Landwards

Agriculture • Horticulture • Forestry • Environment • Amenity

IAgrE Professional Journal www.iagre.org Volume 70, Number 1 Spring 2015

Manifesto 2015

IAgrE wish list for incoming government

In this issue...

Biosystems Engineering

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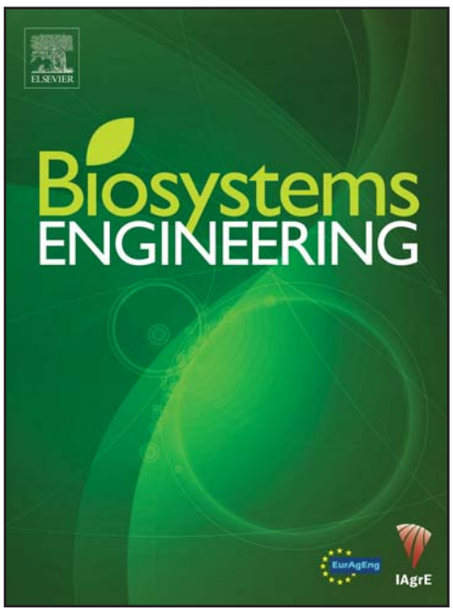

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To view the full article list of the current edition, visit:

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IAgrE

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

Biosystems Engineering

Volume 127, November 2014, Pages 1-10

Fatigue life assessment of a four-rotor swather based on rainflow cycle counting

Dimitris S. Paraforos, Hans W. Griepentrog, Stavros G. Vougioukas, Dietrich Kortenbruck

University of Hohenheim, Institute of Agricultural Engineering, Stuttgart, Germany

University of California, Department of Biological and Agricultural Engineering, Davis, USA

Assessing the fatigue life of agricultural machinery is challenging, especially when the machine assumes different configurations in various operating modes. In such cases, assessing fatigue life requires the recording of loads at high stress points on the machine chassis during every possible mode of operation. Strain data were recorded at critical, high-stress points of a four-rotor swather, along with acceleration data on the main axle. Measurements were performed while the machine was transported on asphalt and along unmade roads that are typically used by farmers. Additionally, data were acquired during swathing operations in grass fields with different conditions and speeds. Load cycles were extracted from stress data. Fatigue damage from each individual cycle was obtained and the total accumulated fatigue damage established. Transition between operating modes, e.g. lifting the rotors for headland turning, proved to have a high impact on machine fatigue life. Fatigue damage under working conditions in grass fields was increased by surface irregularities.

Volume 128, December 2014, Pages 21-28 - Special Issue: Irrigated Agriculture

Wind pumps for irrigating greenhouse crops: Comparison in different socio-economical frameworks

Rodrigo Díaz-Méndez, Adnan Rasheed, Manuel Peillón, Alicia Perdigones , Raúl Sánchez, Ana M. Tarquis, José L. García-Fernández

Technical University of Madrid, Spain

University of Agriculture, Faisalabad, Pakistan

University of Santiago de Cuba, Faculty of Constructions, Cuba

The economic feasibility of providing energy for pumping irrigation water in commercial greenhouses in Spain, Cuba and Pakistan was investigated. The analysis took into account wind resources, distance to the grid, water storage tank volume requirements, and planting dates. For all three countries, if a grid connection was already in place, installing wind pumps would be economically unwise. Where no grid connection exists, the distance to the grid and the wind resource available are key factors to be taken into consideration when deciding between options. Water elevation has a major influence on the economic feasibility of wind pump technology, more than, for example, solar photovoltaic pumping technology. The results reveal differences between countries. In Spain, the proximity of the electrical grid makes the connection to it the best option. In Pakistan, scarce wind resources are a serious limiting factor. Cuba, however, has good wind resources; water elevation, distance to the grid and water storage needed are the critical factors.

Volume 129, January 2015, Pages 127-133

The use of additives and fuel blending to reduce emissions from the combustion of agricultural fuels in small scale boilers

J.P. Carroll, J.M. Finnan

Crops Research, Teagasc, Oak Park, Carlow, Ireland

Additives and blends can make agri-residues suitable for use in domestic boilers.The results of tests to determine the efficacy of fuel blending and additives to reduce emissions from the combustion of agricultural fuels are presented. It was shown that peat blended with miscanthus and tall fescue has the potential to significantly reduce both particle emissions and problems related to ash melting. However, the high nitrogen content of the peat (1.5%) compared to the two agricultural fuels tested, miscanthus and tall fescue leads to increased NOx emission with increasing proportions of peat in the blend. The results also showed that for both fuels a kaolin addition rate of 4% gave significant reductions in particle emissions. With increasing peat/kaolin addition ash sintering temperature increased while potassium release decreased. With further developments in the use of additives and fuel blending it is foreseen that pellets from agricultural fuels may form a viable alternative to wood pellets.

