'd like to thank City Farm Systems, Cranfield University, the NFU, New Holland and Rothamsted Research for their support of this event.

This will be an opportunity for members to share their experiences with our participants and speakers and my hope is that everyone involved will enjoy a day dedicated to networking and shared experience that will encourage and inspire."

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Dr Jonathan Scurlock, National Farmers' Union
Chief Adviser, Renewable Energy & Climate Change

Dr Jonathan Scurlock is the NFU Chief Adviser, Renewable Energy and Climate Change. Since 2007 he has led a small team on this topical subject area, providing analysis and advice to the NFU's senior management, office holders and members.

His background is in university and government research, covering energy and climate change policy, plant physiology, all kinds of biomass fuels, bio-based products and other renewable energy technologies, and he was previously a scientist with the US Department of Energy in Tennessee.

As one of the introductory speakers, Jonathan will speak on the subject of "Agriculture and the low-carbon economy", setting the scene, reviewing the future of managing agricultural emissions and including the latest developments in battery energy storage and possible vehicle-to-grid applications for farmers.

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Sean Lennon
Head of Tractor Line New Holland Agriculture

Mr. Lennon is the Head of Tractor Line for New Holland Agriculture, a brand of CNH Industrial, a role he assumed in 2015.

Mr. Lennon has extensive international experience in the agricultural industry that he acquired through roles of increasing responsibility within the New Holland brand.

Prior to his current role he was Head of Product Marketing for the Asia Pacific Region from 2013-2015 and a position he also held for the International Region since 2012.

From 2010 – 2012 Mr. Lennon was the Product Marketing Manager for Tractors and Implements in the International Region. He started his career with CNH Industrial in 2002, and until 2010 was based in the UK and undertook roles of increasing importance in the area of international product support.

Mr. Lennon holds a Bachelor's degree in Agricultural Engineering with Business Management from Writtle Agriculture College in the UK.

New Holland Agriculture imagines the farm of the future as being completely energy independent: a farm that produces not only food, but also the biomass it needs to generate the energy it uses to run its operations and power its tractors and other machinery.

Such a self-sufficient future is achievable today, with New Holland's advanced technology and vision. The recently unveiled methane powered concept tractor is the latest development in the brand's pursuit of sustainable and efficient technology farming through innovation. Its ground breaking engine delivers the same performance and has the same durability as its standard equivalent, but with much lower running costs. It combines alternative fuels and advanced agricultural technology to create a vital link that closes the loop in the Energy Independent Farm™'s virtuous cycle by running on the energy produced from the land and waste products.

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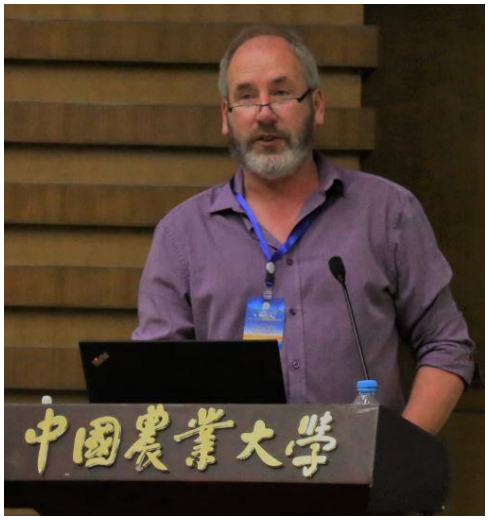
Jonathan Lodge, Chief Executive
City Farm Systems

Jonathan is an award winning entrepreneur and international speaker. He founded City Farm Systems to develop his thinking about fresh produce supply chains. With a background in resource efficiency he set out to show how urban farming could be made sustainable, environmentally friendly and economically viable.



Branding the technology as CloudGro ® and delivering CloudGrown ® produce trademarks and patents protect their carbon reduction abilities. Jonathan is now in demand helping to shape the research approach to future horticultural trends.

The time has come to re-think how we use current horticultural technologies and shorten supply chains. Incremental improvement along complex supply chains is not enough. Core business models need to adapt. Moving the commercial greenhouse business model to expensive city facilities will never make sense when many of their costs are unnecessary.

