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IAgrE Professional Journal www.iagre.org
Volume 72 Number 1 **Spring 2017**

Landwards

DEVELOPING ROBOTS FOR AGRICULTURE

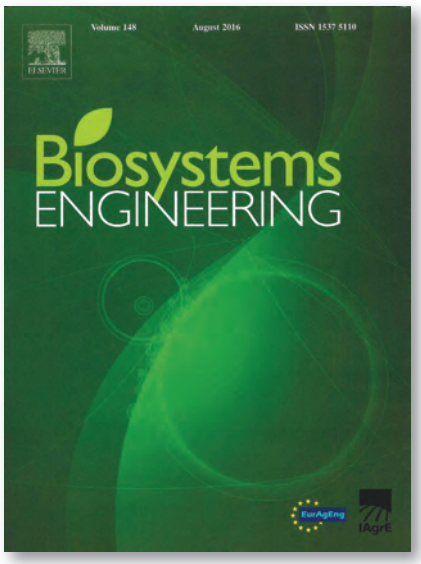
LABOUR-SAVING AGRI-TECH SOLUTIONS

In this issue

IAgrE

Biosystems Engineering

Biosystems Engineering, owned by IAgrE, and the Official Scientific Journal of EurAgEng, is published monthly with occasional special issues.



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The Managing Editor of Biosystems Engineering, Dr Steve Parkin, has kindly summarised a selection of the papers published in the last three issues which he thinks will be of interest to IAgrE members

Biosystems Engineering
Volume 151, November 2016, Pages 200–217
Review
Mechanisms of natural ventilation in livestock buildings: Perspectives on past achievements and future challenges
Li Ronga, Bjarne Bjerg, Thomas Batzanas, Guoqiang Zhang
Aarhus University, Denmark
University of Copenhagen, Frederiksberg C, Denmark
Institute of Research and Technology Thessaly, Volos, Greece

Studies on the mechanisms of natural ventilation in livestock buildings are reviewed and influences on discharge and pressure coefficients are discussed. Compared industrial buildings and buildings for human occupation our understanding of the mechanisms involved in natural ventilation of livestock buildings is limited to the application of the orifice equation. It has been observed that the assumptions made for using the orifice equation are not valid for wind-induced cross ventilation through large openings. This review identifies that the power balance model, the concept of stream tube and the local dynamic similarity model has helped in the fundamental understanding of wind-induced natural ventilation in buildings for human occupation and industrial buildings. These concepts have distinguished the flow through large openings from that of 'cracks', which is where the orifice equation is normally used for prediction of airflow rate. More field measurements on the effect of wind turbulence on ventilation rate and research on bidirectional flow at openings are required.

Biosystems Engineering
Volume 152, December 2016, Pages 41–50
Special Issue: Proximal Soil Sensing
Microscope-based computer vision to characterise soil texture and soil organic matter
Bharath Sudarsan, Wenjun Ji, Asim Biswas, Viacheslav Adamchuk
McGill University, Ste Anne de Bellevue, Quebec, Canada

Characterisation and quantification of soil properties are important for the optimum use and management of soil. While soil texture is an important factor for decision making in agriculture, civil engineering and other industries, soil organic matter (SOM) is the backbone of soil health and quality and also affects a range of other soil properties and processes. Traditional methods for estimating these soil properties are time consuming and laborious. This paper discloses the design and development of a new cost effective in situ computer vision-based sensor system to estimate soil texture and SOM. A small and inexpensive hand-held microscope was used to develop an image acquisition system. Images acquired in laboratory with variable texture and SOM were processed using means of geospatial data analysis based computer vision algorithm.

Biosystems Engineering
Volume 153, January 2017, Pages 63–69
Early and non-intrusive lameness detection in dairy cows using 3-dimensional video
K. Abdul Jabbar, Mark F. Hansen, Melvyn L. Smith, Lyndon N. Smith
Bristol Robotics Laboratory, University of the West of England, Bristol, United Kingdom

Lameness is a major issue in dairy herds and its early and automated detection offers animal welfare benefits together with potentially high commercial savings for farmers. Current advancements in automated detection have not achieved a sensitive measure for classifying early lameness. A novel proxy for lameness using 3-dimensional (3D) depth video data to analyse the animal's gait asymmetry is introduced. This dynamic proxy is derived from the height variations in the hip joint during walking. The video capture setup is completely covert and it facilitates an automated process. The animals are recorded using an overhead 3D depth camera as they walk freely in single file after the milking session. A 3D depth image of the cow's body is used to automatically track key regions such as the hooks and the spine. The height movements are calculated from these regions to form the locomotion signals of this study, which are analysed using a Hilbert transform. Using a linear Support Vector Machine (SVM) binary classification model, the threshold achieved an accuracy of 95.7% with a 100% sensitivity (detecting lame cows) and 75% specificity (detecting non-lame cows).

EDITORIAL: SOCIAL CHALLENGES

There are certain words and phrases that often defy logical analysis. Immigration is one, the National Health Service another.
To that you might add the word Robots, particularly when Reform, a right-of-centre think-tank produced a report earlier this year claiming that '250,000 public sectors workers could lose their jobs to robots over the next 15 years'.
Even that prediction was dwarfed by a forecast from Andy Haldane, the Bank of England's chief economist last November that 'up to 15 million jobs were at risk of being lost to a new age of robots'.
Experience shows that such sweeping statements tend to be akin to earlier predictions that computers would lead to the 'paper-less office' and more leisure time – or that the NHS would need less beds as the nation grew fitter and healthier.
The fact is that robotic technology abounds in all strands of society. From voice-recognition telephone answering to virtually every manufacturing process where robotics have long provided cost-effective solutions in mass production.

Within agriculture, it is accepted that robotics will inevitably provide the alternative to both the threat of a diminishing labour force and the cost pressures in today's competitive food market.
However, all those at the sharp-end of research recognise that for many harvesting procedures, it is extremely difficult to replicate the skills and judgement of human involvement, particularly for more delicate crops.
As ever, integration is the key. The general public have little appreciation of the sheer scale of robotics already embedded in our society - and probably won't have until the day that the receptionist at a Premier Inn fixes them with rather glassy stare and a jerky movement when handing over the key-card (come to think of it . . !).
This month we focus (but hardly scratch the surface) of some of the current work with robotics in agri-tech.
However, it is clear that from the warnings issued by the Bank of England and others that the long term impact of robots will be on the social fabric of our nations, rather than on technological challenges.

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IAgrE is a founder member of EurAgEng, a licensed body of the Engineering Council and a founder constituent of the Society for the Environment

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Volume 72, Number 1 2017

OTHER FEATURES

LANDWARDS PRODUCTION TEAM
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NEW CEO FOR ENGINEERING COUNCIL

Alastair Coates replaces Jon Pritchard

Alasdair Coates BEng(Hons) MSc CEng FICE MCIHT CMIOSH has been appointed the Engineering Council's new Chief Executive Officer and will step into the role on 13 March 2017 replacing Jon Prichard who has taken up a similar role at the Institution of Chemical Engineers.

Alasdair was Route Managing Director, South East, at Network Rail having commenced in 2015 and leaving at the end of 2016. He will join the Engineering Council after completing an interim assignment for the new National College for High Speed Rail in Birmingham, to help develop and write the course material for the civil engineering component.

He says: "I am delighted to join the Engineering Council and take forward the organisation's crucial work of regulating and promoting the engineering profession. Having worked on international infrastructure projects for over three decades, I know how essential it is for engineers and technicians to be competent and constantly developing and improving their skills, particularly with the pace of change in today's industries"


Alasdair Coates

Alasdair has more than 30 years' experience in the planning, design, management and implementation of infrastructure projects initially with Husband and Company Consulting Engineers, then with Sir William Halcrow & Partners. In 2003 he was appointed Managing Director of the Transportation Business for Halcrow Group Ltd and over the following years appointed Group Board Director and Regional Managing Director for Europe. Following Halcrow Group's acquisition by CH2M IN 2011, Alasdair was the International Operations Director, Transportation, before joining Network Rail.


Prof. Chris Atkin

Alasdair is a Fellow and active member of the Institution of Civil Engineers (ICE), having previously been chair of the Graduate and Student section and member of his local ICE membership committee.

In a further appointment, Professor Chris Atkin CEng FRAes has been elected as the next Chairman of the Engineering Council. He will step into the role at the organisation's Annual General Meeting in June 2017 and takes over from the current Chairman Rear Admiral Nigel Guild CB CEng FIET FIMarEST MIMA FREng who has been in post for 6 years.

Professor Atkin, who is Professor of Aeronautical Engineering at City, University of London, joined the Engineering Council's Board of Trustees in 2015. He is a Fellow of the Royal Aeronautical Society and has undertaken a number of roles for the Institution, including as its current President until May 2017.

CIGR launches new International Academy of Agricultural and Biosystems Engineering.

The International Commission of Agricultural and Biosystems Engineering (CIGR), as a global academic organisation with a large membership, seven professional technical sections and a strong impact in global agricultural and biosystems engineering, takes the lead to acknowledge the most significant contributions made by our scientists, professors and entrepreneurs around the world.

For this purpose, CIGR has established the International Academy of Agricultural and Biosystems Engineering (iAABE and composed of elected Fellows.

In a statement it says "We are now in a fast moving era. The challenges presented by population boom and climate change require agricultural and biosystems engineers to discover the appropriate interdisciplinary solutions. People in some parts of the world need more food to survive; urban garbage and industrial waste need new technology to become valuable energy; limited water resources need advanced technology and equipment to realise its efficient utilisation and sustainability. Therefore as agricultural and biosystems engineers, we share the responsibility to advance technology research and equipment design and manufacture. We devote our professional life for the improvement of the quality of our life, and for the betterment of global development"

The founding members of the academy are CIGR Fellows, with Professor Da-Wen Sun being the first elected president.

The focus of iAABE is to:

- Recognise individuals distinguished by the scientific, professional and entrepreneurial contributions to the field. These are individuals that have made exceptional contributions to advance agricultural and biosystems engineering in research, education and industry.
- Foster international cooperation and exchange of information.
- Promote agricultural and biosystems engineering as a contributor to the solution of global problems.
- Stimulate international education and training.
- Create an identifiable body of competence that can provide input to policy, strategy and decision making at the highest levels.

Persons recognised as having established an outstanding reputation for their accomplishments and/or leadership in the discipline are eligible for election as an iAABE Fellow. Nominations for election as Fellows can be submitted to the Academy's Executive Council during the twelve months leading up to a CIGR World Congress or International Conference.

The CIGR Presidium or a Fellow of the Academy must sponsor a nomination to the Academy. No more than 20 Fellows will be elected every two years.

IAGRE AT LAMMA

IVEL Award presented to Witham Group for its Prolan lubricant

IAGRE staff led by CEO Alastair Taylor and President Dr Robert Merrall were out in force at this years' LAMMA show with a stand that proved busy throughout the event.

More than 40,000 visitors descended on the East of England Showground on 18-19 January to view around 900 exhibitors from the farm machinery and equipment sector.

It was the first show since Brexit and organisers Briefing Media reported an atmosphere of cautious optimism among exhibitors and visitors, due to the improved commodity prices as a result of the vote.

Elisabeth Mork-Eidem, group head of events for Briefing Media, commented: "We were delighted by the success of LAMMA 2017. Visitors were able to see a number of new launches at the show and our sponsors and exhibitors have fed back that they were impressed both by the number of visitors and also by the positive nature of the conversations held.

"After a couple of difficult years in the market, there were many instances of this, with real business being done at the show."

The Witham Group, manufacturers of a huge range of commercial lubricants and paints won the Ivel Award for best new product or environmental innovation for a product called Prolan, an environmentally friendly, protective lubricant that provides incredibly long lasting protection from rust and corrosion.

The judges said: the product has multi industry worldwide appreciation for protecting against rust, corrosion and galvanitic attack. Developed from an agricultural waste, researched and formulated it can be applied in a number of ways to a very wide range of equipment.

Nigel Bottom managing director said, "Prolan is completely natural, non-toxic and non-carcinogenic and so surpasses other petrochemical products as a safer, environmentally sustainable alternative. It is these green credentials that got the product range shortlisted for this year's LAMMA Innovation awards in the environmental category."

The IAgrE Awards committee decided in 2007 that it would be fitting for the Institution to celebrate the name of Dan Albone and the memory of the Ivel tractor by making an annual award using the Ivel name. The committee felt that this award should be for a new product or innovation which will have the most positive impact on the environment.

Presentation of IVEL award

WEIGHT LIMIT INCREASE SHELVED

NFU and Contractors Association ask DfT for explanation

The National Farmers Union (NFU) and the National Association of Agricultural Contractors (NAAC) have expressed disappointment at the decision from the Department for Transport (Dft) saying that they will no longer proceed with 'Phase 2' of increases to the combination weight limits of agricultural tractors and trailers.

On 9 March 2015 the law on tractor speed and weights changed. This 'Phase 1' of amendments increased the maximum combination weight of a tractor and single trailer from 24.39 tonnes to 31 tonnes. However, the maximum laden weight of trailers remained unchanged at 18.29 tonnes. The NFU and the NAAC have been involved in negotiations and consultation for over eight years, working towards further trailer weight increases as part of the 'Phase 2' of changes. However, on 3rd February 2017 the DfT announced that it will not proceed further with regulatory change.

The NFU is calling on the DfT to explain the reasoning behind this and engage transparently with the farming industry on the next steps for this important issue.

NFU combinable crops board chairman Mike Hambly said: "The NFU, with the crops board, has worked effectively with the DfT for many years on updating decades-old regulation on tractor and trailer weights and speeds, making progress in moving to 31 tonnes and 40kph.

DfT's announcement has put vital progress on this regulation in jeopardy.

"Weight restrictions for tractors and trailers in other countries far surpass our own 31 tonne limit. We're put at a competitive disadvantage to countries like Germany and France who benefit from 40 and 38 tonne limits respectively"

JOHN DEERE APPRENTICE INTAKE

First female and forestry registrants

John Deere's first female and forestry technicians have been registered in the latest intake for the company's award winning apprenticeship scheme, managed by training provider ProVQ, which celebrates its 25th anniversary this year.

A total of 34 apprentices have signed up to begin their first year of training in the work-based Ag Tech, Parts Tech and Turf Tech advanced apprenticeship programmes, including Zoe Parker of dealer Ben Burgess Coates and Matthew McPherson of John Deere Forestry in Carlisle.

The apprentices, their families and sponsoring dealers attended an induction day at John Deere's Langar headquarters and were given a tour of the branch and a ride & drive session with the latest Gator utility vehicles. They also visited the new John Deere Apprentice Training Centre at nearby Radcliffe-on-Trent in Nottinghamshire. This is the British agriculture and turf industry's first and only purpose-built apprentice training facility, designed specifically and solely for John Deere dealer apprentices.

John Deere's apprenticeship scheme was the first land-based agricultural and turf machinery programme to deliver training in the workplace, at the sponsoring dealership, with assessment and guidance from ProVQ's team of expert assessors. Additional block release training takes place at the new Apprentice Training Centre.

Ag Tech was the first such scheme to be introduced in the UK and won a National Training Award at the end of 1997, the only one ever made to an agricultural machinery apprenticeship programme. Since the first programme started in 1992, more than 600 apprentices have graduated through all the training programmes and been employed in the company's nationwide dealer network.