The Professional Journal for Engineers, Scientists and Technologists in Agriculture, Horticulture, Forestry, Environment and Amenity

Landwards

EDITORIAL:

We're in the here and now . .

CHRIS BIDDLE
Editor
chris.biddle@btinternet.com

LAST month I attended a debate at the London HQ of *The Times* where four worthy political commentators gave their version of the likely outcome of the forthcoming election. (Verdict: not a clue!)

We are now in the realms of politicians across the divide saying things that they hope will strike a chord with voters who may be wavering.

The Q&A after the debate strayed down predictable territory. Immigration (of course), tuition fees (topical), NHS (a banker topic), welfare payment (predictable). Then someone from the oil industry asked about the possible impact of fracking on the election. Blank faces, no real answers - and not one person on the panel thought it worthy of discussion. Too long term.

There is only one aim for political parties over the coming weeks and that is to secure the vote. Winning is everything. Long term ideals have to take a back seat, we are operating in the here and now.

Agriculture is not like that. It is not and never has been, since the days of the Corn Laws, a topic that will have them arguing and debating with passion and commitment in the marginals. At the recent NFU Conference, the President quite rightly stoked up the debate about self-sufficiency and British food. "At present we are self-sufficient in food from the New Year to 7 August, but at the present rate we will be only sufficient to mid-summer by 2045," he said.

Today, the supermarket shelves are full, milk is at a ridiculously low price, weekly food bills have been reducing mainly due to fierce competition. So is food a burning issue with voters? Hardly.

But of course, when all is done and dusted, agriculture has to win the hearts, minds - and ears - of those in charge. Which is why we are devoting a major part of this issue to hearing from those closest to the ideals and aims of IAgrE to present their view on what needs to be achieved - long term.

The views expressed in Landwards editorial are those of the Editor, and do not necessarily reflect those of the Institution

IAgrE
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Landwards is published quarterly by:
IAgrE
The Bullock Building, University Way,
Cranfield, Bedford MK43 0GH
Telephone: + 44 (0) 1234 750876
Fax: + 44 (0) 1234 751319
E-mail: secretary@iagre.org

President
Mark Kibblewhite CEnv FIAgrE
Chief Executive and Secretary
Alastair Taylor IEng CEnv MIAgrE

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THIS ISSUE

PRODUCTION TEAM

EDITOR: Chris Biddle
Tel: 44 (0) 7785 295625
chris.biddle@btinternet.com

SUB-EDITOR: Steve Gibbs
Tel: 44 (0) 7929 438213
steve@stevegibbs.co.uk

DESIGNED BY:
Chris Biddle Media
12 Kingfisher Close, Salisbury, Wiltshire, SP2 8JE

Welcome to Sarah

Sarah McLeod has joined the team at head office replacing Sylvia Harris. Sarah joins IAgrE as an administrator. She was previosuly the office manager at Bostock Health Care Limited in Bedford.

In her new role Sarah will be responsible for branch communication, event and conference planning, maintaining databases plus lot of other administrative duties.

Thrown in at the deep end, as the beginning of the year is always a busy period for the secretariat, Sarah said, "It's lovely to join such a vibrant and lively office and I've been made to feel very welcome by both the secretariat and the members. I look forward to meeting many of them at this year's annual conference."

IAgrE CEO Alastair Taylor said, "We welcome Sarah to the team. The IAgrE is at its best when we work together for the common good and it's great to have Sarah on board."

IAgrE, SSAB & Farmers Guardian team up

Health & Safety award launched

IAgrE in partnership with SSAB, the Nordic and US-based steel company and *Farmers Guardian* has announced the launch of a new and significant health and safety award.

The annual award, which will be judged by a panel of eminent agricultural engineering specialists will be open to any company, institution, organisation or individual. The prize will comprise of a statuette, £300 and an invitation to visit SSAB in Sweden.