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Professor Jane Rickson CEnv FIAgrE
Cranfield University

Jane Rickson is Professor of Soil Erosion and Conservation in the Cranfield Soil and AgriFood Institute, School of Water, Energy and Environment, Cranfield University. She has specialised in land resource management at MSc and PhD level. She has over 30 years' experience of research, consultancy and teaching in soil and water engineering, with focus on soil degradation processes (such as soil erosion) and sustainable land management practices.

Jane uses multi-disciplinary approaches to integrate applied soil science and management at a range of spatial and temporal scales.

She works with and for individual farmers, grower groups, agribusinesses, Research Councils and policy makers at the local, national and international level. She has published widely in international, peer reviewed journals, conference proceedings and trade articles.

She is a Fellow and President Elect of the Institution of Agricultural Engineers, a Chartered Environmentalist, Fellow of the Higher Education Academy and member of the Institute of Professional Soil Scientists.

Soil! Our natural capital: The role of soil and soil management in (de)carbonising agriculture

The importance of soil has moved up the agri-environment agenda, with increasing recognition that this vital natural asset underpins the sustainability of most agribusinesses. This finite resource delivers a range of essential ecosystem goods and services, including production of food, fodder, fuel and fibre, regulation of water during floods and droughts, and mitigation of global warming (and associated climate change and extreme weather) through carbon sequestration. Globally, soils store approximately 1,600 Gigatonnes of carbon (compared with only 610 Gt C in vegetation).This "thin layer of soil…represents the difference between survival and extinction for most terrestrial life."

The vital role of soil carbon in delivering these services will be presented, as well as the consequences of losing soil carbon through processes such as erosion and oxidation. Cranfield University's applied soil science research strengthens the evidence base to demonstrate how soil management practices can be used to both reduce CO_2 emissions from soils, as well as increase the storage of soil carbon, which is essential for healthy, resilient soils.

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Dr Ian Shield, Agronomist, Sustainable Agricultural Sciences Rothamsted Research

Ian Shield is an agronomist and plant breeder who has spent the last 14 years applying his knowledge and experience to the production of energy crops on UK (& EU) farms.

He used his agronomic experience to design management packages for dedicated, perennial, energy crops such as miscanthus and willow and to provide expert knowledge on wider energy crop options to Life Cycle Assessment practitioners.

Ian led the Rothamsted Willow Breeding Programme and was responsible for registering and marketing 5 cultivars of willow.

Energy Crops and Carbon Reduction

The production of energy crops can clearly be demonstrated to result in many positive outcomes of which substitution of fossil fuels and diversification of farming systems are most prominent. Rothamsted Research has a long history of research in energy crops, primarily willow and miscanthus, covering breeding, agronomy and working collaboratively with energy conversion experts.

Willow and miscanthus are very low input crops which leaves limited targets for improvements in their management. The greatest financial expense and potential for energy and greenhouse gas losses is the harvesting and immediate post-harvest management of the crops. Innovative as ever, the industry came up with options for harvest management, however this resulted in uncertainty regarding efficiency. Rothamsted Research conducted the first study to include the combined impact of in field harvesting and post-harvest management.

The other important component of the C cycle and energy crops is the extent to which C is accumulated in the soil. There are many variables affecting the outcome in any individual situation and these were thoroughly reviewed by a recent piece of work at Rothamsted.

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Exploring Rothamsted

Professor Achim Dobermann, Director and Chief Executive Rothamsted Research

Achim is Director and Chief Executive of Rothamsted Research, where he provides leadership for a wide range of research programmes that aim to develop solutions for the sustainable intensification of agricultural systems.

He has more than 30 years of field research experience from all regions of the world. He received an MSc in Tropical Agriculture and a PhD in Soil Science from the University of Leipzig in Germany.

In 1992, he joined the International Rice Research Institute (IRRI) as a soil scientist, followed by an appointment as a professor at the University of Nebraska-Lincoln from 2000 to 2007. From 2008 to 2014, he served as deputy director general for research at IRRI.