IAGRE SURVEY *Embracing Agi-Tech opportunities*

How many UK engineering and manufacturing companies will be in a position to develop the innovative ideas evolving as a result of the government's Agri-Tech strategy funding?

IAgrE has launched a survey designed to answer this question. CEO Alastair Taylor says "We will be looking at how ready UK industry is to develop the engineering and manufacturing supply chain opportunities that will arise as new Agri-Tech systems develop."

Launched at LAMMA, IAgrE is now questioning engineers to get a snapshot of how fit businesses are to meet this challenge.

"There are some serious questions to be asked. For example, I wonder how many engineering and manufacturing companies are embracing the opportunities which are coming out of AgriTech. Are they well placed to use technologies such as rapid prototyping, computer coding, electronics applications, 3D printing, novel sensors and robotics?" added Alastair.

The survey will also cover aspects of education and training and how engineers overcome any barriers to introducing new technologies and whether companies understand and use the grant and funding opportunities available from government departments such as Innovate UK.

As well as reporting to the agricultural engineering industry, the results will be analysed and shared with the government Department for Business, Energy and Industrial Strategy.

This new report is the second to be prepared by the Institution. The first, published in 2012 was stimulated by discussions with the Government's Chief Scientific Adviser and others and called "*Agricultural Engineering – a key discipline enabling agriculture to deliver global food security*."

The survey can be accessed at **www.iagre.org/agri-tech-systems-survey**

NAAC APPOINT DUNCAN RUSSELL

The National Association of Agricultural Contractors (NAAC) has appointed a new Chief Executive, Duncan Russell, effective from January 2017.

In his new role, Duncan will be responsible for driving the NAAC forward and ensuring that the Association takes a proactive role in sensitive political negotiations in the coming year, supporting contracting members and continuing to raise the Association's profile.

Duncan has a wealth of agricultural experience after seventeen years running the National Sprayer Test Scheme, as part of his previous role as Services Manager at The Agricultural Engineers Association (AEA).

Commenting, NAAC Chairman Martins Hays said, "Duncan will be an asset to the NAAC, with lots of industry contacts and grass roots experience. We are confident he will be capable of representing our interests at the highest possible level, working alongside our Technical Consultant, Jill Hewitt and Membership Officer, Louise Cox."

Duncan Russell

AGCO Apprentices

Awards highlights opportunities

The importance of high service levels at agricultural dealerships is crucial to the future success of the industry, and this is underpinned by the emergence of newly qualified dealership technicians. That was the strong message outlined at the AGCO Academy Apprentice Awards ceremony held on 15 December 2016.

Freddie Pullan, AGCO's technical training manager, told the audience that the investment AGCO places in its apprenticeships scheme is fundamental to its future plans, particularly in the crucial UK and Irish markets.

"New technicians are the key component to the success of our dealership networks, so we place huge investment in the apprenticeships, as do our dealers. But equally we get the returns in terms of the most skilled technicians coming out at the end of their training."

The big winners on the day, B&B Tractors of Warsop, Nottinghamshire, echoed Mr Pullan's comments. The Massey Ferguson, Challenger and Fendt dealership has four depots covering a customer base over eight counties, and saw apprentices pick up two of the key awards at the ceremony.

James Booth, based at B&B's Tideswell depot in Derbyshire, picked up the prestigious Apprentice of the Year Award, while his colleague Jonathan Cook, based at the company's head depot in Warsop, collected the Most Improved Apprentice of the Year Award.

The other key winner on the day was Glasgow-based Matt Griffin, who was voted by his peers as the Apprentices' Apprentice of the Year.

Tony Linfield, AGCO's training development manager said, "We want to encourage youngsters to stay on in the agriculture industry - do something practical, get paid but also receive a qualification. At the end of the programme the apprentices will work for their dealerships. They will be trained as dealership technicians and prospects are good - they could be earning £40,000/£50,000 a year.

ABOVE: James Booth receives Award from BAGMA's Keith Christian

BELOW: AGCO Apprentices

TRACTOR SALES

Lowest total for a decade

The **Agricultural Engineers Association (AEA)** has announced that registrations of agricultural tractors (over 50hp) reached 10,602 units in 2016, a decrease of 2.2% from the level of the previous year. As a single month December showed a fall of 13.4% to 515 units.
The AEA say although this is the lowest annual unit total for more than a decade the second half did see a substantial improvement following a first half that recorded a year-on-year drop of 9.8%.
The average size of unit continues to increase with a 0.8% rise last year to 158.3hp.

STEPHEN HOWARTH

Appointed AEA Economist

Stephen Howarth has joined the Agricultural Engineers Association (AEA) team as the new Agricultural Economist.
Stephen will be specialising in economic analysis and market intelligence for the farm equipment industry. He will also be providing the secretariat to the Farm Equipment Council and will represent the industry on several external committees and bodies.
Stephen brings with him a wealth of knowledge about agricultural markets, having spent the last 5 and a half years working in the Market Intelligence division of the AHDB. His specialism has been more recently in the red meat sectors but he has worked closely with colleagues covering both dairy and arable.
Stephen has been closely involved in AHDB's work on the implications of Brexit, including contributing to the organisation's highly-acclaimed Horizon reports. He joins an already established economics team with Theodora Levanti-Rowe as Economist specialising in Outdoor Power Equipment, Graham Stannard, Statistician and Daniel Fasham, Business Analyst.
Before joining AHDB, Stephen held a number of statistical and socio-economic research roles in the public sector. He worked for the West Midlands Regional Observatory, Adult Learning Inspectorate and started his career as a government statistician.
Ruth Bailey, CEO of the AEA said, "We are delighted at the AEA that Stephen has decided to join us. He will add great value by bringing specialist knowledge and strength to the Market Information team which we now have in place at the organisation."

NEW CLAAS HQ PLANNED

Includes Technoparc machinery showroom

The CLAAS Group has given approval for the construction of a new, state-of-the-art headquarters building for CLAAS UK and their dealer MANNS of Saxham on the Saxham Business Park near Bury St Edmunds, Suffolk.

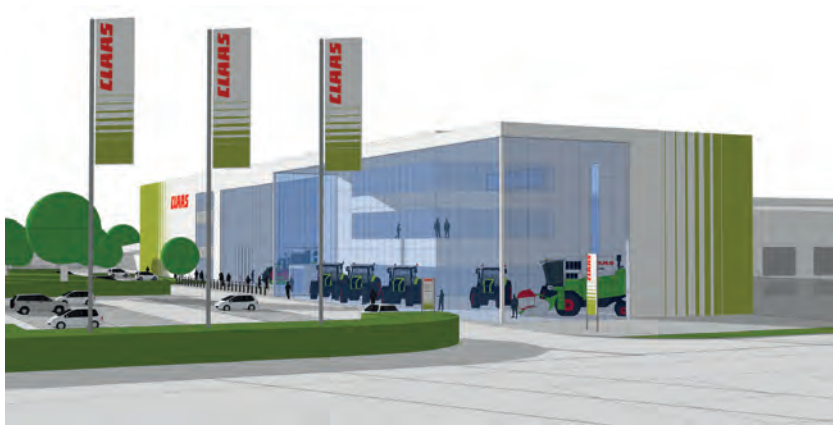
Over the course of the next five years, the multi-million pound project will see the complete redevelopment of the existing CLAAS and MANNS site. Within this will be the construction of a new, signature building that reflects both the importance of CLAAS within the UK agricultural industry and also the site's prominent position alongside the A14.
"By giving go-ahead for this new building, both the CLAAS Group and the Claas family have shown their commitment to both CLAAS in the UK, and also to west Suffolk where we are now one of the largest employers," says Trevor Tyrrell, CEO of CLAAS UK.

CLAAS UK employs over 400 people throughout the UK and Ireland and is the market leader for both combine harvesters and self-propelled forage harvesters, and has a rapidly growing customer base for CLAAS Tractors.

"When the current building was constructed, they would never have imagined that 50 years later we would now have over 100 people working on site and that as the headquarters for CLAAS UK, it would be providing sales, service, parts and training support to dealerships throughout the UK and Ireland, in addition to receiving visitors from around the world," states Trevor Tyrrell. "The site is at maximum capacity."

The site is also the headquarters for the MANNS dealer group with six dealerships throughout the eastern counties. In addition, the CLAAS Academy training centre is located on the site, which provides over 4,000 training days for dealer personnel and customers every year.
The redevelopment of the site will take place in phases, with completion expected in 2020.

A central feature of the design is a new Technoparc machinery showroom, which will serve both as a display area for MANNS, but also as a striking entrance and welcome area for visitors to CLAAS UK.



CEO

Reflections on a changing world

LAMMA, LOOKING AND LEARNING

Shortage of suitable staff and access to apprentices remain real concerns

Alastair Taylor *IEng CEnv MIAgrE*

I must confess that I am no great fan of agricultural shows. A show, outdoors, in January doesn't really appeal too much. July any day (although I do recall getting very, very wet at the old Royal Show on more than one occasion). All of this said, I confess to having really enjoying my two days at LAMMA in January this year. OK it was dull, and cold, and an 0530 start on two consecutive days does take its toll.

IAgrE had joined forces with our friends in the Agricultural Engineers Association (AEA) and the British Agriculture and Garden Machinery Association (BAGMA) to have three stands in a row with a fourth stand to promote the work of the Landbased Engineering Training and Education Committee. It was a great success and wonderful to see so many IAgrE members and friends calling by to say hello. I think the secretariat staff have just about thawed out.

Had I been a farmer looking to buy a tractor

My normal attitude towards agricultural shows was changed by the fact that I had a reason to be there. Having a stand is one thing but the opportunity to spend the time with the President meeting exhibitors was very useful. Had I been a farmer looking to buy a tractor, I am sure there would have been plenty to choose from and the opportunity to see all things gathered together in one place is quite a rare opportunity.

My main purpose was to talk to the UK Engineers and Manufacturers exhibiting at the show. This proved hard for a couple of reasons. Firstly, identifying them was a little depressing. It was a case of taking the list of exhibitors and highlighting those engineers and manufacturers from the UK. Unfortunately, the list is not as long as you would hope but amongst them are some very well established brands and some real history. The second challenge was to engage in conversation – not because they are shy but because they were very busy with customers. I certainly learnt that I should never stand between a manufacturer and potential sale!

The reason for the conversation was to tell them about a survey which have been running. Our question is to determine the challenges associated with developing and implementing some of the new innovation coming out of the Governments Agri-Tech strategy and in particular how UK based Engineering and Manufacturing is placed to move things forward.

Those people I met were certainly keen to engage.

I certainly learnt that I should never stand between a manufacturer and potential sale!

In short, IAgrE want to help by giving Government the information they need to target funding to best effect. We are particularly interested in identifying where we do have capacity as well as the barriers which need to be addressed. The four key questions we asked were.

- What is your company's capability to take on innovative Agri Tech concepts and develop them to production and deployment?
- What barriers exist to achieving the above aspiration?
- What appetite is there for the wider advanced and high value manufacturing sectors to expand into Agri Tech developments?
- What training, development and support will be required to help your business overcome the challenge of converting innovative ideas into manufacture and production?

I am looking forward to analysing the findings of this survey. One always commences a project like this with a thought that you might already know some of the answers and I am sure there will be some areas where I am accurate in my hypothesis. However I do hope there are new answers and solutions which we can share with our members and the wider audience.

One common theme from the UK Engineers and Manufactures I met was the shortage of skilled staff and a lack of access to apprentices in Performing Manufacturing Operations (PMO) which is the name of the qualification often followed by those looking to work in this area. There is a message for us here in that all the work we have done to promote apprenticeship in land based engineering and link this to the Land based Technician Accreditation Scheme (LTA) is all very well but we have a new job on the agenda which is to help employers secure the people they need with the skills to work in machine shops and with fabrication.

We have a big task on our hands.

Feedback

LEARNING AT THE SHARP-END

New scheme provides students with an insight into agricultural engineering

Geoffrey Bond OBE DL

Geoffrey Bond OBE DL is a retired lawyer and businessman who has a longstanding and wide ranging interest in the arts and heritage. He was one of the original experts on the Antiques Roadshow. Amongst his many offices he has been Chair of MLA (Museums, Libraries & Archives) London, Sheriff of the City of London 2003/4, Chairman of the Treasures of the Livery Companies Exhibition 2012, and founder of the Lord Mayor of London's Cultural Scholarship Scheme for young people.

In 2016 I had the privilege of being the President of the Newark & Nottinghamshire Agricultural Society which in May each year holds The Nottinghamshire County Show. In preparation for my year as President, I spent time in 2015 looking at the agricultural engineering industry, which was a completely new world to me.

I realised in attending events such as the Midlands Machinery Show, that there was a great need for more young people to know about careers in agricultural engineering. It is my opinion that many enthusiastic youngsters at school leaving age are simply not aware of your industry. This means that many capable young people are lost to other sectors without ever exploring the opportunities provided by agricultural engineering.

I have learned of the Careers & Enterprise Company created by Government in 2014, which provided for 'Enterprise Coordinators' working with schools on career guidance. However, critics say aspects of the £70m scheme could be better spent on training teachers to deliver guidance in the classrooms. It must be sensible for specialist careers advisors, teachers and employers to work together on advising and showing what careers are available for young people.

In visiting schools with colleagues we realised there was little information for young people about agricultural engineering and among the things that we have done to improve knowledge of the industry is to attend School Careers events. We have received good support from schools by being allowed to talk to both students and parents about opportunities presented by apprenticeships. Also, we have been able to arrange for groups of students to attend major agricultural engineering companies such as John Deere, who very kindly host the students, explaining the nature of the industry and showing them agricultural farming machinery operating in the new computer-led world.

I am pleased to say in the East Midlands there are schools which specialise in engineering, one recently created is called NUAST (Nottingham University Academy of Science & Technology) which specialises in teaching young people all branches of engineering, who can choose to go into apprenticeships or on to University. We need more of these 'engineering-focused' academies.

In order to give young people an opportunity to consider a career in agricultural engineering we have set up a traineeship scheme in the East Midlands, in the counties of Leicestershire, Nottinghamshire and Lincolnshire. **(The Midlands Agricultural Engineering Traineeship and Apprenticeship Scheme)**

The Scheme gives youngsters time during their school holiday with an agricultural engineering company in the hope that they will realise what great opportunities are presented by the industry. The summer of 2016 saw a number of young people taking up such placement opportunities. This year we will at least double the number on such courses. Discussions with, in particular, smaller agricultural engineering companies has shown great support for the Scheme. I hope that other agricultural societies around the country will set up similar initiatives.

In addition, on a more formal level, in cooperation with Bob Sheldon, Chairman of the Midlands Machinery Show and Charles Szabo of Riseholme College, we are also supporting those students already on an agricultural engineering apprenticeship course by encouraging them to win one of our awards. This means that anyone who wins an award will have a toolkit supplied which is so important for their work. These apprentices, usually on a day release to agricultural educational institutions combine working with study and the ability to earn money, and not as in the case of many students at University, building up a debt to be repaid on qualification.

British farmers make a huge contribution to our economy and work in an increasingly sophisticated technological world, they make use of precision farming techniques with GPS systems, robotics and even drones. The challenge is to deliver the message to more young people that there is a first class career to be had in agricultural engineering.