The prize will be awarded for an innovation, product or practice which supports best practice in promoting safety and can demonstrate the clear benefits. This could relate for example to new design features, lighter products, simplified production, longer life time, improved performance or beneficial environmental effects. The prize will also cover methods and tools.

Alastair Taylor, CEO of IAgrE said, "Agriculture is the most dangerous industry in the UK with an average of one person being killed each week on farms and many serious injuries and cases of ill health occurring across the land-based sector and the incident rates show no sign of reducing. At IAgrE we are committed to help the industry improve this figure and believe this new award is a way of raising and promoting a healthy and safe agricultural industry"

Johan Mattsson, SSAB Key Segment Specialist, Agriculture said, "The farm is one of the most dangerous workplaces of modern society. Fortunately, Advanced High Strength Steel has enormous potential to really make a difference for environment, animals and people living and working on farms."

SSAB manufacture AHSS - Advanced High Strength Steel, which increases productivity and reduces fuel consumption. "The automotive sector has been transformed in the last 20 to 30 years and everyone today takes for granted that cars are safe and fuel efficient. It's now time to look at the agricultural sector and using steel to develop farm machinery, produce machines more cost effectively with higher safety levels and reduced fuel consumption using new lighter and stronger materials," added Johan.

Hartpury students given the tools for a future career

Agricultural engineering students at Hartpury spent time finding out what their future careers could hold from IAgrE CEO Alastair Taylor, during a talk at the college.

Alastair, gave students on land-based technology courses at the college a unique insight into what lies ahead of them.

Ryan Dymott, 16, a land-based engineering student at the college, said, "The talk was really interesting. He gave a great insight into what life in the industry is like and gave a real sense of where we could be in the future with our careers.

"He started off exactly where we are now so it's great to hear from someone who has got to where his is now by starting out on a similar route to us."

Ryan, who is in the first year of his course, is also part of the John Deere Apprenticeship scheme which Alastair Taylor is closely linked with.

"It's great here at Hartpury. What I find useful is that the classroom is right next to the workshop so we can go straight from our theory to getting stuck in with the manual stuff."

Alastair's talk focused on what a great career the students have ahead of them in what is a fast growing industry, how they will need to keep an eye on technological advancements, the benefits of networking and the importance of being part of an institute.

"I know engineering has gone on at Hartpury for a number of years and, much like the rest of the industry, it seems to be on the up at the moment," Alastair added.

"Coming here it's great to see that there's been investment and it's good to see that resources are on the up and that student numbers are rising.

"I've had a chance to look around and chat to some of the students and it's great to see the quality of the provision they're getting and how much they know already at such young ages. The fact they all really seem to be enjoying themselves is an added bonus as well!

"We need to inspire these students to embrace the technology and to congratulate them on choosing this path.

"Research says that those who are registered as engineering technicians will earn more over their lifetime because they will be recognised as having the required skills and as someone who is at the top of their game."

Alastair Taylor with Hartpury students

IAgrE present innovation awards

Ivel award won by Trelleborg Wheel Systems

Trelleborg Wheel Systems has won the Ivel Award for best new product or environmental innovation for its Progressive Traction™ Agricultural Tyre Technology.

The award was presented at January's LAMMA agricultural show by Andy Newbold, past IAgrE President and managing director of Farm Smart Events.

Bruce Lauder from Trelleborg who received the award on behalf of Trelleborg said, "We are very proud that the agricultural industry recognises Trelleborg's commitment to continually developing solutions that improve the efficiency, productivity and sustainability of modern farming. We are always striving to help the agricultural industry to produce more with less."

The Progressive Traction™ tyre is a new concept in agricultural tyres, specifically designed to improve farming efficiency due to its double lug. Operating on the soil at different times, the double lug progressively releases higher traction when required.

The double lug also provides the tyre with better flotation capability, ensuring an even pressure distribution over the extra wide footprint, resulting in lower soil compaction, higher fuel efficiency and a reduction in overall working time.

L-R: Andy Newbold, IAgre; Andrea Manenti MD UK & Ireland, country manager China; and Bruce Lauder marketing manager UK & Ireland Trelleborg

. . . and Tralee student picks up double honours

Owen Doran, right, receiving his award from Andy Newbold

Owen Doran has won this year's IAgrE Johnson New Holland Trophy and the IAgrE Safety Award for his project called 'Modulating Trailer brake system'.