As a member of the Leadership Council of the UN Sustainable Development Solutions Network (unsdsn.org), Achim contributes to implementing the new Sustainable Development Goals

Professor Dobermann will give an overview of the work that is carried out at Rothamsted. This will be followed by the opportunity to take a look at some of the interesting projects being undertaken at the moment as well as the chance to explore the extensive and unique Archive.

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The Field Scanalyzer

Guide - Dr Pouria Sadheghi-Tehran

The Field Scanalyzer is a fully automated robotic field phenotyping platform with a dedicated sensor array that may be accurately positioned in three dimensions and mounted on fixed rails has been built at Rothamsted. This facility allows continual and high-throughput monitoring of crop performance within a 15m x 120m area. Crops be monitored throughout the season with a high degree of resolution and reproducibility. Employed sensors include; high-resolution visible, chlorophyll fluorescence and thermal infrared cameras, two hyperspectral imagers and dual 3D laser scanners. The sensor array facilitates specific growth measurements and identification of key growth stages with dense temporal and spectral resolution. Together, this platform produces a detailed description of canopy development across the crops entire lifecycle, with a high-degree of accuracy and reproducibility. In conjunction with above ground measurements electrical resistive tomography (ERT) is being used to image soil drying under the growing crop.

Dr Pouria Sadheghi-Tehran

Pouria's research interests span both artificial intelligence and intelligent systems with a focus on computer vision and machine learning. His research concerns the design and implementation of self-aware and self-adaptive systems, which manage competing goals in terms of high-performance and low-power models for computer vision applications. Currently, he is working on the world's first fully-automated field phenotyping platform at Rothamsted Research. He works with a multidisciplinary team to design and develop novel applications and holistic models; he is also interpreting customised high-throughput heterogeneous data, including 3D Lidar, visible, thermal and hyperspectral imaging. The aim is to improve phenotyping capabilities for crop improvement through quantifying traits associated with yield and yield components.

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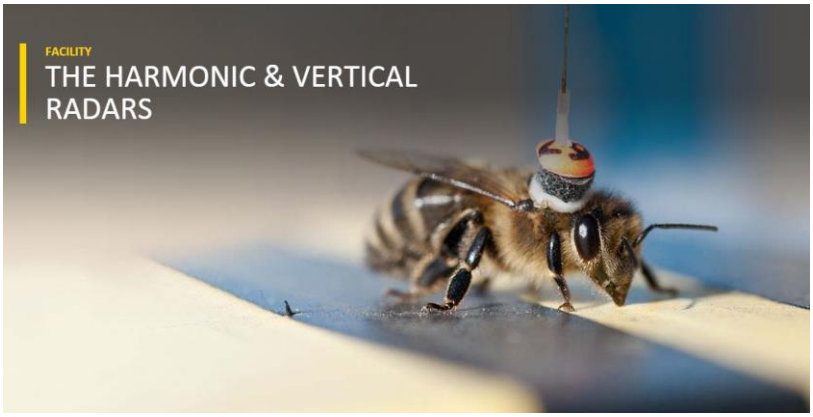
The Bee Radar & Suction Traps

Guide – Dr Jason Lim CEng MIAgrE



Rothamsted Radar Entomology Unit, a specialised technical unit within Britain's oldest agricultural research institute. The unit was first established in 1971 and it has a wealth of knowledge and history in the use of remote sensing technology in study insect movement around the globe. Scientists are studying the interactions between human activities, insect spatial ecology and population dynamics in agricultural landscapes and beyond. At present, the unit focuses on insect movement ecology at both high and low altitudes. The high-flyers: with our network of vertical-looking radars (VLRs), we study insect migration at heights up to 1.2 km above the ground. The pollinators: we have pioneered radar tracking techniques for low-flying insects (e.g. bees). This allows us to understand the effect of modern agricultural systems on the behaviour of important pollinators.