Work experience Students
(photo courtesy of Craven College)

Responses to **Landwards** Feedback to the Editor chris.biddle@btinternet.com

A NEW GLOBAL OUTLOOK

Enhanced prospects for high impact innovation

President's Musings

IAgrE President
Dr ROBERT MERRALL
MIAgrE, Eng D

There is a famous quote attributed to film producer Samuel Goldwyn that seems to have particular resonance right now. "The harder I work, the luckier I seem to get" - something I've thought about a great deal, and we work in an industry made up of hard working people, many of whom deserve to get luckier.

I am writing this en route to join a British Foreign & Commonwealth Office trade mission in Beijing, which gives me the opportunity to reflect on the nature of the commercial and research opportunities currently presented to those of us working in agri-tech. There is the real prospect of strong growth and investment in our sector over the next couple of years. Brexit is encouraging an (even) more global outlook and whilst I was never that keen on departing from the EU, I recognise that there are signs that the emerging climate will be one which encourages commercial investment and enhances prospects for dynamic, high impact, and collaborative innovation. This is thrown up in sharp relief when we consider the long term global food security and sustainability issues we all face.

Our Chief Executive, Alastair Taylor is presently working on an interesting project which our institution has been commissioned to undertake by Government: a survey to examine how ready our industry is to capitalise on new agri-tech opportunities. Specifically this is looking to identify strengths and potential gaps in our sector's manufacturing capacity. If you are asked to support this work, I'd ask that you look at it as an opportunity to influence Government policy which might unlock further stimulus or help ensure what encouragement is available is targeted as effectively as possible.

SUSTAINABILITY

I am keen to focus on sustainability in this year's autumn conference, and am championing a theme of decarbonising agricultural production. I know many people have thought long and hard about what "sustainable intensification" might look like, and I think that looking at this from a standpoint of reducing the carbon footprint of food production should give us some greater insight. If anyone has ideas for topics, speakers or projects that could contribute to this, I know the team at the Secretariat would be very pleased to hear from you. This theme, I hope, gives us the opportunity to hear from our members whose interests are in machinery design and manufacture, as well as our members who are more engaged with environment management. Hopefully we can achieve a balanced programme with broad appeal to our current membership and beyond.

I am hopeful that as an Institution our trajectory can continue to be one of growing influence, as trusted counsel for those who are tasked with making policy decisions that impact on all of us. Not to take any particular political position, but rather to offer our collective expertise in order to harness our sector's capacity for innovation in ways which leave us all in a stronger, more sustainable position. We are living through truly interesting times and I have a feeling things will have moved on significantly by the time I write this piece for the next Landwards.

Wishing all our members every success in their endeavours.

PLOTMECH 2017

Rothamsted showcases event for latest equipment and techniques for field trial professionals

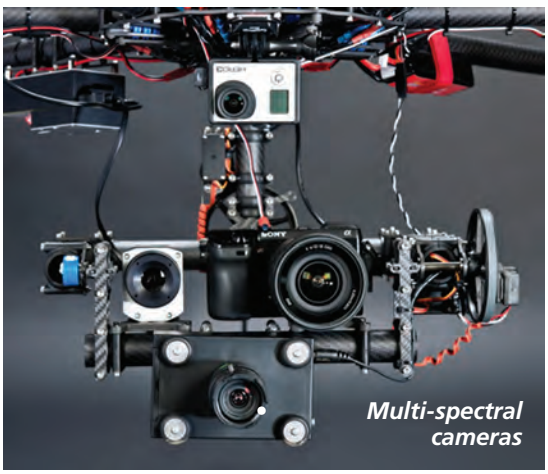
Report by Dr Chris Watts IEng CEnv FIAgrE
Sustainable Soils and Grassland Systems, Rothamsted Research

We were delighted to welcome 150 delegates to Rothamsted Research on 3 February 2017 for Plotmech2017, a demonstration and discussions of the latest equipment and techniques for field trial professionals.

Thousands of field trials are conducted by universities as well as many research organisations, both commercial and government supported. These trials support research looking at a whole range of activities ranging from improving crop production to the effects of agricultural management on the environment.

This industry has developed a whole range of specialist equipment and novel techniques and the event was organised by Rothamsted Research and supported by APH and Haldrup. APH are a Peterborough engineering company and the UK and Ireland dealer for Haldrup, the German-based manufacturer of specialist machinery - including seeders, plot combines, harvesters and lab machines - for the field research sector.


Plot combine


Multi-spectral cameras

The morning discussions, chaired by Martin Powell General Manager of APH, included a welcome by Achim Doberman, Director and CEO, Rothamsted Research who emphasised the increasing need for field trials work utilizing the latest engineering techniques. Field trials have been conducted at Rothamsted since the mid-19th century and many of the statistical methodologies used in the design and analysis of field experiments were developed here.

PLOT DRILLS AND COMBINES

Anna Sprinzl, sales director of Haldrup reviewed the wide range of specialist trials equipment the company provides. Their range of plot drills are designed to work with cereals, oilseeds, grasses and vegetable seeds, come in a range of coulter types, working widths and capable of precision placement of seeds as well as offering the possibility for quickly changing row spacing.

Plot combines are built to customer specifications, offering a alternative header types and size, on board grain (plot and sub-sample) weighing and moisture determination systems, plus options to weigh or chop straw. As well as field machinery, the company manufactures a range of laboratory based devices such as laboratory threshers seed counters and dressers.

The range of field experiments carried out at the four Rothamsted sites were described by Chris MacKay is Field Trials Co-ordinator at Rothamsted. The small team run more than 70 field experiments, planting and harvesting between


Trial plots at Rothamsted


Delegates at Plotmech

Plot drill at work

13,000 and 15,000 plots/year with a whole range of arable crops. Included in this number are the classical field experiments which have been running continuously since 1843 as well as the small number of GM field trials. Additionally, there are 18 long-running energy crop experiments with willow and miscanthus cropping. Chris explained how planting and harvesting techniques have evolved over the years and the importance of mechanisation as the numbers of experiments have increased and staff numbers have decreased.

Static display at Plotmech

MONITORING SOIL DRYING

From my role at Rothamsted, I was able to review some current techniques for monitoring soil drying under growing crops and phenotyping root activity. Techniques included surface imaging techniques; electrical resistive tomography (ERT), electromagnetic imaging (EMI) and Acoustic/Seismic techniques. These methodologies are non-invasive but allow us to build up a picture of crop water extraction from the soil profile during the growing system. However, there still remains a need for more invasive techniques such as insertion of soil moisture sensors (neutron probes).

These sensors utilise access tubes installed to a depth of 1.5 m which remain in-situ throughout the season. These tubes (200 + in some field experiments) are visited at regular intervals to measure crop related changes in water content. This group are working with a small engineering company (HF Bond, Woodbridge, Suffolk) to mechanise the installation and extraction of access tubes and the taking of soil and soil/root cores without disturbing the surrounding crop.

The final talk was by Andrew Riche also from Rothamsted, describing automatic trials monitoring by UAVs. Rothamsted run a number of UAV drones fitted with a suite of different sensors including high definition RGB (red green blue – conventional cameras), thermal imaging, near infrared and multi-spectral cameras. The UAV's can be flown manually or pre-programed via geo located waypoints and in-house image processing allows spatial and temporal analysis of a range of crop characteristics at the small plot scale.

Crop height, disease, abiotic stress including compaction drought, excess and inadequate N, senescence and lodging have all been monitored over time. Measurements taken a couple of times in a season, requiring large groups can now be collected on a weekly basis.

Following the morning session, delegates moved to Rothamsted Farm for lunch and to view a wide range of specialist plot machinery on display. Delegates also had the opportunity to have a guided tour Rothamsted Bee and insect radar workshop by Dr. Jason Lim and a tour of Rothamsted Farm and Field Experiments.

There was a general view among delegates that it had been a really valuable day and that Plotmech should become a regular show.

Plot combine at work

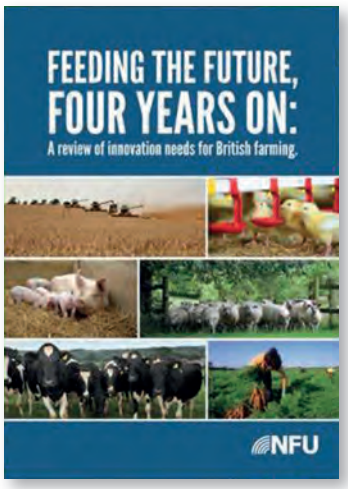
All images courtesy of Rothamsted Research

NFU urges new investment in research

Eight point priorities identified

A new report from the NFU urges Government and research providers to invest in agricultural R&D and to enable British farmers to use the latest technologies.

The report, *Feeding the Future, Four Years On,* was launched at NFU Conference in February and identifies several innovation needs that will enable British agriculture to boost its competitiveness, resilience and profitability. The NFU is calling for decision-makers, research funders and providers to read the report and help create a funding and regulatory environment where new technologies and innovative practices can be adopted on farm as quickly as possible.



The NFU Conference session entitled *Competitiveness: Keeping Ahead of the Game* saw NFU Vice President Guy Smith and Head of Robotics and Automation at Harper Adams University, Professor Simon Blackmore assess farming's current and future use of new, developing technologies.

Commenting Mr Smith said: "Farming and agriculture is already an incredibly innovative industry but it remains very important that farmers recognise new opportunities for better returns, such as those developed from the Agri-Tech Strategy. The priorities listed in this report show the desire to continue building on what the industry already has.

"In the current climate of political uncertainty, there are many challenges out there for farmers, but with this comes real opportunities."

Farmers across agriculture and horticulture have set out eight research priorities that would boost the sector's contribution to the economic and environmental performance of the UK food production system.

The eight priorities are:

- Digital, data-driven and engineering technologies
- Crop and livestock genetics and breeding technologies
- Interactions between air, soil, water and crop/animal processes within farming systems
- Integrated approaches to management of crop weeds, pests and diseases
- Integrated approaches to management of animal disease within farming systems
- Evidence-based management and valuation of ecosystem service provision from farming systems
- Skills, training and KE
- Use of social and economic sciences

Feeding the Future, *Four Years On* is available for download from the NFU website www.nfuonline.com

THE INSTITUTION OF AGRICULTURAL ENGINEERS IAgrE

NOTICE OF MEETING

Notice is hereby given that the **Seventy-first Annual General Meeting** of the Institution will be held at John Deere, Langar, Nottingham on **Thursday 27th April 2017 at 10.30am**.

Agenda

1. To receive and confirm the minutes of the seventieth AGM held on 28th April 2016.
2. To propose as an Ordinary Resolution: ***"That the Annual General Meeting authorises the Council of the Institution to review members' subscriptions and to make such adjustment, if any, as may be required with effect from 1 January 2018"***.
3. To consider and adopt the Report of Council for the year ending 31 December 2016.
4. To receive and adopt the Accounts for the ending 31 December 2016.
5. To announce nominations for election to Council for the 2017/2018 Session.
6. To re-appoint Lander & Co, registered auditors, as reporting accountants and to authorise Council to fix their remuneration.

By Order of Council

A.J. Taylor.

Alastair J Taylor, Chief Executive & Secretary

IAgrE

THE INSTITUTION OF AGRICULTURAL ENGINEERS

NOTICE OF MEETING

All members are invited to attend an **Extraordinary General Meeting on Thursday 27th April 2017 at 10.45am** at the AGM venue to consider and if agreed to pass the following motion:

To approve the amended Memorandum and Articles of Association which will take effect from 1 May 2017.

It is important in a democratic professional society, where all members are part of a regulatory process, to try to attend and participate in General Meetings so that as many of the members as possible contribute to the decisions of the society.

NB ALL PAPERS ARE AVAILABLE ON THE IAGRE WEBSITE

ROBOTS FOR AGRICULTURE

Labour-saving agri-tech solutions can overcome labour issues, but only with careful and planned integration

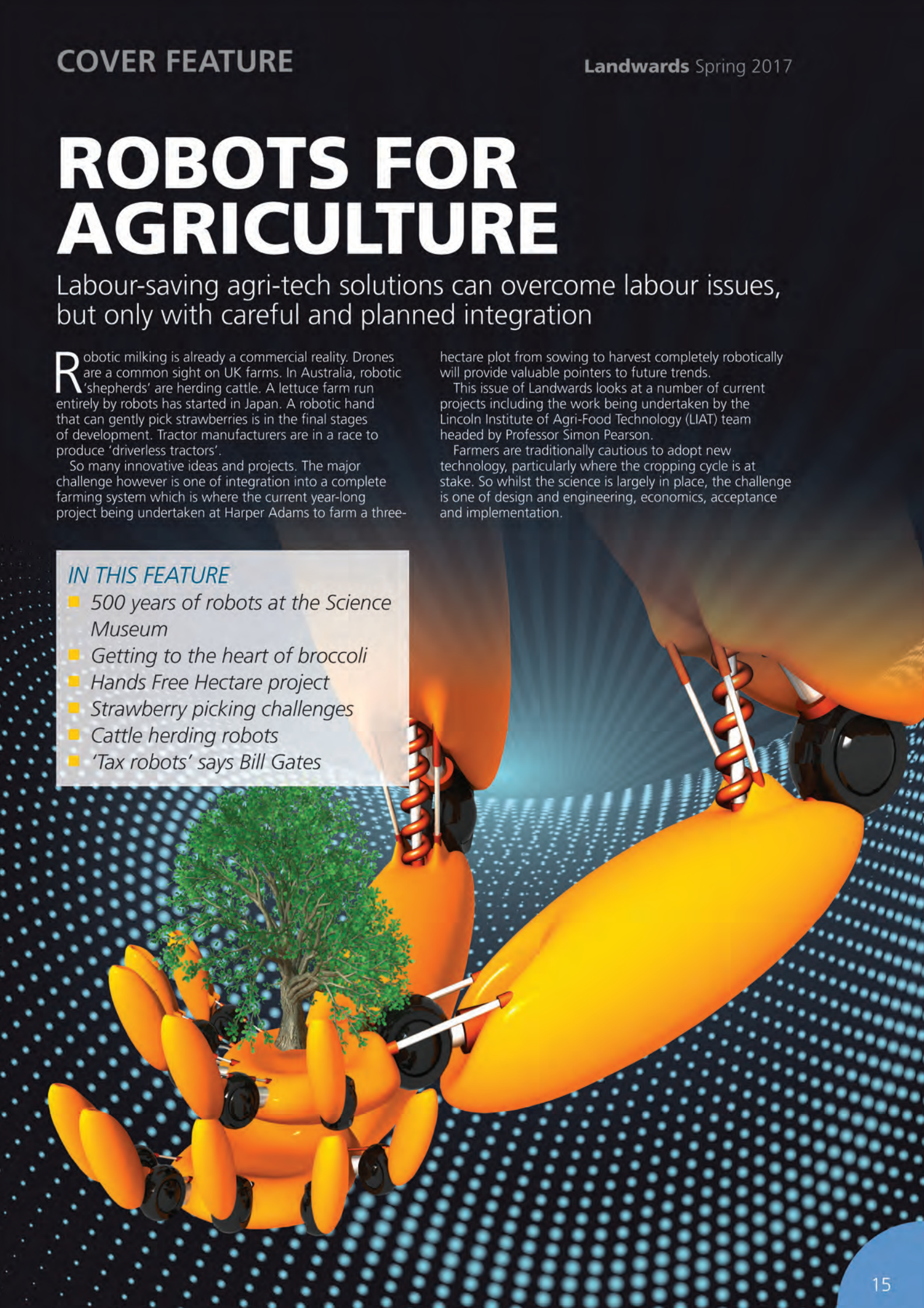
Robotic milking is already a commercial reality. Drones are a common sight on UK farms. In Australia, robotic 'shepherds' are herding cattle. A lettuce farm run entirely by robots has started in Japan. A robotic hand that can gently pick strawberries is in the final stages of development. Tractor manufacturers are in a race to produce 'driverless tractors'.