The Johnson New Holland trophy was created to encourage and recognise innovation by students in subjects related to the application of engineering to the landbased sector.

The judging panel commented that Owen tackled the topic very well. The project was well reported with a good description of the systems' dynamics. Professor Paul Miller, a member of the panel said, "This project addresses a continuing safety problem in the industry in a creative and practical way and could be the basis for future development."

Owen also received the IAgrE Safety award for the project. This award was established to encourage and recognise innovation in safe design or operation of equipment and processes by students studying agricultural engineering or subjects related to the application of engineering and technology to the landbased sector.

Owen, who has completed a Bachelor of Engineering in Agricultural Engineering at the Institute of Technology Tralee, is now studying for a BSc (Honours) in Agricultural Engineering Management at Tralee.

"I chose to study agricultural engineering because from a young age I've always had a keen interest in farming. I feel that by completing my studies in Agricultural Engineering it will give me the necessary skills to get a job in the agricultural manufacturing sector. I would like to pursue a career as a technical trainer or be involved in the technical service side," said Owen.

IAgrE AGM to be held at AGCO

The 2015 IAgrE AGM will be held on Thursday 30 April at AGCO, Abbey Park, Kenilworth, Warwickshire, CV8 2TQ.

All members are welcome to attend. The agenda is available at *www.iagre.org* and also in the enclosed Accounts and Annual Report booklet.

The AGM will be followed by a Council meeting and Group Discussion, prior to holding this year's IAgrE Awards Ceremony. The day will conclude with a visit to some of the AGCO training facilities.

If you plan to attend, please advise the Secretariat.

Record intakes on Claas and Deere schemes

Both CLAAS UK and John Deere have reported record numbers of students joining their respective apprentice schemes.

CLAAS say that this academic year a record 30 students from across the UK and Ireland joined their scheme.

Of these, two are the first to study as part of a new Parts Apprenticeship. As with service technicians, there is a shortage of young knowledgeable and experienced parts personnel coming up through the industry. It is in order to address this that CLAAS UK, in a joint initiative with AGCO, has established the Parts (Sales and Marketing) Apprenticeship, which will be run alongside the Technician course at Reaseheath College.

CLAAS say they are the only UK agricultural machinery company to offer two training bases for its Technician apprentices, and in addition to the 13 studying at SRUC Barony campus, a further 17 will be training at Reaseheath College in Cheshire.

John Deere meanwhile say that 59 young apprentices - up by three on last year - have signed up to begin their first year of training in the work-based programmes. The latest intake includes 40 Ag Tech apprentice engineering technicians, 12 Parts Tech and seven Turf Tech technicians.

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 training company Babcock's team of expert learning advisers.

Engineering apprentices needed

Or it will cost the UK £27bn a year

IAgrE supports the results of a study undertaken by Engineering UK that reports filling the demand for new engineering jobs will generate an additional £27 billion per year for the UK economy from 2022, but to meet projected employer demand, the number of engineering apprentices and graduates entering the industry will need to double.

Alastair Taylor, CEO of IAgrE said, "Engineering is central to ensuring economic growth and also plays a major role in helping tackle global challenges such as climate change, health, food security, biodiversity, water security, population and energy security."

On behalf of the engineering community Engineering UK has made the following calls for collaborative action across government, engineering businesses, the education sector and the wider engineering community need to realise these recommendations:

- **Double the number of engineering graduates or increase number of engineering and technology and other related STEM graduates by 50%**
- **Double the number of young people studying GCSE physics as part of triple sciences and grow the number of students studying physics A level or equivalent to equal that of maths.**
- **Increase two-fold number of Advanced Apprenticeships achievements in engineering and manufacturing technology, construction planning and the built environment and information and communication technologies**
- **Provide career inspirations for all 11-14 year olds, including opportunities for every child to have at least one engineering experience with an employer.**
- **Support for teachers and careers advisors delivering careers information**

"IAgrE supports the call for collaborative action across Government, business, the education sector and the wider engineering community to address the shortage of engineering skills. Agriculture and agricultural engineering are forward-looking sectors. If we are to meet the challenges of climate change and food security we must act now to address these issues," Alastair added.

The Engineering UK 2015 The State of Engineering (#EngUK15) report is available from *www.engineeringuk.com*

> "..If we are to meet the challenges of climate change and food security we must act now to address these issues"

IAgrE Conference programme set

This year's IAgrE Conference takes place at The Great North Museum in association with Newcastle University on Wednesday 20th May. It is sponsored by Mastenbroek.