Dr Jason Lim CEng MIAgrE

Jason's current position allows him to apply his technical knowledge to solve a number of the most major issues in the modern agricultural sector; the insect migration and movement ecology of both insect pests and insect pollinators. His work continues to have a significant impact in the field of engineering and agricultural sciences in design, development and maintenance of an international network of agricultural crop pest monitoring stations around the world.

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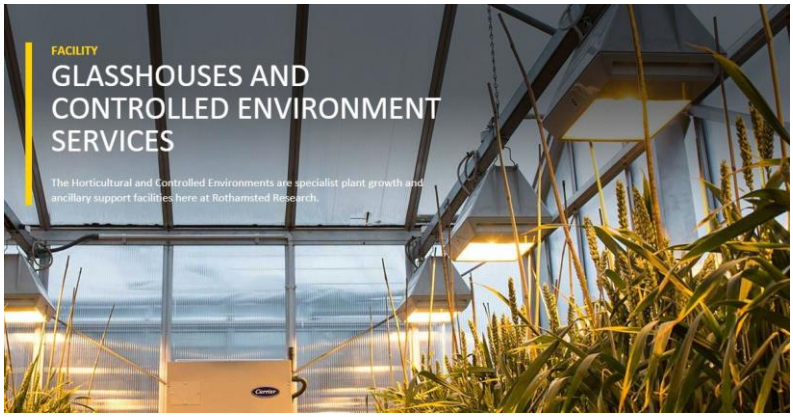
Glasshouses & Controlled Environment

Guide – Julian Franklin



Almost half the energy used, costing in excess of £1 million, on the Rothamsted site is used to grow plants. Of this we estimate the majority is electricity to produce light. Whilst our glasshouses use free light we supplement natural light to extend day length as well as provide additional light all year round.

LED lighting can reduce electrical consumption by 50% yet still produce light intensities comparable to our existing SON-T and fluorescent lighting. The challenge is however to ensure light quality is still sufficient to grow plants. We will demonstrate the facilities used to grow plants (and insects) and the lighting used.

Julian Franklin, Head of Horticulture & Controlled Environments

Julian manages the horticultural (glasshouses) and controlled environment facilities. He is interested in LED lighting and its application to arable crops and in novel growing systems for defined research outcomes. He has expertise in biosecurity, containment of plant pathogens and of insects, and plant health licences

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Cropping Carbon

Guide – Dr Ian Shield

An important component of the Cropping Carbon Institute Strategic Programme was the use of dedicated energy crops to substitute for fossil fuels. This aspect of the afternoon builds upon the presentation made in the morning.

On display, will be a Short Rotation Coppice harvester; based upon a forage harvester the machine has a purpose built cutting head capable of dealing with the high yielding crops produced on UK farms. It will be parked alongside a standing crop of willow planted in a typical plantation design. There will also be the opportunity to see the harvested product, wood chip. The other major energy crop grown in the UK is miscanthus and some cut material will be displayed for comparison to the willow

Dr Ian Shield, Agronomist

Ian Shield is an agronomist and plant breeder who has spent the last 14 years applying his knowledge and experience to the production of energy crops on UK (& EU) farms.

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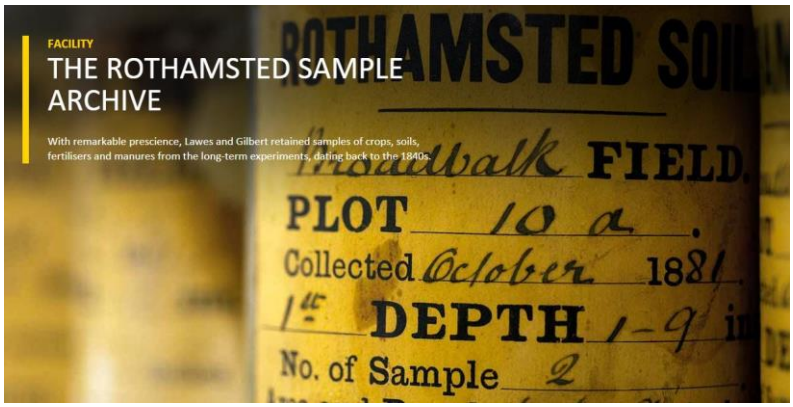
Rothamsted Sample Archives

Guide – Dr Andy Gregory



With remarkable prescience Lawes & Gilbert saved samples of crops, soils, fertilizer and manures from the long-term field experiments dating back to the 1840s. Successive generations of scientists at Rothamsted have continued to add to the collection and the resulting Sample Archive now comprises about 300,000 samples. This unique resource is of immense scientific value.