So many innovative ideas and projects. The major challenge however is one of integration into a complete farming system which is where the current year-long project being undertaken at Harper Adams to farm a three-hectare plot from sowing to harvest completely robotically will provide valuable pointers to future trends.

This issue of Landwards looks at a number of current projects including the work being undertaken by the Lincoln Institute of Agri-Food Technology (LIAT) team headed by Professor Simon Pearson.

Farmers are traditionally cautious to adopt new technology, particularly where the cropping cycle is at stake. So whilst the science is largely in place, the challenge is one of design and engineering, economics, acceptance and implementation.

IN THIS FEATURE



500 YEARS OF ROBOTS

A new exhibition at the Science Museum charts the rise of substitute humans

Chris Biddle reports

One evening in 1979, television viewers who hadn't gone to make a cup of tea in the middle of News at Ten, saw something very unusual, a commercial break completely taken up by one ad. It was a two-minute triumph showing a car being put together in a factory, with not a dirty blue overall in sight.

The advertising agency's brief was to create an ad to promote the new Fiat Strada. The producer recalled an item from Tomorrow's World about the Fiat factory in Italy where cars were put together by robots. The ad contained no voiceovers, simply a strong musical track, Rossini's Figaro aria

Ironically, when the production team led by the director Hugh Hudson arrived at the Fiat factory in Turin to shoot the film they had to run a gauntlet of pickets and burning tyres lit by workers protesting about robots taking their jobs!

Baxter: a factory 'employee'

Today, the use of robotic equipment is widespread in manufacturing plants across the world. For operations such as welding, steel cutting, paint spraying and assembly, robots have already established a firm toehold.

Take Baxter. An unassuming robot figure with unwieldy mechanical arms who might have been designed by a child with imagination. He is programmed to pick random items, examine them closely and decided what action to take from his on-board electronic library.

Yet Baxter's 'offsprings' are today available to factory managers at a cost of around £19,000, roughly the average workers annual salary. He will load and sort stuff – without cigarette breaks, 'sickies', relative's funerals, 24 hours a day, seven days a week.

Robots can induce fascination and fear in equal measure. A recent 'think-tank' predicted that the jobs of 250,000 public sector employees including 24,000 doctors, nurses and receptionists could be replaced by robots in time.

Baxter's offspring are available to factory managers at around £19,000

This latest forecast came on the heels of a 2013 paper by Oxford University economists, Carl Frey and Michael Osborne who calculated that about a third of the UK's labour force was vulnerable to automation, with professionals no more secure than blue-collar workers.

Now legislators are trying to get their head around the status of robots, particularly those of a humanoid nature. The European Parliament proposing to grant legal status to robots, categorising them as "electronic persons" and warning that new legislation is needed to focus on how the machines can be held responsible for their "acts or omissions".

The draft bill states current rules are 'insufficient' for what it calls the 'technological revolution', and suggests the EU should establish "basic ethical principles to avoid potential pitfalls".

The report suggests that robots and other manifestations of artificial intelligence such as bots and androids are poised to "unleash a new industrial revolution, which is likely to leave no stratum of society untouched".

"The more autonomous robots are, the less they can be considered simple tools in the hands of other actors (such as the manufacturer, the owner, the user, etc.). This, in turn, makes the ordinary rules on liability insufficient and calls for new rules which focus on how a machine can be held – partly or entirely – responsible for its acts or omissions.

It becomes more and more urgent to address the fundamental question of whether robots should possess a legal status."

SCIENCE MUSEUM

Opening on 8 February, *Robots*, a major new exhibition at the Science Museum, explores humanity's 500-year quest to reimagine ourselves – not through paintings or sculpture – but as machines.

This intriguing exhibition features a unique collection of over 100 robots, from a 16th-century mechanical monk to robots from science fiction and modern-day research labs. Set in five different times, *Robots,* explores how religious belief, the industrial revolution, popular culture and dreams about the future have all shaped society through the incredible robots on display.

Eric was originally built in 1928

Recent developments from robotics research are also on show, with visitors able to explore how and, more importantly, why roboticists are building robots that resemble us and interact in human-like ways. The exhibition encourages you to imagine what a shared future with robots would be like, with visitors able to see the latest humanoid robots in action.

Ian Blatchford, Director of the Science Museum Group said: 'Visitors to *Robots* will see the greatest collection of humanoids ever assembled. This stunning exhibition explores the fascinating question of why, rather than how, we build robots. To look through the eyes of those who built, commissioned or gazed upon these mesmerising mechanical creations over the past 500 years, reveals so much about humanity's hopes, fears, dreams and delusions.'

The first robot visitors to the

Visitors admire the 18th Century Silver Swan

exhibition will encounter is an incredibly life-like mechanical human baby, recently acquired for the Museum's new robotics collection. Usually made for use on film sets, this baby has no intelligence, making only pre-programmed movements (sneezing, breathing and moving its arms and legs) yet many visitors will feel strong emotions towards it.

Ben Russell, lead curator of *Robots,* said: 'Coming face to face with a mechanical human has always been a disconcerting experience. Over the centuries, each generation has experienced this afresh as new waves of technology heralded its own curiosity-inducing robots. That sense of unease, of something you cannot quite put your finger on, goes to the heart of our long relationship with robots.'

"Coming face-to-face with a mechanical human has always been a disconcerting experience"

Our understanding of ourselves and our place in the universe has often been expressed through religious faith, and *Robots* begins by exploring both the heavens and the human body. On display is a beautiful Astrolabe, made in France in about 1300 and the oldest astronomical instrument originating in western Europe. These clockwork machines provoked ideas about the human body as a machine, leading to the creation of the earliest robots. Objects like the automaton monk – built in around 1560 and one of only three in the world – were expressions of faith, but also of our desire to amaze, enthral and wield power.

Model showing an articulation of the human body based on a 1582 drawing

SILVER SWAN

The incredible Silver Swan, a life-size clockwork automaton built in 1773, will be on display until 23 March 2017, on loan for the first time ever from the Bowes Museum in County Durham. As the only one of its kind in the world, the Swan uniquely illustrates our endless fascination with replicating living things in mechanical form. Its performances have enchanted audiences for four centuries and this will continue at the Science Museum as the Swan will play most weekday mornings at 10.25am.

Lead curator Ben Russell said: 'The Silver Swan is an amazing evocation of life. We are honoured that the Bowes Museum has loaned us this treasured object for *Robots* and delighted that visitors will see the Swan on display in all its glory.'

Robots have been at the heart of popular culture since the word 'robot' was first used in 1920. In the exhibition, visitors will come face-to-face with Eric, a modern recreation of the UK's first robot, as well as Cygan, a 1950s robot with a glamorous past, and a T800 Terminator used in the film Terminator Salvation.

The challenges of recreating human abilities, such as walking, in mechanical form is also explored, with visitors able to study the intricate mechanisms of the Bipedal Walker – rescued by curator Ben Russell from a forgotten basement cupboard – and Honda's P2, two of the first robots in the world to walk like humans.

Visitors can watch as 16 mechanical forms spring to life and even interact with some of the robots on display. **Inhka**, once a receptionist at King's College London, will be answering questions and offering fashion advice, **Zeno R25** replicates visitor's facial expressions and **ROSA** will move its camera 'eye' and head to watch visitors as they move. Every twenty minutes **Kodomoroid**, the most life-like android of its time, reads robot-related news bulletins.

EXHIBITION DETAILS

Robots is open daily until 3 September 2017, with late opening until 22.00 each Friday (last entry 21.00) The *Robots* exhibition is supported by the Heritage Lottery Fund (HLF).

Two new books have been published to accompany the new exhibition. **Robots: The 500-year quest to make machines human**, edited by curator Ben Russell, expands on the themes and stories explored in the exhibition through a series of newly commissioned essays with photographs of key exhibition objects. **The Super-Intelligent High-Tech Robot Book**, written by the Science Museum's Jon Milton and published by Macmillan Children's Books, is a fact-packed illustrated guide to the world of robots.

In late 2017 *Robots* will embark on a five-year UK and international tour, visiting the **Museum of Science and Industry** in Manchester to open the 2017 Manchester Science Festival, the **Life Science Centre** in Newcastle (2018) and the **National Museum of Scotland** in Edinburgh (2019).

FARMING ROBOTICS

GETTING TO HEART OF BROCCOLI

Chris Biddle talks to **Professor Simon Pearson**, the Founding Director of the Lincoln Institute of Agri-Food Technology about harnessing the power and potential of robotics in agriculture.

Growing up on the family farm in Lincolnshire, Simon Pearson's view from the house was dominated by fields of broccoli for just about as far as the eye could see.

So, it is somewhat apt that one of the initial projects undertaken by the newly-formed Lincoln Institute of Agri-Food Technology (LIAT), where Simon was appointed Founding Director in February 2016, is to research the harvesting of broccoli robotically.

"I suppose broccoli was always part of my upbringing" he says "but like cauliflower, it is one of the more challenging vegetables to harvest efficiently".

LIAT was established by the University of Lincoln at the back-end of 2015 to work in collaboration with the university's National Centre for Food Manufacturing (NCFM) based at Holbeach, which provides part-time training and qualifications for staff working in the food industry. It also works with employers, equipment suppliers and partners to innovate food production and advanced automation.

As with so much in business, planning and timing is everything. Planning and timing is absolutely crucial for the economic harvesting of crops. External factors are less easy to plan or control – like weather and the economic climate.

With the referendum vote in June 2016 in favour of leaving EU, the farming and food production landscape is likely to alter dramatically over the next few years, particularly for those sectors dependent on labour. Despite the increased technological sophistication of farm machinery in recent years, most of the fruit and vegetable harvesting equipment still need to be supplemented by manual labour.

"Make no mistake" says Simon "todays farmers demand who are motivated and good at their job, and that includes the huge workforce flowing from the EU. These are not itinerant workers drifting from job to job, they are a highly skilled workforce. So any automated machine has to replicate the personal touch, but at the same time meet the harsh economics of providing food at the right price and at the right time to ever-demanding food retailers and consumers"

Lincolnshire farming

Professor Simon Pearson is far from your typical image of an academic or scientist beavering away in a laboratory or seat of learning. For a start, the University of Lincoln is just over 20 years old. Opened by the Queen in 1996, it was a University forged by the will of the local community, not by a government directive, and was the first new city centre campus to be built in the UK for decades.

Initially, the university had a strong arts and science basis, but the arrival of vice-chancellor Mary Stuart resulted in the establishment of the first new Engineering School to be created in the UK for more than 20 years. Much of this brought about by a collaboration with Siemens (Lincoln's largest business employer) who now rely on a regular flow engineering graduates for its huge gas turbine manufacturing facility in Lincoln.

The university has brought a new vibrancy to the cathedral city of Lincoln and the county of Lincolnshire - a county where more than 1 in 10 people are currently employed in food and farming according to a recent report (*The Value of Food and Farming in Lincolnshire by the Lincolnshire Research Observatory).*

The report also says that the food and farming sector contributes nearly 13% of the country's GVA, equating to more than £1 billion a year. This compares to 3% for the national average.

Lincolnshire is the single largest

Lincolnshire Wolds

Professor Pearson

county producer of cereals and horticulture, and in the case of bulbs and flowers, provides more than a third of the land use in the UK – principally because of the quality of the soil and the level terrain.

But despite the scale, the economics are changing. A recent report by the NFU found that since 1998, food prices had risen by 8.5% (compared with an increase of 22% in retail), whilst prices to farmers had fallen by 9% over the same period.

In Lincolnshire, the number of people employed in food and farming stood at 51,000 in 1981. That figure dropped to 32,000 in 2006 and is estimated to fall further to 21,000 in 2020.

So a 'perfect storm' faces the farming community, particularly in counties like Lincolnshire. Continuing pressure on farm prices, falling labour availability and the prospect of subsidies being reduced as a result of the UK leaving Europe.

Paradoxically, given the importance of agriculture to Lincolnshire, the county recorded some of the highest votes to Leave, with Boston voting 75.6% in favour (the highest in the UK), the bulb growing area of South Holland 73.6% and the city of Lincoln itself 56.9%.

Commercial focus

Simon Pearson says that he is concerned for the farming economy of Lincolnshire if the supply of labour dries up significantly.

But he is a pragmatist – and also has the commercial experience to know that solutions have to be found to meet changing conditions.

After gaining a PhD in crop forecasting at Reading University in 1992, he stayed on as a lecturer in Horticulture before taking up a post with Marks and Spencer, based at its Baker Street headquarters in London where he was part of the team sourcing the supply and quality of cut flowers and plants.

After 7 years with M&S, he joined Winchester Growers, Europe's largest grower of fresh flowers, as Commercial Director, later becoming Managing Director. When the company merged with Belgian subsidiary, UNIVEG, and the Winchester Growers operations relocated to Cornwall, Simon joined Lincoln University as a Senior Lecturer in Fresh Produce. At the same time, Simon also became involved with Marie Curie Cancer Care where he brought his expertise in the cut flower, food and drink sector to help develop campaign such as the Caring Cuppa fund-raising initiative.

It was this commercial experience, coupled with a strong academic background that presumably made Simon an ideal person to tackle the much wider challenges facing the agri-food sector where networking and collaboration with external bodies and funders is equally important to the internal role of developing solutions.

This is, arguably, a pivotal era for the agri-tech industry. Largely disappearing is the rush to build bigger and bigger tractors and harvesting machinery. Smarter rather than bigger is the watchword.

That means investment, serious investment. Almost certainly the biggest jump in funding within the ag sector since the start of the mechanisation revolution in the 1920s, and the capital required to reboot food production post war in the 1940s and 1950s. One report by US analyst WinterGreen Research forecasts that the market will grow from the $817m (£655m) in 2013 to $16.3bn (£13n) in 2020.

All around the world ag-technicians are working feverishly, developing machines that automate farming in a way that will transform an industry faced with producing more food from diminishing resources at a time when climate change could see yields falling.

"But" says Simon Pearson "the future success for automated farming will only come about if we recognise the cross-disciplinary skills required by today's farmer. As scientists we cannot work in isolation. The products we design and eventually bring to market will have to complement the long-established principles and practices of food production. Yes, we can (and always should) think 'outside the box', but there is a limit to the industry's capacity to build and then adopt new technology. This has to be evolution rather than revolution – and the pace of change has to be sustainable"

Camera technology

For the newly formed LIAT, the robotic

Thorvald, robotic field assistant

revolution has started by finding an automated solution to the harvesting of one of our staple vegetables, broccoli.

"We are at the first stages of identifying broccoli crops," says Professor Pearson. "Then we can move onto crops with cluster fruits such as tomatoes while the third level is with plants that cannot be seen immediately such as cauliflowers.

This also involves precision robotic weeding and the creation of 3D mapping techniques to improve the precision of agricultural sprayers enabling only those plants which need spraying to receive the spray.