Titled *'Too much or too little water?: Engineering innovation for agricultural water management in a changing climate'*, the convenor of the event, IAgrE President Mark Kibblewhite said, "Water management is key to achieving higher yields and better environmental performance. This conference will focus on water management on the farm and the role engineering has in making it effective and cost-efficient.

"The emergent impacts of climate change include a higher probability of summer drought and more frequent and intense winter rainfall. Adaptation requires irrigation, drainage and management of surface water run-off. Anticipated shortages of water will drive demand for precision irrigation. Many field drains are at the end of their useful life and there has been little innovation in drain design. And there is concern about soil compaction increasing surface water runoff and flood risk.

"We will take stock of the 'state of on-farm water', where investment is needed in systems for water management and how engineering innovation secure optimal farm performance."

The schedule for the day is now set and runs as follows:

- *10.00* **Welcome:** Professor Mark Kibblewhite, IAgrE President
- *10.10* **The Engineering Challenge:** Professor Dick Godwin FREng, HonFIAgrE Harper Adams University
- *10.50*: **Integrating water and production** Caroline Drummond MBE, Chief Executive, LEAF
- *11.30* **Break** - Networking Opportunity
- *11.45* **Soil management technology to control run-off:** Dr Rob Simmons, Cranfield University
- *12.15* **Water use efficiency for crop production:** Dr Mark Else, East Malling Research
- *12.45* **Lunch** - Networking Opportunity
- *13.30* **Advances in sub-surface drainage technology:** Fred Clarke, Technical Sales Director at Mastenbroek
- *14.00* **Land use and hydrology in semi-arid environments** Dr John Gowing, Newcastle University
- *14.30* **Sensors and information for water management (title tbc):** Dr John Newstead, Technical Sales Engineer at Delta-T Devices Ltd
- *15.00* **Discussion & wrap-up:** Led by Prof Jane Rickson, MIAgrE, Cranfield University
- *15.30* **Tea** - Networking Opportunity
- *16.00* **Finish**

Visit the IAgrE website at www.iagre.org for online booking. Register by 31 March 2015 to take advantage of the early bird rate. Alternatively call the IAgrE Secretariat on 01234 750876 or email *conferences@iagre.org* for further details.

Climate change will have far reaching effects on UK agriculture

With 2014 reported as the warmest year since records began, continuing a strong trend in recent years, we ignore the implications for agriculture in the UK in the medium to long term at our peril, say scientists from the James Hutton Institute, Scotland.

The issue, they say, is not just the rising average temperatures, but the type of weather, which trends suggest are becoming more prone to extremes. In particular, rainfall patterns are predicted to change with drier conditions in the southern UK causing issues with water supply for crop growth whilst in Scotland rainfall is expected to become concentrated into short bursts of heavy rainfall.

"UK agriculture is currently some of the most productive in the world for key crops such as cereals and potatoes - traditionally, our warm, mild, wet climate has been well suited to world-beating yields per hectare and our lead in agricultural research has cemented these advantages. As the climate changes, the sector - and the research and development capability that supports it - can use its strong position to anticipate new circumstances and adapt resources and practices accordingly," said Tim Daniell, Theme Leader for Sustainable Production Systems at the Hutton Institute.

Ken Loades, a soil physicist at the Hutton Institute, points out that this increased rainfall intensity will lead to greater levels of soil erosion especially on sloping ground. "These effects may be minimised by altering land management to increase infiltration and reduce run off. This would have the additional advantages of maintaining groundwater levels, providing irrigation water during dry periods, and reducing flood risk," he adds.

Adrian Newton, a senior cereal pathologist also at the James Hutton Institute, says changing climate will inevitably lead to alteration in the key pathogens that farmers have to manage. "New threats previously associated with southern climates may become more prevalent however threat from other diseases may reduce.

"This will be driven by both temperature and rainfall changes. Changes in the mosaic of crops across the landscape may also present additional threats from pests and diseases which can be hosted on more than one plant species. Also synergistic effects of climate change, such as combinations of temperature, carbon dioxide and water availability, need to be explored as each has typically been studied in isolation."