No other long-term experiments have such an archive of material. Initially, samples were analysed for their nutrient content, including – N, C, P, K, Na, Mg etc, but with the development of new analytical techniques the samples have been used for many other studies, including: Detecting changes in atmospheric S deposition over time, the development of fungicide resistance in plant pathogens, the effects of S deposition on plant pathogen populations and detecting fallout from atomic bomb tests in the 1950s. Yield and analytical data associated with the samples, together with historic weather data, are stored in the electronic Rothamsted archive. The use of samples and data for collaborative research is actively encouraged.

Dr Andy Gregory

Andy is a soil scientist interested in the interaction between soil carbon and soil physical properties, how these are affected by the way in which soils are managed, and how they impact upon other soil functions. Within this broad area of research, he has interests in land use change between arable and grassland systems, soil structure (aggregation and pore networks), soil hydraulic functions (water retention and conductivity), soil deformation (impacts on water retention and gaseous emissions), soil resilience (resistance and recovery from stresses), and biochemical compounds ('biomarkers' to link plant inputs to soil carbon). His current research supports Rothamsted Research's strategic programmes on 'Designing Future Wheat' and 'Soils to Nutrition'. He is also a member of the Long-Term Experiments National Capability team.

Prior to joining Rothamsted Research in 2004, Andy worked at Silsoe Research Institute for just under three years. He was awarded a Ph.D. from Cranfield University (based at Silsoe College) after completing his thesis on soil restoration on a former landfill site (1998-2001). He has undergraduate (B.Sc. (Hons) Geography 1994-1997) and postgraduate (M.Sc. Natural Resource Management 1997-1998) degrees, both from the University of Leicester.

As an experienced field and laboratory scientist, Andy is expert in the characterisation of soil physical and chemical properties. He has conducted research on differently-managed soils at a range of established sites, including Rothamsted Research (Harpenden and North Wyke), Woburn and Silsoe. He has published and presented his research extensively, is a member of the editorial board of *Geoderma* and is a regular reviewer for the other soil science journals. He has been a member of the British Society of Soil Science (M.I.SoilSci.) since 1999.

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Wednesday 11th October 2017
Rothamsted Research, Harpenden

Delegate Feedback Form

We would like to thank you for attending our Conference today:

Decarbonising UK Agriculture
Perspectives and policy for change

To assist us in maintaining or improving the quality and content of our events, the organising committee would be grateful if you could spend a few minutes to provide feedback on the points listed below by rating the event from 1 (poor) to 5 (excellent).

Any additional comments that you may like to make, or suggestions for future topics, can be added in the space provided below.

*Member/non-Member *please delete as appropriate

Please circle below as appropriate 1 = Poor to 5 = Excellent

1.	Did the conference meet your expectations?	1	2	3	4	5
2.	Level of technical content	1	2	3	4	5
3.	Quality of presentation (inc. audio/visual aids)	1	2	3	4	5
4.	Did the Conference increase your knowledge of the subject?	1	2	3	4	5
5.	Question & Answer and interaction	1	2	3	4	5
6.	Suitability of venue (inc. location, amenities etc.)	1	2	3	4	5

Additional Comments:

On completion please leave at the desk on your way out or return by email to: conferences@iagre.org

Or mail to: Sarah McLeod, Conference Secretary
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IAgrE

Are you a Member of IAgrE?

If not then we are looking for people in our industry just like you.

Agricultural Engineering is a very diverse profession and we have members representing every aspect of the industry, which makes IAgrE such an exciting Institution.