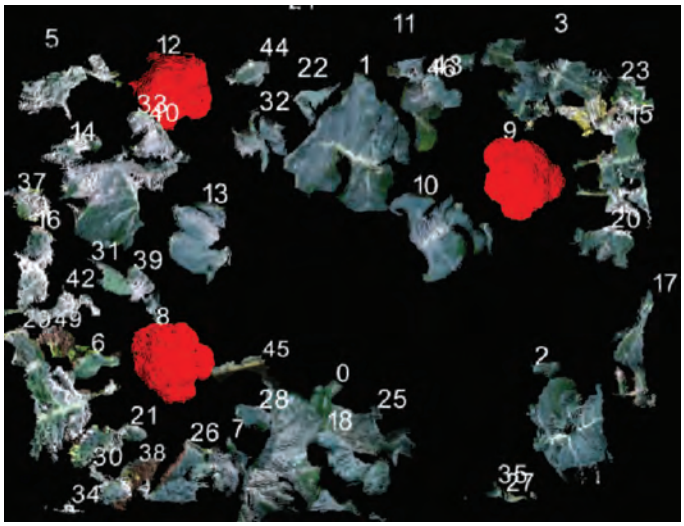
But there are limitations involved since some crops are more suitable for robotic weeding and harvesting than others. For example, the presence of leaves around cauliflowers makes it harder for robots to identify the cauliflower and to weed around it, and harvest it

We have been focusing on the creation of systems to enable robots to see and identify products, followed by cutting, harvesting and packing. 3D cameras give robots the co-ordinates to identify where a product is. The problem is that most 3D cameras have been used indoors in a controlled environment. It is a different matter outside with varying weather conditions and light levels. It can be very light and sunny, then cloudy and this affects the light levels. We had to investigate different cameras to explore what could be used outdoors so as to develop the necessary algorithms"

He continues: "We think we have the camera technology and are now working on the next stage of the project combining camera technology and harvesting techniques. We are probably two years away from coming up with a working machine that can be deployed in the industry

Our benchmark is to be at least 95% as efficient at harvesting crops as when humans are involved, and early indications are that the robotic harvester will do the work previously requiring six people"

The development work is co-ordinated by Simon and his staff of 5 based at Lincoln University's Riseholme site, but the team have just been joined by new 'staff member'.



RGB-D images of broccoli plants are analysed for identifying head locations using 3D recognition

A robot, dubbed Thorvald, developed in collaboration with the Norwegian University of Life Sciences is becoming an indispensable aid.

"In much of our agri-tech research, the fields we use are our laboratory, which brings its own technical and logistical challenges with certain experiments.

"The Thorvald robot will be a welcome addition. It will be our own roaming, robotic lab assistant and capable of supporting a wide variety of research activities. The robot will support research on autonomous outdoor navigation and mapping, soil quality assessment, crop yield prediction, in-field logistics and transportation"

There is little doubt that advances in robotics in agriculture is starting to grab the nation's attention. Both the robotic broccoli harvester and the Thorvald robot have featured prominently on BBC TV's flagship Countryfile programme.

"There is little doubt that ag-tech is starting to electrify the industry – and that in turn will create interest and excitement for young people who may not have previously considered agriculture as a career option"

Simon Pearson is the first to recognise that the current agri-tech research programmes undertaken around the world are a bit like 'holding a tiger by the tail'. "We know the challenges. The science behind the robotic technology exists and is fairly well proven. What we need to perfect is the engineering aspect".

Last question to Professor Pearson. Aside from robotics, what are the great unsolved challenges in agriculture today? "The responsible use of water continues to be a huge issue, but looking at tractors and machinery and their power source . . . the battery company that can develop a power pack to replace to replicate the performance of a diesel engine. Now that would be some 'huge step for mankind'!"

Robotic broccoli harvester in trials

HARPER ADAMS UNIVERSITY

HANDS FREE HECTARE PROJECT: UPDATE

Farming a hectare of spring barley exclusively using autonomous vehicles

The 'Hands Free Hectare' project, which will see a crop exclusively farmed by robots for the first time in the world, is well under-way, with the team having already selected the key machinery required to reach their goal.

The team of three engineers aims to grow and harvest a hectare of spring barley without setting foot into the field. Since the project launch in October, the team have been busy determining the specifications for the equipment, along with purchasing.

Jonathan Gill, researcher at Harper Adams University, said: "We've created a prototype and tested the automation system on an electric all-terrain vehicle in the field. We've proved that it can drive up and down in a consistent straight line; this is what we aim to achieve during our first task of planting the crop."

The next steps are to incorporate this system onto the Iseki tractor that will be used by the team for drilling and spraying.

Jonathan Gill (l) and Martin Abell

Jonathan added: "The project, and engineering as a whole, comes down to specifications and this is definitely true with this project. The requirements of the entire system need to account for the crop row spacing, even the shape of the field, to coordinate with the tractor and machinery available."

Martin Abell, from Precision Decisions, the project's industry partner, said: "The selection process has been very important and time consuming.

"The drill that we'll be using is a vineyard drill which is normally used to add green manure (cover crops) between vines to help the soil retain nutrients. The coulters and seed metering mechanism are identical to those used on conventional versions of the drill and so it suits our application perfectly.

"The spray system that we've selected is not only appropriate for the tractor, giving sufficient capacity to cover the area, but also works with common agricultural practices.

"We're going to use a conventional sprayer controller, the same system that can be bought by a farmer. This means the sprayer will be a self-contained unit, looking after itself while the tractor navigates the hectare.

"We've also turned our attention to safety. It is incredibly important that we have safety systems enabled in the unlikely situation that something goes wrong. The machines will not be radio-controlled but act autonomously. We've found laser scanners which will monitor the front of the tractor and stop it should anything be too close.

"It's been a challenge to find systems that work with our vehicles in conditions that robots aren't normally put in. For example, actuators supplied by Linak, help to control the transmission and other functions in tough environments."

Alongside preparing the tractor for drilling in a couple of months' time, the team are also focusing on creating a mission control. This will provide a platform to see the field in real-time and supplement feedback from the robots whilst working.

Due to the popularity of the project, the engineering department are helping the project by providing a camera that will be fixed to the outside of mission control. Here they are hoping to 'live-stream' important events in the field. They anticipate that they can use renewables to power the cameras.

Jonathan commented: "We've had more in-kind sponsors join the project since we started in October. They are very excited to be a part of this project and have been incredibly generous. We're very thankful for their help."

Martin added, "It's great to see more people believing in, and wanting to support the project. Now that we are a quarter of the way through, I feel that people can really see we have the momentum behind us to make this project work."

Follow the team's progress on their website (www.handsfreehectare.com), via social media – Twitter (@FreeHectare), Facebook (@HandsFreeHectare), YouTube (Hands Free Hectare HFH)

MAN VS MACHINE

The economic and technical challenges of replacing human labour with a robotic 'strawberry-picker'

"Picking and packing soft fruits such as strawberries and raspberries autonomously is a huge challenge. Let's face it, humans are rather good at it, so a robotic solution has to be even better" says Stephen Pattenden, who has been involved in developing the AUTOPIC Project for the past two years.

Working with a number of partners such as Harper Adams University, the National Physical Laboratory, Shadow Robot Company, BerryWorld and Telemetry Associated, AUTOPIC aims to come up with a system that can successfully identify and pick strawberries in a polytunnel using a robotic arm mounted on an autonomous vehicle that was as efficient and cost-effective as human labour.

The project is supported by Innovate UK and BBSRC

"Our challenges were clear" says Stephen.

- A strawberry had to be picked every 3 seconds
- It had to find every strawberry, even behind leaves
- Handle them carefully without bruising or damage
- Put them in a punnet
- Place the punnet in a tray
- Put the tray on a trolley
- All day long.

The economic challenges were equally as clear

- Using human pickers, the cost per punnet picked is about 25 pence
- Human pickers cost around £10 per hour and pick about 25kg of berries (one berry every 4 seconds)
- An AUTOPIC robotic picker with 2 robots could pick around 25kg of berries per hour but can work for twice as long every day. So could replace 2 humans
- Brexit and the falling £ puts at risk the 65,000 migrant population working in soft fruit (about half on strawberries) because the UK is now less attractive.
- The estimate was that that some 1,500 AUTOPICs would be needed to replace some 60% of the human labour picking strawberries

The AUTOPIC project was launched against a background of a decreasing pool of reliable labour and the prospect that the Seasonal Agriculture Workers Scheme which guaranteed the availability of more than 22,000 from the EU might be withdrawn.

The technical challenges were immediate. The system had to find and identify ripe strawberries growing in a polytunnel. It had to grip the stem firmly without damaging the fruit – every three seconds.

The vehicle could be no wider than the gaps between rows in the polytunnel, it had to navigate without damaging the fruit or the polytunnel; it had to be safe, reliable and capable of continuous operation irrespective of ambient light.

"None of this was easy to achieve" say Stephen "particularly in the area of fruit identification".

"For instance, we found that stereo cameras worked but had limited application. We put much effort into "point cloud" techniques and for size, shape and orientation we tried "convoluted neural networks"

We could also find and pick strawberries in the lab if they were single hanging down, but we could not deal with occlusion, nor could we deal with clusters

But our findings recognised how this can be done and identified what additional research was needed"

- We had converted a vehicle to carry the robot and this was now capable of working in poly tunnels autonomously
- We had a robot solution that is quick and accurate
- We had a picking head that holds the fruit and cuts the peduncle

However

- We don't have an "agriculture hardened" robot or picking head

ABOVE: AUTOPIC's Stephen Pattenden speaking at 2016 IAgrE Conference

- The robot is too big to go through some rows in typical poly tunnels
- The picking head only picks berries that hang down.
- But in laboratory conditions we can pick a berry every 3 seconds

"So now we need to make the vision systems much better at finding all the berries. This implies multiple stereo cameras to build up a complete picture. Multiple stereo cameras implies advanced mathematics.

We need to be able to focus on each berry we find and evaluate its ripeness so we only pick perfectly ripe berries, making sure the berry is not damaged, diseased, infected or infested.

Then we need to sequence our picking so that we pick the berries in an order that avoids touching other berries

Oh, a nice touch would be for the last few berries for a punnet to make

an exact weight for that punnet, eg exactly 400 gms"

Summarising, Stephen Pattenden says "The AUTOPIC project has reached a stage where its potential can be shown, however many issues remain to be resolved before significant further funding can be attracted

"I believe we have proved that the AUTOPIC concept is feasible, but we need to validate the market need for a vehicle at the right price and performance" he adds

"Our ambition is perfect grade 1 strawberries from "plant to plate" untouched by human hand"

MODERN DAY 'COWBOY'

Is this the modern day cowboy? Swagbot is the University of Sydney's autonomous, cattle-herding robot prototype.

The technology has been developed to operate on Australia's outback farmsteads, which are remote and enormous. SwagBot is able to keep tabs on cattle (and potentially sheep) on its own and navigate bumpy terrain with ease, helping to guide the cows towards pastures and away from potential hazards.

SwagBot's movements may be deliberate and awkward-looking at times, but that slow and steady approach helps the robot overcome swamps, logs, sudden drops, and other surprise terrain without toppling over. According to University of Sydney professor Salah Sukkarieh, his team plans to enhance SwagBot with sensors that allow the robot to monitor the condition of cows in the field on a regular basis.

It's not fully clear yet how farmers will be able to control or program SwagBot in the future, but the GPS boundaries of the land will probably need to be plugged in or outlined on a map. Quite likely, it would have an interface that could be accessed via a computer or tablet, letting farmers tweak SwagBot's directives before letting it loose into the fields.

"Robots should pay tax" says Bill Gates

Robots should be taxed at the same level as the people they replace, to help fund better social services and education, according to Microsoft co-founder Bill Gates.

"Governments rather than businesses need to take the lead on managing the robotics revolution and ensuring there's a plan to deal with the unemployed workers it creates over the next 20 years" says Gates in an interview to *Quartz* magazine.

"Right now, if a human worker does $50,000 worth of work in a factory, that income is taxed. If a robot comes in to do the same thing, you'd think we'd tax the robot at a similar level," he said.

Gates argues that governments should raise taxes on robot capital to slow down adoption and provide the time needed to devise programmes that create a net benefit from this excess labour. Besides a direct robot tax, he added that some taxes could come from profits made by labour-saving efficiency.

"People should be figuring it out. It's really bad if people overall have more fear about what innovation is going to do than they have enthusiasm. That means they won't shape it for the positive things it can do. And, you know, taxation is certainly a better way to handle it than just banning some elements of it," he said.

Ultimately, Mr Gates believes that people whose jobs are displaced by robots will go on to work in services that require the skills that robots cannot provide.

ABOVE: Bill Gates with Agr-EPI CEO Dave Ross

DOUGLAS BOMFORD TRUST

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STUDENTSHIPS

A total of fifteen applications for Douglas Bomford Trust scholarships were received from students at Harper Adams University and shortlisted candidates were interviewed by a panel comprising Nick August and David White as trustees and the secretary Paul Miller on 17th November 2016. The standard of the written applications and presentations at the interviews was again very high and as a result of the selection process, five studentship awards were made to the students at Harper Adams University. These were presented at a special event at the University on 15th February 2017 where scholarships from more than fifty sponsoring organisations were also presented.

ABOVE: Recipients of Douglas Bomford Trust scholarships at Harper Adams University with Trust secretary Paul Miller and trustee David White (from L to R - Joe Robinson, Henry Thorpe, Alan Mobbs, Paul Miller, Chaunce Barrett-Crosdil, James Shaw and David White).

RESEARCH PROJECTS AND SPONSORED PHD'S

Aspects of work sponsored by The Trust featured at the Crop Production in Southern Britain conference that was held in Peterborough on the 15th and 16th February. The conference was organised by the Association of Applied Biologists (AAB) in conjunction with the British Crop Production Council (BCPC) and the agricultural chemical company Adama and covered a wide range of topics relevant field crop production with the proceedings being published in a volume of the Aspects of Applied Biology.

The Trust supported papers presented by:

- Professor Dick Godwin who reported the results of studies that were part of two PhD projects at Harper Adams University supported by The Trust – those undertaken by Emily Smith and Anthony Millington. These considered the effects of deep, shallow and zero tillage with random conventional and low tyre inflation pressures and controlled traffic systems on the yield of winter wheat, winter barley and spring oats. The results showed that crop yields for zero tillage were significantly less than deep and shallow tillage for all crops with an overall reduction of 1.0 t/ha below the mean of the deep and shallow tillage practices. Controlled traffic farming with a 30% trafficked area produced significantly higher yields than random conventional pressure traffic for the winter wheat and spring oats.
- Agnese Mancini who described her PhD project work at Cranfield University that is investigating the role of different cover crops in reducing runoff and soil erosion from maize crops. An eight-month field trial was described whereby runoff was collected from bounded erosion plots. Treatments comprised four seed mixtures and a control with no cover crop. The experiment was divided into three blocks according to in-field topography. Mean runoff was 1.8 times greater, and soil loss double, in control plots as compared to those with cover crops. However, this difference was not significant due to the high variability within each treatment caused by changes in plot micro-topography, which was evident from a different runoff flow direction between blocks.