Tim Daniell agrees that these are challenging times but studies suggest that there may be an opportunity to increase cropped land area, especially in Scotland, and increase the diversity of crops that can be grown. "Clearly the alteration in our climate will have a profound effect on our agricultural landscape and the Institute - along with others - is directly involved in increasing both our understanding of the effects of climate change and how agronomy can adapt to the challenges that lie ahead.

"Whatever the future climate picture, the key is for society to be ready to adapt to new circumstances by planning crop breeding, agronomy and agricultural practices around a range of potential scenarios."

Whichever way the situation evolves, making these transitions sustainably is the only way to ensure continuing food security and ongoing viability in farming says the Institute.

CEO View

IAgrE launches a new route to professional registration for candidates with evidence of the correct experience and appropriate further learning

Alastair Taylor

Routes to Registration

In the Winter 2014 edition of *Landwards*, John Gittins BEng (Hons), MSc, CEng, MIAgrE prepared an article on how he went about becoming registered for CEng.

The article went down very well, so much so that the Engineering Council now use John as a case study on their website *www.engc.org.uk/case-studies-ceng.aspx*

Congratulations and thanks to John for keeping IAgrE at the forefront - it is much appreciated.

John made a comment which has led to some debate and through this article, I wanted to clear up any confusion which might persist. John says, "*With the correct experience someone with a BSc or HND can become a Chartered Engineer.*" As someone said to me recently, 'I didn't realise that my HND could give me access to CEng'. I had to remind them that the key to successful registration at CEng for someone with a HND is based on the words 'correct experience', with the additional caveat of 'further learning and appropriate experience'. Through this article I wanted to expand on that.

Essentially for all registration grades, that is CEng, IEng and EngTech, there are two pathways to EngC registration. These are called the ***Standard*** Route and the ***Individual*** Route. The IAgrE offers both these options. The details of these routes are captured in the UK Standard for Professional Engineering Competence (UK-SPEC). In summary, for CEng, the guidance is as follows:

Standard Route

Knowledge and understanding are important components of professional competence.

Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications ***exemplify*** the required knowledge and understanding for Chartered Engineers:

- An accredited Bachelors degree with honours in engineering or technology, plus either an appropriate Masters degree or Engineering Doctorate (EngD) accredited by a professional engineering institution, or appropriate further learning to Masters level;
- or an accredited integrated MEng degree.

Individual Route

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

> "... IAgrE has established a new Individual Route to registration at IEng and CEng"

- Taking further qualifications, in whole or in part, as specified by the institution to which they are applying
- Completing appropriate work-based or experiential learning
- Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles

IAgrE Routes to Registration

At the IAgrE most CEng registrations come through the Standard Route.

It is interesting to learn that in many other Professional Engineering Institutions (PEI), and remember that IAgrE is one from 35 PEI, the Individual Route accounts for an increasing proportion of registrants.

Mindful of this, IAgrE has established a new Individual Route to registration at IEng and CEng. This is called the Career Learning Assessment (CLA) and it combines an account of lifelong learning with reference to the technical development encountered over the registrant's career.

It is probable that many of you, just like me, have several degrees, post graduate degrees and doctorates from the so called 'University of Life' and if, through completing the Career Learning Assessment you can demonstrate that all of this meets the UK Standard for Professional Engineering Competence (UK-SPEC) at an appropriate level, then you too could apply to be registered as IEng or CEng. I might even have a go myself!

If you would like to know more about the new IAgrE Career Learning Assessment please contact the IAgrE Membership Secretary Alison Chapman and we will send you an application form and guidance notes. We will endeavour to find you a mentor to help you through the process.

I very much look forward to receiving the first CLA Registration and celebrating, through these pages your achievements.

And welcome

Finally, in other news, it is all change in the IAgrE Secretariat.

We wish Sylvia Harris best wishes for her new venture in the South West and she has promised to give us an update as and when she has some news to share.

We welcome Sarah McLeod who is getting to grips with membership support and communicating the IAgrE message to all and sundry (as well as dealing with an itinerant boss!).

Soon we will be welcoming an additional part-time Business Development and Projects Assistant to support us as we develop a broader range of services.

Membership Secretary, Alison Chapman and Communications Officer, Marion King, continue to do a great job as does Elizabeth Stephens in managing our finances. We have a great team to support you and your professionalism.

Do call in and see us sometime. I promise that we won't talk about the election!

2015 International Year of Soils

Highlights the importance of this precious, natural resource

Mark Kibblewhite, a leading soil scientist and current President of IAgrE said recently, "Organic matter in the UK's soils is declining, while compaction and erosion are widespread."