We run Conferences, Technical Talks, Branch Meetings and visits as well as the IAgrE National Young Engineers' Competition. We ensure our members are represented across the industry and that their interests are at the forefront of government policy.

Join the Institution of Agricultural Engineers and enjoy all the benefits of networking across our fascinating and innovative industry.

Membership starts from £47 per annum and Students join for FREE (DBT Trust Sponsored)

To find out more contact Alison, our Membership Secretary membership@iagre.org or visit iagre.org to see how you can get involved.

MARK YOUR CALENDARS

UPCOMING EVENTS

Intellectual Property Workshop

When: **1st November 2017, 4pm-6.30pm**

Where: **Marks & Clerk LLP, 90 Long Acre, London WC2E 9RA**

This FREE workshop will explore the basics and commercialisation of Intellectual Property

An opportunity for entrepreneurs to learn about the various forms and benefits of Intellectual Property (IP) and why efforts should be taken to register it.

Robert Carpmael, a patent and designs attorney, and a Partner at Marks & Clerk LLP – the UK's largest firm of Intellectual Property practitioners, will be discussing practical elements of IP, providing opportunities for interaction and questions.

This will be an excellent opportunity for you to learn what you need to do to protect your ideas and your business.

To attend this FREE workshop please go to **iagre.org/events/MCIP and register** or simply telephone Sarah at the Secretariat 01234 750876 to book your place.

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m&C Marks&Clerk

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Delegates & Speakers

Xavier	Albano	Cranfield University
Robert	Alker	CNH Industrial
Guillaume	Blanchy	Rothamsted Research
Rob	Borland	Caterpillar UK
Matthew	Brennan	Genus plc
Clare	Butler Ellis	SSAU
Robert	Carpmael	Marks & Clerk LLP
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Peter	Coleman	Head of Bioenergy & Land Use Science, BEIS
Alexandra	Cooke	Cranfield University
Vickie	Cooper	Merralls Consultants Ltd
Nicholas	Corker	
Laura	Cumplido-Marin	Cranfield University
Achim	Doberman	Rothamsted Research
Iain	Dummett	Cranfield University
Jan	England	England Marketing
Robert	Evans	
John	Fox	
Julian	Franklin	Rothamsted Research
Richard	Gadeselli	CNH Industrial
Michail	Giannitsopoulos	Cranfield University
Steve	Gibbs	Landwards
Andrew	Gregory	Rothamsted Research
Liz	Hadden	Berkshire College of Agriculture
Daniel	Hefft	Weetabix
Kayleigh	Holden	AEA
Mark	Howell	CNH Industrial
Alex	Keen	
Marion	King	Communications Office IAgrE
Sean	Lennon	New Holland Agriculture
Theo	Levanti-Rowe	AEA
Jason	Lim	Rothamsted Research
Jonathan	Lodge	City Farm Systems Ltd
Timothy	Lowden	New Holland
William	MacAlpine	Rothamsted Research
Tatum	Matharu	SocEnv

Sarah	McLeod	Conference & Events - IAgrE
Rob	Merrall	President IAgrE
Paul	Miller	Douglas Bomford Trust
Sam	Moulding	Gs
Andy	Newbold	Newmac
Joanna	Niziolomski	Cranfield University
Laura	Overall	CNH Industrial
Steve	Parkin	Managing Editor Biosystems Engineering
Martin	Parsons	Perkins Engine Company
Nigel	Penlington	Agriculture & Horticulture Development Board
Adam	Peter	Cranfield University
Maria	Pimenta da Costa	Cranfield University
Alan	Plom	Douglas Bomford Trust
Jonah	Prout	Rothamsted Research
Vaughan	Redfern	
Peter	Redman	Agricultural Consultant
Sam	Reynolds	Rothamsted Research
Jane	Rickson	Cranfield University
Phil	Ridley	North Shropshire College
Richard	Robinson	Autoguide
Peter	Rogers	
Pouria	Sadeghi-Tehran	Rothamsted Research
Jonathan	Scurlock	NFU
Ian	Shield	Rothamsted Research
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