Professor Dick Godwin (left) and (above) Agnese Mancini on the platform at the Crop Production in Southern Britain conference

TRAVEL AWARDS

The Trust has recently supported the following travel arrangements for two small groups of students from Harper Adams University:

- Six 5th year MEng students enrolled on the Emerging Engineering Technologies module travelled to the EIMA exhibition in Bologna, Italy in November 2016 accompanied by Agricultural Engineering Lecturer Kit Franklin. The students reported that the opportunity to see machinery manufactured in Europe but not widely available in the UK, particularly relating to the growing and harvesting of grapes and forestry, as being a particular highlight of the visit. The students were also surprised by the quantity and range of sub-systems that could be purchased "off-the-shelf"- an observation that may influence their future design work.
- Five students studying Agricultural Engineering with Marketing and Management were funded to travel to three events in the UK (The Precision Farming event on 18 October 2016; Crop Tech on 29 November 2016 and LAMMA on 19 January 2017) as part of a study to "Fully investigate and compile a detailed and comprehensive industry market on the current European row crop planter market". The report from the students indicated that the contacts gained with manufacturers and the opportunity to see machines at first hand, particularly at LAMMA, had been very useful in their project work.

LAST WORD:
Random thoughts by The Engineer

MARCH OF THE ROBOTS

I was struck by a headline in my local paper "Robots are coming and they're taking our jobs". The point the article went on to make was the thought that "it is all very well negotiating trade deals and drawing up plans to protect national industry by imposing import duties to stop jobs going abroad" but "what about all the thousands of jobs already disappearing thanks to the march of the machines?". All of this was around the time when Donald Trump and Theresa May were meeting to initiate trade talks.

> A robot is not some sort of "Frankenstein" monster

The same article went on to share some startling facts. For example in 1970 over half a million people were directly employed making cars whilst today, with a similar number of cars being produced, the figure is around 170,000 people. Over the past 45 years productivity has gone from 3.2 cars per employee per year to around ten. Impressive by any measure and any trip to a manufacturing plant will show similar productivity gains with the use of robots at the fore.

For those who like to say that UK doesn't make anything anymore, I say rubbish!

The real point is that we no longer employ as many people making things. We still make loads of things though. The things we make are often very high tech and ultra-high value. Our arm chair economists need to get their facts right.

Another point made was that Oxford University believes that 35 per cent of all jobs could disappear within the next 20 years and that with a surge towards artificial intelligence, even lawyers, accountants, insurance broker's, teachers, and even doctors are in the firing line. There is always the chance the IAgrE can replace the current CEO with a robot when he chooses to retire then!

Of course this has happened before and any student of the industrial revolution will no doubt quote the Luddite uprising.

I am fascinated by the development of robots and automation. Our industry is becoming as advanced as many in this respect and to be frank, I can't see it going in any other direction, particularly with the ongoing debates about migrant workers and the real question as to where their replacements might come from. After all, the lowest paid of workers is on that social mobility ladder and is looking to move up a rung or two.

As an engineer, I can only see the benefit of robots. The engineering excellence and ingenuity required to build them never ceases to impress me. The opportunity for them to be introduced and embedded into a wider range of agricultural applications and systems is something which I watch with intrigue.

> The real challenge is in raising the expectations of those being replaced

But there is that social question and one which I had to address only the other day. I took a phone call from a journal which leans to the left of centre. The question I was asked concerned the social cost to the nation of the growing march of the robot. Whilst acknowledging that is a fair question, I deflected it by making the point that the real challenge is in raising the expectations of those being replaced - so that they became the future engineers who design, install, service, and programme the robot.

The journalist understood my point and we had a useful debate.

It would be wrong to suggest that for every job replaced by a robot a new, high quality job is created for those who engineer the robots but it would certainly be interesting to understand the economics of this. I also believe there some "hearts and minds" work to be done to help the consumer understand that a robot is not some sort of "Frankenstein" monster. The less a robot looks and acts like a human, the better in my view.

On the latter point, I heard the tail of a consumer who was worried that a cow milking robot presented an animal welfare concern. It is easy to see how such an assumption may "take a life of its own", when the opposite is probably true. After all what worse sight is there than the dairy herd limping across the road, dribbling milk from an udder which should have been milked much earlier had the animal had instant access to an automated system? This "rose tinted" view of the jolly old farmer and their dairy herd needs to be replaced by the uncomfortable truth that automation and robots can actually be a better thing for all concerned.

LAST WORD
***Views expressed are those of the author and not of IAgrE**. The aim of **Last Word** is to present original, contentious or provocative opinion by IAgrE members on an industry-related topic. Authorship will be credited if requested or appear under the nom-de-plume of **The Engineer**. Copy for consideration should be around 750 words and be sent to the Editor (chris.biddle@btinternet.com)*

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UPDATE TO MEMORANDUM AND ARTICLES OF ASSOCIATION

Message to members from President Robert Merrell and CEO Alastair Taylor

Last year it was agreed by the IAgrE Executive Committee that it was time to take a look at the Institution's Memorandum and Articles of Association with the expectation that a major overhaul was well overdue to reflect 21st century law and best practice.

Through the Engineering Council, we engaged the professional services of Keith Lawrey, a lawyer working as Professional Societies' Liaison Officer for the Foundation of Science and Technology, of which IAgrE is a member. We were pleasantly surprised to discover that minimal changes were needed to bring us up to date with language and law. In fact the original documents dating back to the 1960's were remarkably accurate in their interpretation of the Agricultural Engineering discipline.

This exercise has involved updating and simplifying the wording for ease of interpretation and to reflect current Company and Charity practices. References to out-of-date government organisations and trade bodies have been removed with the new language designed to be more future proofed.

There are a few key changes in the revised Memorandum and Articles of Association

- The Associate of IAgrE (AIAgrE) grade will become Affiliate to make it clearer to which grade each belongs and to avoid confusion with the Associate Member (AMIAgrE) grade. We will be encouraging Associates to upgrade to Associate Member.
- A new Technician grade will be created between Affiliate and Associate Member to give technicians greater recognition for their achievements.
- The Associate Member now becomes a corporate (voting) grade to better reflect the persons influence and qualifications.
- Firming up the role of the IAgrE Advisory Council and the Trustees who go on to form the Executive Committee. The latter have the legal responsibilities associated with Company law.

The other key change is that everyday areas of the Articles have been moved to Regulations. This will allow the Executive Committee to update and alter them without having to call an Extra General Meeting (EGM). This is normal practice across institutions and this means that the new Articles of Association are now much shorter.

Both a Memorandum of Association and Articles of Association are required for a company formed in the UK under the Companies Act 2006 and previous Companies Acts. The Memorandum of Association is the document that sets up the company and the Articles of Association set out how the company is run, governed and owned. The Articles of Association include the responsibilities and powers of the Trustees and the means by which the members exert control over the board of directors.

These changes are a "once in a generation" opportunity to future proof the important legal status of the Institution.

Those members eligible to vote (Members, Fellows and Honorary Fellows) of the Institution are urged to attend the EGM and make their positive view known.

We look forward to seeing as many of you as possible on 27 April at John Deere UK headquarters at Langar

COUNCIL MEETING

Held at the Toro Hayter HQ, Spellbrook on 9 February

A lively and constructive Council Meeting under the chairmanship of President Dr Robert Merrall was held at the iconic Toro Hayter mower manufacturing plant at Spellbrook, Bishops Stortford. A substantial part of the discussion within Council surrounded ideas and initiatives for increasing IAgrE membership.

The visit to Spellbrook had been arranged by Executive Member Ian Sumpter, who organised a tour of the plant after lunch.

The factory sits on the site where in 1946, Douglas Hayter made his first lawnmower, initially for the commercial market, branching post war into the fast growing homeowner market with famous models such as the Hayterette and Hayter Harrier, the latter still a consumer favourite today.

Hayter was purchased by international turfcare manufacturer, Toro in 2005 and today, just over 70 years after Doug Hayter made his first mower, the Spellbrook factory manufacturers market leading mowers for both the Hayter and Toro model range.

WEST MIDLANDS BRANCH

NORTH KOREA AND THE EU TRACTOR AID PROGRAM
Report by William Waddilove on meeting held on 7 February 2017

The EU has a policy of overseas aid aimed at developing agricultural self-sufficiency. Through a German consultancy company David Williams has made three trips to North Korea to report on progress. North Korea is country of contrasts and as has been said elsewhere it is not a normal country. You will be aware the country is led by members of the Kim dynasty and it is clear on visiting that the people are very loyal followers of their leader. The leadership dictate guidance from the top and have produced a number of 'manuals' giving instructions as to how things should be done. For instance it is said that the land should be 'deep ploughed' if asked the farmers say they do.

However David did observe several instances where there had been no ploughing! Some ploughs that had never been used and some not used because the shares were completely worn out. It has been dictated that the country should be 'self-sufficient', this has the effect that spares are difficult to obtain from outside the county and often even local made components are not available. The existence of these manuals also means that it is very difficult to introduce change as a part of the outside EU support.
They have many examples of a robust locally made Chollima tractor, these are owned by the government are need to be returned every winter for overhaul. Some of the need of overhaul is due to the very poor quality of fuel and oil.
There have been several projects to provide tractors and related equipment but from the procurement procedures of the EU each support campaign starts afresh. For example one project provided a number of naturally aspirated diesel tractors but the next project was with 'newer' tractor with turbocharges. However the oil that is available is of very low quality, the diesel fuel is also very poor and usually contaminated due to having been transferred several times into dirty tanks and also they local people are not used to having sealed coolant systems with antifreeze so that they drain the engines every night to prevent frost damage and refuel with fresh water in the morning. This removes the antifreeze and anti-corrosion properties so leading to internal engine corrosion.
The impression we got was of a country with great agricultural potential but the top of the government being very out of touch with the grass roots and some of the EU support, although useful it could have been focussed to be more effectively..


Chollima tractor

David Williams

ASSIST DRIVE TECHNOLOGY
. . for when the going gets tough
Report by William Waddilove on meeting held on 6 December 2016

What do you do if you are a manufacturer and have designed a large piece of trailed equipment?
One option is to ask the customer to buy a bigger tractor. Another option is to ask them only to use the equipment when the ground is hard and dry. There is another option and it is to use power from the tractor to power the wheels on the trailed equipment. If you want to do this you need to speak to someone like Mark Cheetham of Linde Hydraulics who came to speak to the West Midlands Branch in December.
By using the PTO to drive a hydraulic pump you can power the wheels on the trailer. The tow bar can sense the power needed and adjust the wheel speed to the towing vehicle. And what about going on the roads? The drive can incorporate a free wheel device so it could allow you at least the maximum permitted road speed for tractors.
We were shown how the hydraulic wheel motors worked and some of the equipment using their motors in forestry and other heavy going applications. We didn't get detail of the cost range but if it is designed into the equipment and enables the use of a smaller tractor then the advantages could clearly be seen.
The picture shows a typical application a trailed harvester made by Standens.

JIM WILKIE FILM EVENING
Report by Mike Whiting

On the 8th of February we were treated to a selection of machiney manufacturer's promotional films by Jim Wilkie. Jim is the founder of the Old Sodbury sort out, which is effectively an emporium of 2nd hand off road vehicle, Landrover and tractor spares. Visitors from far and wide, and even overseas visit the Sodbury sort out to find that essential component which will resurrect their vintage vehicle, when OEM's have long stopped supporting the spares market.

What made the evening so entertaining was watching Jim taking on the role of the cinematographer as he wound the reel of film through the projector, requested the lights were dimmed, and then the clatter as the projector started up and the film commenced. Just for good measure the speed had to be adjusted, and the picture focused, all with Jim's knowledge and expertise.

There was a selection of films available, and we all had the opportunity to pick our favourites. Richard Robinson kicked off the evening by choosing promotional films by Caterpillar, produced sometime in the late 1950's. With the iconic voice typical of the World War II Pathé news presenters, the film explained in great detail the advantages of choosing Caterpillar equipment. From agriculture through to construction, power generation and marine engineering, almost every type of machine was depicted. In the cycle of engineering development, the film demonstrated the use of 1950's manufacturing techniques which are often refined and displayed as ground breaking in current times.

Following on we chose films from Massey Ferguson with the iconic 1200 series with the diamond plough and other primary cultivation equipment. In addition we couldn't resist the reels labelled "Harry Fergusons 3 point linkage", and the late 1960's and 1970's era of the David Brown tractor production years.

Just for a bit of variety we watched the maintenance and inspection schedules required for a spitfire. It reminded us the humble grease nipple has a role to play in all engineering disciplines.

Jim has well over 1000 films on reels, many of which he hasn't actually seen himself before. His sources are from far and wide, with somebody once saying, "We've a dustbin full of films", and they were literally delivered in a bin! As a back-up, Jim is gradually transferring material over to more modern presentation media. It would be interesting to know how much film archive that Jim has for which the global manufacturers have no clue still exists.

The venue, The Greyhound Pub at Bromham provided us with a tasty hot evening meal and drinks. A thoroughly enjoyable evening for all members and visitors, and certainly we'll welcome Jim back for a repeat evening's entertainment.

REFLECTIONS ON 60 YEAR CERTIFICATE

Alan Chadborn

Agricultural Engineer in the Inner City

I was delighted to receive the certificate marking my 60 years of membership. Your President kindly invited me to send in a paragraph or two for the journal.

I worked in rural Africa for 19 years, particularly with animal draft and appropriate technology, and taught at craft level at Otley, Suffolk for 8 years. In Africa I learnt to plough with donkeys, and got shot at by rebels. At Otley I learnt to reverse a tractor and trailer by remote control with a student at the wheel (akin to robotics!)

Since then I have continued to teach blacksmithing in adult education in the London Borough of Newham, and to do maintenance work on the complex building of a youth club in Bermondsey.

I also take part as a volunteer with the Surrey Docks Farm which enables inner-city children and adults to experience livestock and crops, with Christian Engineers in Development (ced.org.uk) which offers professional help to rural communities in Africa and Pakistan, often with water projects, and with a local expression of Men In Sheds.


Surrey Docks Farm


CED Water Project

The young men I trained in Uganda still correspond with me, particularly about tools. This involves Tools With A Mission (TWAM). On their behalf I am also working on the design of single wheel trailers for bicycles.

Recently I have been commissioned to make treadle lathes for work with inner city men and boys.

I read Landwards with interest, particularly about small scale equipment for Conservation Agriculture in Africa, as this has great potential for food production. The broad training I received through IAgrE enables me to adapt to a range of current challenges and I have always been grateful for it.

EAST MIDLANDS BRANCH

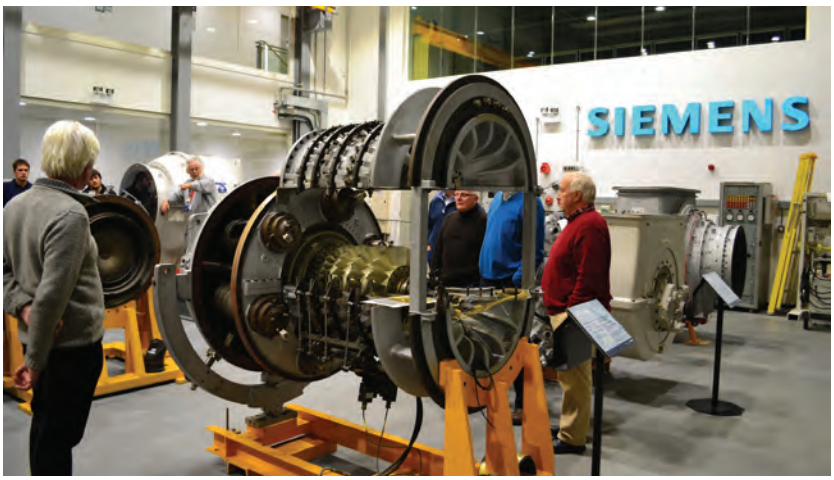
VISIT TO THE ENGINEERING DEPARTMENT OF LINCOLN UNIVERSITY
Report by Philip Spencer MIAgrE

Twenty members of the East Midlands Branch met on 13 December in the Issac Newton Building of Lincoln University, which is a newly built modern campus right in the heart of the city.