The Food and Agriculture Organisation of the United Nations report that 33% of soil is moderately to highly degraded due to erosion, nutrient depletion, acidification, salinisation, compaction and chemical pollution.

More efficient use of water, reduced use of pesticides and improvements in soil health can lead to average crop yield increases of 79%.

"This is an excellent opportunity for the UK to focus on this extremely important issue. Farmers are beginning to realise that farming practices will need to change to help soils to flourish.

"Farmers are being encourage to plant trees on their land to prevent soil erosion. A shelter belt or hedge can improve water infiltration rates of compacted soil by 60 times within three years of being planted.

"Hedges help to control soil erosion by water and wind and are important infrastructure for soil protection," Mark added.

IAgrE Fellow Professor Jane Rickson who is Professor of Soil Erosion and Conservation in the Cranfield Soil and Agrifood Institute School of Energy, Environment and Agrifood (SEEA) says, "Soil provides us with essential goods and services such as the production of food, storage of rainwater, nutrients and carbon, shelter to a variety of living organisms and protection of our cultural heritage. Processes such as erosion, compaction and loss of organic matter degrade the ability of soils to carry out these functions, which are fundamental to human health and well-being."

Mark Kibblewhite

Organic matter in the UK's soils is declining, while compaction and erosion are widespread

Alastair Taylor IAgrE CEO, said "Membership of IAgrE includes a community of scientists, practitioners and engineers, engineers, involved not only with soils but water engineering and management. In support of the International Year of Soils this year's annual conference at Newcastle University on May 20th will take a look at new tools for water management and how engineering can develop and support their adoption."

An update

Reports of technical projects that received funding support from The Trust

An extract from a project report submitted to The Trust is given below - *further details can be obtained from our office.*

VALIDATION OF A MOTION SENSOR FOR AUTOMATIC DETECTION OF LAMENESS IN PIGS

- work conducted at Newcastle University

The aim of this project was to take the first step in developing an automated system for detecting lameness in growing pigs.

The main objective was to validate a commercially available motion sensor (Microsoft Kinect) against a marker-based 3D system by undertaking a pilot study to confirm the validity of this readily available, low-cost motion sensor to measure key parameters of animal movement which have been identified as being reliable indicators of gait.

Lameness is a major problem affecting pigs and its detection on commercial farms is challenging due to the reliance on subjective scoring systems and large group sizes which can make it difficult to see individual pigs.

Using advanced objective kinematic gait analysis techniques such as the Vicon system, lameness in pigs has been associated with abnormality in the movement of the axial body during walking. In a previous PhD research programme, vertical displacement of the head and neck was found to be most affected and increased in lame pigs compared to normal animals.

However, simpler and more cost-effective technology is required to automate lameness detection for commercial application.

In the current study, the walking trajectories of mid-line dorsal body regions of normal pigs varying in size were captured repeatedly, within capture day and between days, on two or three occasions within a week. Pigs were trained to walk at a steady pace along a walkway. Trajectories of the body regions were tracked simultaneously using both a 6-camera Vicon motion capture system, with the cameras set up in an array flanking the walkway to detect reflective markers placed along the axial body, and a Microsoft Kinect motion sensor which was mounted above the walkway (see photograph).

Four pigs wore a large reflective marker in the mid-neck region, detectable by both systems on two capture occasions.

The experimental set-up of the apparatus used in the project: Vicon cameras flank the walkway whilst the Kinect sensor is mounted above the walkway

Compensatory movements in the mid-neck region during lameness episodes may be expected and this region can be tracked more reliably in the Kinect depth data.

Two custom-written computer algorithms using the Kinect developer toolkit were produced to follow the large neck marker and enable marker-free tracking of other body regions. Reversed depth data from the Kinect sensor and vertical position data from the Vicon system were used to assess the level of agreement in tracking movement of selected body regions between the two systems.

Correlation and limits of agreement of Vicon and Kinect vertical trajectory means and descriptive statistics of continuous trajectory differences were evaluated.

The results showed that there was a high positive correlation between the Kinect and Vicon vertical trajectory means of the large neck marker. The Kinect neck marker vertical trajectory mean was generally higher than that of the Vicon trajectory mean. There was no pig effect on differences, but a pig effect on absolute trajectory mean which reflected the size of the pig. The mean of vertical amplitudes, i.e. difference between local extremes on curves, was 5 ± 2.8 mm, and hence a minimum difference of +15 mm in vertical amplitude in lame animals should be detectable in more than 99% of cases.