The Engineering Department combines state of the art research and development, with an up to date training facility.Hosted by Professor Ron Bickerton, we were briefed on how, with collaboration with Siemens UK, the department were able to offer B Eng Honours in Mechanical Engineering and provides links with their Electrical Engineering programmes.

In association with Siemens Apprenticeship programmes, students undertake operational, maintenance and research activities. Siemens UK currently employs over 6000 people in power generator industries.

The first part of our tour was an opportunity to get up close to a number of training aids, namely jet turbine engines. Studies included operational processes, plus design and research into improving fuel efficiency when powering grid generators.



With words ringing in our ears from our host about safety, (losing fingers in the closely fitting sharp precision components is a real risk), we set about examining stripped out engine parts. We could differentiate between the different types of blades and observe the movement of fuel and air in a range of gas turbine engines. There was still a real temptation to spin the highly balanced turbines on a Rolls Royce RB211 jet engine. This currently powers you over the Atlantic on a jumbo jet, or supplies power to your home.

The University concentrates on the electrical power generator sector and have a fully operational simulator room where students can train how to initiate start up, monitor its' output and diagnose faults. We were treated to a working demonstration and a briefing on how everything was programmed.

The department also had a 360 virtual reality car simulator, used to test the risks of using mobile phones, drink driving or lack of attention at the wheel.

Over a final cup of coffee, members were also updated on the work of the Universities Agricultural Food Technology Department (LIAT) by Isobel Wright, Senior Lecturer, operating both from Lincoln City University and also their Riseholme campus. It was explained the ongoing research with plant growth, irrigation, drones, robotics and driverless machinery, this in collaboration with a range of industrial bodies.

The University has a great future, driven by highly skilled and motivated staff which was evident to see during the evening. Further information can be easily found on their websites.

VISIT TO AGRICULTURAL ENGINEERS ASSOCIATION
Report by Richard Trevarthen

The visit to AEA on 10 January 2017 was hosted by Keith Hawken and entitled 'The work of the AEA'. The evening began with a most welcome buffet supper followed by an extensive and comprehensive talk about the role of the AEA, it's role and the services it provides to its industry members.

The AEA is one of the oldest trade associations in the UK, founded by Sir Bernhard Samuelson in 1875. For its members it provides support in the following areas; Economic data and forecasts, Export support, Legal and Technical. In addition the AEA runs two events (Scotgrass and Tillage) and administers the NSTS (National Sprayer Testing Scheme). It also provides links to the European Trade Associations, organises training for businesses, has voting rights for standards with both BSI and CEN and chairs various standard committees

After an overview of the above Keith took us a whirlwind tour of the world of standards covering BSI, EU and ISO. This included an overview of all the stakeholders including the chair, the working groups and other organisations required to agree a standard. He paid particular attention the improvement in safety and accident reduction that had been brought about by the implementation of standards in the industry. What surprised many was the sheer quantity of documents that required reviewing on an annual basis to keep abreast with all the ongoing standard and the size of the AEA's library of standards.

In addition the AEA sits on committees relating to industries not directly applicable to agricultural equipment. This was necessary as their standards may have impact on Agricultural equipment. Our thanks to Keith and the AEA for a most informative evening. Further details about Keith's career and the work he is involved in can be found in Landwards Vol. 71 No. 4 'Keeping Up Standards'.

Official opening of AEA HQ

WESTERN BRANCH

TALK BY RAY CLAY (JCB)
Report by Rupert Caplat B.Eng(Hons) CEng MIAgrE

On 23 November 2016 members and guests of the IAgrE Western Branch were present at Lackham College to listen to Ray Clay give a talk about his life and times as an engineer. Ray is most well known for being one of the main engineers on the JCB Fastrac project from its very start.

Ray was born and raised in Sheffield, the son of a steel roller. From an early age his father wanted him to follow him into the steel industry by becoming a metallurgist. In pursuit of this Ray was doing very well in his A-level studies and was due to move on to Birmingham University to read Metallurgy until he met a young lady who became a distraction – so much so he only got a pass in Physics. The upside was he married her and they are still married after 53 years.

Due to his sudden change of fortune Ray managed to land a job at the Transport and Road Research Laboratory near Slough in 1959. His first job was to operate a device to measure the braking coefficient of road surfaces up to 30mph. This was towed by a 1951 Standard Vanguard estate wagon, which was fine for the job but with the advent of the Motorway in the late 1950's it was required to raise the test speed to 70mph. This meant using a different vehicle altogether – a Jaguar XK150. This had 210hp and had raced at Le Mans two years previously so at 19 years old, Ray thought he had the best job in the world.

ABOVE: JCB Fastrac

At the time braking coefficient measurement was found to be not only necessary on motorways but also runways and aircraft carrier decks. This needed a test speed of 150mph so the weapon of choice then became an Aston Martin DB4 4.0 ltr – the job got even better!

This work continued until 1966 when Ray moved to Vauxhall to work on automatic transmissions and suspension systems. He had spent 10 years at Vauxhall on passenger car and van design and development when product R&D was moved in 1976 from Vauxhall in Luton to Opel in Germany. Despite being offered the chance to migrate, he transferred to Bedford trucks, and worked on the introduction of tapered leaf spring suspension various aspects of trucks, including disc brakes.

In 1986, GM Truck and Bus, as it had become, was transferred to Detroit. He and his colleagues were told to expect a big announcement at 9am and then one hour later he received a call from a selection agency asking for a chassis engineer. The initial interview went well and Ray was informed the job was for JCB which made him question why a manufacturer of off-highway machinery would want a suspension specialist. A second interview at JCB Transmissions in Wrexham with the late Dave Brown (an brilliant engineer, originally from Massey Ferguson Industrial in Manchester) meant that within a week Ray had the job and joined a small team designing a new fast tractor concept, the brainchild of the then Sir Anthony Bamford, now Lord Bamford – the Fastrac .

This became quite a pressure situation because Lord Bamford's father, the founder of the company in 1945, maintained a watchful critique on the design progress.

"We were usually tipped off that he was on his way to visit us about 4.45pm. That was the signal to prepare his Earl Grey tea for when he arrived. He rarely left before 8pm. Mr JCB was the most intuitive self - taught engineer, and ranked up there with Stephenson and Brunel

In the late 80's tractors travelled at a maximum of 20mph (30 kph) and it was Lord Bamford's concept to develop a faster machine for improved road performance and productivity. Higher speed would require better handling and brakes, this in turn required suspension. The received wisdom was that you couldn't plough with a suspended rear axle. – the high torque made the rear axle tramp. Due to Ray's automotive experience he was able to adapt the technology used on Opel GTs and Vauxhall Vivas to develop a multilink system which transferred the forces better and allowed acceptable ploughing performance.

Ray went on to give a presentation in his own cartoon drawn form of the concepts of off-highway vehicle suspension, braking and handling. For instance, tractors have to brake at a rate of 2.5m/s^2 whereas all other road vehicle have to brake at a rate twice that – Ray's advice – stay behind a tractor! Ray fought for better tractor braking standards at the EU, along with the late Ken Bradley, for nigh on 20 years. ABS will become a legal requirement in 2018. Ray finished with some videos of the latest 8000 series tractor being both tested and operated. A lively Q&A session ensued and all attendees thanked Ray for his time with the usual applause.

WEST MIDLANDS BRANCH

TRACTOR DEVELOPMENT AT BANNER LANE
Ian Moore.

As everyone must know by now, 2016 was the 70th anniversary of the production of the first Ferguson TE20 tractor at the Massey Ferguson Banner Lane factory in Coventry. So the West Midlands Branch thought it would be appropriate to invite branch member William Waddilove to give a presentation looking at 'Tractor development at Banner Lane'.

William is ex Banner Lane employee and maintains a keen interest in the mark and the tractors produced at Coventry. He explained that he was taking us though the history of the factory and the tractors developed there via a selection of films. Starting with a film entitled 'The Standard Built Ferguson' this covered a lot of the background to the production and assembly of the early TE20.

Then a short film on the 35 and 65 models which showed how easy they were to use in the field, and finally 'Cornerstone' a film emphasising the need for food in the rapidly growing country and how the farmer using the new 100 series range of tractors were the cornerstone of feeding the nation.

We have arranged for William to return in the New Year to continue the story up to the introduction of the 4300 series, the last model made before the factory closed.

AGRICULTURAL CONTRACTING IN CO DOWN

Report by Terence Chambers

The November 2016 meeting of the Northern Ireland Branch of IAgrE was based on a discussion forum about agricultural contract work. Two generations of three Co. Down based families kindly agreed to share their knowledge and experience of the subject. The participants were Mr John Dan O'Hare and his sons Danny and Mark (Katesbridge), Mr Roy Townley and his son James (Ballygowan), Mr Francis Newell and his son David (Kilkeel). Their operations focussed on the following areas.

Slurry work

All of the panel participants are involved in slurry spreading. Tank mixing, at the end of the housing period, is a high risk venture because of the amount of poisonous gas given off during the process. All were aware of the need to follow strict safety guidelines for this work.

Field spreading was previously allowed over a longer season, when land and weather conditions were favourable, but environmental regulations in Northern Ireland now restrict this to the main growing seasons with the closed season is from 15th October to 31st January.

Hedge cutting

This operation is also seasonal for environmental reasons. The contract services offered include both flail trimming and circular saw work for heavier growth. The discussion covered both types including an example of a saw mounted on a tracked excavator for use in difficult ground conditions.

Grass work

This is a significant operation with all of the 3 families running high capacity self-propelled forage harvester teams. Their season runs from mid May to late autumn. The trend is to now to field wilting, for higher dry matter silage, with around 40% of customers choosing this option. The latest forage harvesters offer more technical features to save fuel by engine speed management and ongoing refinements for servicing and adjustment.

Cultivation and planting work.

All of the panel are involved with cultivation work involving establishment of crops both for customers and their own enterprises. One is a potato grower with extensive experience of destoning, planting and 2-row harvesting systems.

Cereal harvesting

Barley, wheat and oats are the main combinable crops in the area with the latest combines capable of harvesting up to 800 acres during a good season. There is also positive experience of successfully harvesting field beans but peas are more difficult.

Machine choice, service and replacement policies.

Between them, the panel have a lot of capital invested in up-to-date machinery. The range of main brands represented are market leaders with local dealership support.

Front line harvesting equipment tended to be replaced after several years depending on reliability, hours on the clock and trade in values..

Dealing with customers

Providing field operations for customers on time in an unpredictable climate where weather, ground conditions and cropping dates vary from year to year is often a challenge. In dealing with decisions on who comes first it was obvious that all of our panel had retained their customers over a long time and that good customer relations are well established. An understanding of the cropping system on each farm has meant that the same basic order of field works has been maintained from year to year.

Favourite tractors

The meeting concluded with a fun discussion around "What were the best tractors ?" Obviously there has been a lot of technical development in tractor design and power during the last 40 years and users are influenced by their own experiences. The choice range from the Nuffield 10 /60 from the mid 1960s, Ford 5000 and 7000s, Massey Ferguson 165, from 1965, and its 100 series siblings, 85hp Zetor 8011 Crystal, Fiat tractors of the early 1970s Deere's EU built tractors and its successors especially the 10 series (including the 6810 and 7810) are still very popular with contractors.

The Case IH 956, of 1985, with its simple specification had its supporters as did the 110hp Massey Ferguson 3095 from 1990, with its electronic systems and the Fendt with trendsetting infinitely-variable Vario transmission in 1996.

The Northern Ireland Branch of IAgrE are most grateful to all 3 families for taking the time to share their experiences with us during such an informative and enjoyable evening.

PICTURED BELOW: L to R: James Townley, Roy Townley, David Newell, Francis Newell, John Dan O'Hare, Danny O'Hare and Mark O'Hare

MEMBERSHIP CHANGES

ADMISSIONS

Member
Gabarron M (East Midlands)
Hefft D (East Midlands)

Associate Member
Krier P (Yorkshire)

STUDENT
Harper Adams University
Adams R G
Allen C
Aston T H
Baker HY
Bangar S
Beach TG
Boothby AL
Bowers T
Bremner E
Broom A
Bryning RJ
Campbell M
Clements J
Cox RE
Crabtree KA
Crawford J
Crinnian AR
Davis PJ
Dawson JA
Dell N
Downie WP
Edwards AL
Evans IL
Evans TM
Faulkner R
Fielden S
Gallimore J
Gilchrist H
Gillingwater H
Hardy A
Hawkes C
Hogg SW
Jones HD
Kelso DF
Kent L
Kidd MA
King R
Lee M
Llywelyn-Roberts LI
MacInnes JA
Maude SL
Metherell BW
Mill A
Mortimer T
Morton B
Moseley HTU
Mosley W
Murphy-Hunt F
Musson I
Neal JHD
Nyhan M
Ogg A
Owen TD
Philp M
Pratt RA
Pring J
Rhodes JC
Ryan T
Sandercock J
Saunders WA
Seacombe H
Sears ME
Seymour J
Shaw J
Simmonds J
Smith H
Smith G
Snookes-Hathaway R
Stewart D
Stirzaker J
Stride A
Teper J
Tucker E
Vaughan AWS
Wakeham M
Webb GCE
Williams B
Williams RS
Williams AD
Wright GJ
Wyatt JI
Young T
Yusaf K

Reaseheath College
Baker T
Beams H
Blamire p
Brinkley JE
Carslake L
Davies R
Edgerton J
Fairbairn SJ
Frazer BJ
Gardiner TJ
Harries GR
Harrison LA
Heath C
Heaton G
Heeps C
Hollamby EC
Howard ER
Moon E
Peissel TG
Robinson BA
Robson D
Spurgeon R
Walker D
Walsh JT
Wheeler R
Whitfield J
Wood J

READMISSION
Haresign S MIAgrE (East Midlands)

DEATHS
We have recently learned of the death of the following members and we send our condolences to their family and friends:
Mr Derek Greig (Southern) a member since 1955

TRANSFERS

Member
Griffiths DR (East Midlands)

Associate Member
Charnley JWD (Yorkshire)
Smith J P (Wrekin)
Stott K (Yorkshire)
Yerburgh W (Western)
Matthews J (Western)

ENGINEERING COUNCIL REGISTRATIONS

CEng
Lim Ka S (Herts & Essex)

SOCIETY FOR THE ENVIRONMENT

CEng
Cooke A (East Midlands)

CORRECTION

In the Winter 2016 issue of Landwards, Membership section under Transfers, Richard Trevarthen was shown as Member rather than a Fellow, whilst Ian Sumpter and Alex Cooke were shown as Fellows rather than Members. Our apologies to those concerned

LONG SERVICE CERTIFICATES (1.1.17 – 31.3.17)

IAgrE congratulates the following members on reaching significant milestones.

Name	*Date of Anniversary*
60 Years	
Richard Basil Evans MIAgrE	08-Jan-17
John Kevin Grundey FIAgrE	08-Jan-17
Peter Stewart Barton MIAgrE	12-Mar-17
Peter Cyril Brimblecombe MIAgrE	12-Mar-17
David Alastair Jack FIAgrE	12-Mar-17
John Kilgour AIAgrE	12-Mar-17
50 Years	
David Ian Bartlett AIAgrE	13-Jan-17
Douglas George Scott MIAgrE	13-Jan-17

Name	*Date of Anniversary*
35 Years	
Ruth Diana Metcalfe MIAgrE	13-Jan-17
Richard Bond MIAgrE	15-Jan-17
Paul James Stevens AMIAgrE	21-Jan-17
Andrew Thomas Blowey MIAgrE	02-Mar-17
Owen George Grant O'Connell MIAgrE	09-Mar-17
25 Years	
Stewart Coombie MIAgrE	02-Jan-17
Roger Charles Balls AMIAgrE	02-Jan-17
Robert John Merrall MIAgrE	02-Jan-17
Peter Charles Anderson MIAgrE	31-Jan-17
Robert Lindsay Watson MIAgrE	04-Feb-17
Jonathan Charles Booty AMIAgrE	30-Mar-17

ACADEMIC AND COMMERCIAL MEMBERS

ACADEMIC MEMBERS

Bishop Burton College
York Road
Bishop Burton
Beverley HU17 8QG

Brooksby Melton College
Asfordby Road
Melton Mowbray
Leics LE13 0HJ

Coleg sir Gar
Gelli Aur Campus
Llandeilo
Carmarthenshire SA32 8NJ

Cranfield University
Cranfield
Bedfordshire MK43 0AL

Duchy College
Stoke Climsland
Callington
Cornwall
PL17 8PB

Easton & Otley College
Easton
Norwich
Norfolk, NR9 5DX

Greenmount College
CAFRE
22 Greenmount Road
Antrim,
Northern Ireland BT41 4PU

Harper Adams University
Newport
Shropshire TF10 8NB

Institute of Technology
Tralee
Clash,
Tralee
Co Kerry, Ireland

Lincoln Institute of Agri-Food Technology,
Lincoln University
Lincoln LN6 7TS

Myerscough College,
Bilsbarrow
Preston
Lancashire PR3 0RY

Newcastle University
King's Gate
Newcastle Upon Tyne NE1 7RU

Pallaskenry Agricultural College
Co Limerick
Ireland

Plumpton College
Ditchling Road
Lewes
East Sussex, BN7 3AE

Reaseheath College
Reaseheath,
Nantwich
Cheshire, CW5 6DF

Royal Agricultural University
Cirencester
Gloucester, GL7 6JS

Sparsholt College
Sparsholt,
Winchester SO21 2NF

SRUC – Auchincruive
Auchincruive Estate
Ayr, KA6 5HW

Wiltshire College Lackham
Lacock
Chippenham
Wiltshire SN15 2NY

COMMERCIAL MEMBERS

Agricultural Engineers Association (AEA)
Samuelson House,
62 Forder Way,
Hampton,
Peterborough, PE7 8JB

AGCO Ltd
Stoneleigh, Abbey Park,
Kenilworth,
Warwickshire, CV8 2TQ

Alvan Blanch Development Co,
Chelworth,
Malmesbury,
Wiltshire SN16 9SG

Autoguide Equipment Ltd
Stockley Road , Heddington
Calne,
Wiltshire, SN11 0PS

BAGMA
Middleton House,
2 Main Road, Middleton Cheney,
Banbury,
Oxon, OX17 2TN

Bomford Turner Limited
Salford Priors
Evesham,
Worcestershire WR11 5SW

City & Guilds
1 Giltspur Street
London EC1A 9DD

City Farm Systems Ltd
25 Hepplewhite Close
High Wycombe
Bucks HP13 6BZ

David Ritchie (Implements) Ltd
Carseview Road, Suttieside,
Forfar, Angus, DD8 3EE

Douglas Bomford Trust
The Bullock Building
University Way, Cranfield
Bedford, MK43 0GH

DSL Systems
Adbolton Hall
Adbolton Lane
West Bridgford
Nottingham NG2 5AS

FEC Services
Stoneleigh Park
Kenilworth
Warwickshire CV8 2LS

Fullwood
Grange Road
Ellesmere
Cheshire SY12 9DF

HSS Hire
Head Office
25 Willow Lane,
Mitcham, London
CR4 4TS

John Deere Ltd
Harby Road, Langar
Nottinghamshire NG13 9HT

Marks & Clerk LLP
90 Long Acre
LONDON WC2E 9RA

Mastenbroek Limited
83 Swineshead Road
Boston, Lincs, PE21 7JG

Shelbourne Reynolds
Shepherds Grove Ind. Est.
Stanton, Bury St Edmunds
Suffolk, IP31 2AR

SSAB Swedish Steel Ltd
Narrowboat Way
Hurst Business Park
Brierley Hill
West Midlands DY5 1UF

TeeJet London Ltd
Headley House,
Headley Road, Hindhead,
Surrey, GU26 6UK

FORTHCOMING EVENTS

IAgrE EVENTS

4 April 2017
IAgrE 2017 Young Engineers Competition
Kubota Training School, Thame, Oxfordshire
Teams of young engineers compete for valuable prizes to create a remote or radio controlled vehicle to tackle the competition track.

27 April 2017
IAgrE AGM, EGM & Awards Presentation
John Deere, Harby Road, Langar, Notts NG13 9HT
Join us for the AGM and celebrate IAgrE success at the Awards Presentation. Programme for the day is as follows:
10.00am Arrival and coffee
10.30am AGM
followed by EGM at 10.45am
11 am Awards Ceremony
12.30pm Lunch
1.30pm Tour of John Deere UK
3pm End of visit

11 OCTOBER 2017
2017 IAGRE LANDWARDS ANNUAL CONFERENCE
Rothamsted Centre for Research and Enterprise, Harpenden, Herts
Conference Theme: Decarbonising Agriculture
The conference will address the policies and practices, the correct approach and the technologies required if reliance on carbon is to be reduced.

19 OCTOBER 2017
IAGRE COUNCIL MEETING
Lincoln Institute for Agri-Food Technology (LIAT)
Riseholme Campus, Lincoln University

All enquiries regarding IAgrE Events Contact Sarah McLeod.
Tel: 01234 750876
secretary@iagre.org

BRANCH EVENTS

EAST MIDLANDS
CONTACT: Richard Trevarthen
01509 215109
richard.trevarthen@gmail.com

14 March 2017
"Aftersales an Afterthought"
In a change from our advertised programme, as the original speaker is away in China, we are delighted to welcome Peter Harding, Manager Aftersales Dealer Development, AGCO. 7pm for 7.30pm
Quorn Lodge Hotel, 48 Asfordby Road, Melton Mowbray, Leics LE13 0HR

21 March 2017
Branch AGM & Annual Dinner
The evening commences with a PRE - BOOKED two course dinner
Cost: £14.95 per person please make cheques payable to R. Trevarthen
IMPORTANT: Please notify me, either by Email richard.trevarthen@gmail.com or Tel 01509 215 109 by 7.00 pm THURSDAY MARCH 16th with your menu choice (no reservation... no meal).
Partners are invited, and a very warm welcome awaits. 7pm
Quorn Lodge Hotel, 48 Asfordby Road, Melton Mowbray, Leics LE13 0HR

SOUTH EAST MIDLANDS
CONTACT: John Stafford
01525 402229 john.stafford@silsoe-solutions.co.uk

3 April 2017
Success with No-Till, under any conditions. A Nuffield Scholar Report
Speaker: Russell McKenzie Russell entered his scholarship wanting to find out if crop establishment with tillage was doing more harm than good. He will share his Nuffield travelling experiences from Australia to Brazil
Maulden Church Hall, Church Road, Maulden MK45 2AU

17 May 2017
Visit to Silsoe Spray Unit *(details to follow)*
SSAU, Silsoe

WEST MIDLANDS
Contact: Ian Moore
0121 704 5700 ianw@whale.co.uk

14 March 2017
BRANCH AGM
Dr Clare Butler Ellis will give the Presidential Address and take questions from the Members present. Following this, she will give a short presentation based upon her work at the Silsoe Spray Applications Unit 7.30pm
Friends Meeting House, 37 Maidenhead Road, Stratford upon Avon, CV37 6XT

WESTERN
Contact: Mike Whiting
07751 345580
mike.whiting@newmac.org.uk

15 March 2017
BRANCH AGM AND LECTURE "Pros and Cons of Min Till
Speaker: Dick Godwin FREng HonFIAgrE "Professor Dick Godwin is an Internationally recognised researcher and educator on soil mechanics. 6.30 pm
Parkinson's Theatre, Royal Agricultural University, Cirencester GL7 6JS

WREKIN
Contact: David Clare
01952 815087
dclare@harper-adams.ac.uk

20 March 2017
Branch AGM & Technical Presentation Speaker:
The AGM will be followed by Tea and coffee with the technical meeting starting at 6.30 pm
Agricultural Engineering Innovation Centre at Harper Adam University

3 April 2017
Visit to Morris Corfield, Broseley
A presentation and demonstration of the latest diagnostic equipment.
7.30 pm
Morris Corfield, Broseley

15 May 2017
Innovative Welding Technology
Speaker: Chris Dungey of The Welding Institute
Chris Dungey of The Welding Institute will be taking about the latest jointing technologies, additive manufacturing and deposition coatings.
7.30pm
Agricultural Engineering Innovation Centre at Harper Adam University

FOR UP TO DATE INFORMATION ON ALL BRANCH MEETINGS AND ACTIVITIES
Visit EVENTS: www.iagre.org/events
BRANCH DETAILS: www.iagre.org/brgpselect

INDUSTRY EVENTS

22 - 24 March 2017
Essential Management Skills 2017
Venue: Warwick Manufacturing Group, Coventry Essential Management Skills 2017 (EMS 2017) is the flagship management event from the Institute of Mechanical Engineers)IMechE)
Warwick Manufacturing Group, Coventry

30 March 2017
Westminster Food and Nutrition Forum Seminar: The Future of UK Agriculture Policy
THIS EVENT IS CPD CERTIFIED Guest of Honour: Mike Rowe, Deputy Director, Future Agriculture Policy, DEFRA 9am-1pm
Central London

31 March – 1 April 2017
National Engineering & Construction Recruitment Exhibition
If you're looking for a new challenge, or want to discover how your skills can transfer to a different sector, don't miss the opportunity to meet recruiters from the industry's top employers
NEC Birmingham

4 April 2017
Working with Soil – Exposing and Describing a Soil Profile
The ability to expose a representative soil profile and to describe it accurately and consistently are skills that are fundamental to the study of soil in the field. This practical one day course is the first of three courses covering the foundation skills
Shuttleworth College, Old Warden Park, Biggleswade SG18 9DX

25 April 2017
Off Highway Vehicle Seminar
Off Highway Vehicles include vehicles used for different environments, including, agriculture, construction, mining and other off-highway roles. Those working in off highway engineering face a unique set of challenges.
West Midlands

27 April 2017
Westminster Energy, Environment and Transport Forum Seminar. Next Steps for Natural Environmental Policy in England
Guest of Honour: Shirley Trundle, Director, Countryside and Nature, Department for Environment, Food and Rural Affairs
9am-1pm
Central London

9 – 10 May 2017
Turret Media FZ LLC
GFIA Europe Global Forum for Innovations in Agriculture
Welcome to the future of agriculture. Supported by an international network of 40+ partners, the Global Forum for Innovations in Agriculture is the world's largest dedicated expo of sustainable agriculture
Jaarbeurs Expo Centre, Utrecht, Netherlands

10 – 11 May 2017
Working with Soil – Understanding Soil Variability at Landscape to Local Scale
Soil variability impacts on the effective management of soil systems. Understanding and recognising these changes in the field is a key skill required to ensure the sustainable use of soil through targeted management practices
Plumpton College, West Sussex

6 – 7 June 2017
Pigs 2022 – The Opportunities
With an international focus on antibiotics, a volatile marketplace, the increasing influence of Chinese consumption and production on the global industry, Brexit and the ever-present threat of disease.
St Johns Hotel, Solihull, United Kingdom

13 – 16 June 2017
1st International Conference on Timber Structures and Engineering
Organised by: Wessex Institute, UK, Technical Centre of Wood Industry, Belgium Sponsored by: WIT Transactions on the Built Environment, International Journal of Computational Methods and Experimental Measures
Balmer Lawn Hotel, The New Forest

14 June – 15 June 2017
Cereals 2017
Join over 25,000 farmers, agronomists and industry suppliers on the 14th & 15th June at Boothby Graffoe, Lincolnshire for the industry's leading technical event and discover the latest arable techniques
Boothby Graffoe, Lincolnshire

15 June 2017
Westminster Energy, Environment and Transport Forum Seminar. Next Steps for a national air quality plan
Guest of Honour - Catriona Henderson, Deputy Head, Joint Air Quality Unit, Defra and DfT This seminar will provide opportunity to assess Government's plans for improving air quality levels.
Central London

23 June 2017
International Women in Engineering Day 2017
In 2017 NWED is going international. It's now time to start planning for INTERNATIONAL WOMEN IN ENGINEERING DAY #INWED17

29 June 2017
Groundswell 2017
Groundswell is a new farming conference, designed by farmers for farmers to educate and inform the industry about no-till techniques and soil regeneration in arable and mixed farming situations.
Hertfordshire TBC

16 – 20 July 2017
11th European Conference on Precision Agriculture
It is 20 years since the first ECPA conference and the UK organisers are pleased to welcome the return of the conference to the UK and to Edinburgh.
University of Edinburgh's John McIntyre Conference Centre

13 - 14 September 2017
The UK Produce Industry Fair
It's not just a fair exhibiting to the trade for the trade, it's a fair exhibiting a one stop shop for you, your customers and potential new customers.
Peterborough Arena

14 September 2017
Tillage Live 2017
This year's Tillage-Live takes place on Thursday 14th September 2017 at Wickenby Airfield, Lincoln. Organised by the Agricultural Engineers Association (AEA)
Wickenby Airfield, Lincoln.

19 – 21 November 2017
Pan African Society for Agricultural Engineering Nairobi 2017 Conference
The Pan African Society for Agricultural Engineers was formed in 2012. The mission of the society is to promote and advance the profession of agricultural engineering in Africa.
Southern Sun Mayfair Hotel, Nairobi, Kenya

29 – 30 November 2017
Croptec 2017
CropTec, the essential technical and business event for arable and mixed farmers, their advisers and associated industries, will be packed with innovative features and content.
East of England Showground, Peterborough, PE2 6XE

SAVE THE DATE

IAgrE

2017 LANDWARDS CONFERENCE

WEDNESDAY 11 OCTOBER 2017

Rothamsted Centre for Research and Enterprise, Harpenden, Hertfordshire

RoCRE Rothamsted Centre for Research & Enterprise

DECARBONISING UK AGRICULTURE

Perspectives and Policy for Change

SUMMARY

The carbon footprint of agriculture is complex. At one end, tractors and machines are big energy users, whilst natural resources such as forests and the soil can be managed to capture carbon.

The conference will address the policies and practices, the correct approach and the technologies required if reliance on carbon is to be reduced.
The event is aimed at engineers, scientists and technologists, farmers, growers, producers and for those working in policy and sustainable development

OUTLINE PROGRAMME

- The Impact of UK Agriculture on Carbon Production
- Carbon and Social Responsibility
- The Energy Independent Farm
- Search for Sustainable Agriculture
- Carbon Capture and CO2 Enrichment Technologies
- Soil – Our Natural Capital
- Minimum Tillage and Carbon Reduction

FURTHER INFORMATION

Online: www.iagre.org E-Mail: secretary@iagre.org
Telephone: 01234 750876