In contrast, the trajectories of the neck, back and pelvis body regions generated by a marker-free Kinect application showed less similarity with the corresponding Vicon trajectories.

On the basis of these findings, we suggest that the Kinect sensor has the potential to distinguish clinically lame pigs from sound animals, based on the extent of elevation of the neck region during walking. However, marker-free tracking algorithms need refinement and further development to become sensitive and reliable for commercial application.

The Douglas Bomford Trust, The Bullock Building, University Way, Cranfield, Bedford MK43 0GH
Telephone: + 44 (0) 1234 750876
www.dbt.org.uk enquiries@dbt.org.uk
Secretary: **Paul Miller** Administrator: **Elizabeth Stephens**

Studentships

The Douglas Bomford Trust has awarded scholarships to six engineering students at Harper Adams University for the current academic year.

The scholarship winners, selected after a competitive application and interview process were presented with their awards at an event held at the University on 11th February - *see photograph*.

Agricultural Engineering student, **FINLAY WHITEHEAD**, from Newton Abbot, Devon, said, "To have been selected as a Douglas Bomford Trust scholar is a very privileged position to be in and I am extremely grateful to the Trust for granting me such support in my fifth and final year of study.

"The Trust has had huge, positive impact on my engineering studies at Harper Adams, contributing significantly to the new Agricultural Engineering Innovation Centre, which is now an amazing study area where I, as an MEng student, have dedicated desk space; contributing to a previous trip arranged by myself and some fellow students to Agritechnica 2013; and now granting me a scholarship. I cannot thank them enough for their input to my studies."

HYWEL PHILLIPS, from Haverfordwest, Wales, said, "It is excellent to be associated with the Douglas Bomford Trust as they provide the Harper Adams engineering department with tremendous support.

"The trust pays for all engineering students to be members of the IAgrE, which allows us to attend very interesting and informative meetings and presentations relevant to our course.

"I would like to thank the panel for the interview experience and the Trust for its kind support. The financial support from this scholarship is going to be very beneficial towards paying my tuition fees for this academic year. I was pleased that my interest in organising trips to manufacturers either next term or in my fourth year, was of interest to the Trust."

ALISON SKEA, a second year BEng (Hons) Agricultural Engineering student from Forfar, Scotland, said, "I am extremely grateful to the committee for choosing me to be their scholar. I have spent the last few years working in France and Austria trying to gather as much knowledge and experience as possible to help towards my degree.

"I would like to thank the trust for their support and encouragement. I'm not sure how I will use the money but I do know that as much as I can, I will invest in myself, to learn new skills or languages or engage in new experiences."

Receiving his fourth Douglas Bomford Trust Scholarship was **JACOB SMITH** from Market Rasen, Lincolnshire (not able to attend the Awards Presentation).

Jacob, a fifth year MEng Agricultural Engineering student, said, "The assistance the Douglas Bomford Trust has provided me will be a huge help to my professional development. It will allow me to develop skills that are sought after by many employers, and I would like to say a huge thank you for this."

ADAM MONTGOMERY, a fourth year MEng Agricultural Engineering student from Monaghan, Republic of Ireland, said, "I am extremely honoured to receive the Douglas Bomford Trust scholarship. This scholarship will allow me to concentrate on my studies and to achieve a distinction level degree.

"I would like to thank the Douglas Bomford Trust and Development Trust for their support."

MAX THORNE from Dunstable is a fifth year off-road vehicle design student. He said, "I am very grateful to receive this scholarship which will allow me to purchase additional resources for me to continue to excel at Harper Adams."

Max completed his placement with Niftylift. "I was working as a design engineer on a number of exciting projects. I was on the Monitored Professional Development Scheme (MPDS) scheme, allowing me to work towards becoming a chartered engineer. I plan to return to industry immediately upon graduation to allow me to develop skills and work towards becoming a chartered engineer. Ultimately I would like to set up an engineering business on the home farm."

The group of recipients of Douglas Bomford Trust scholarships at Harper Adams University pictured with trustee Jonathan Bomford and Trust secretary Paul Miller.

Back row (left to right): Hywel Phillips, Adam Montgomery, Finlay Whitehead and Max Thorne. Front row (left to right): Jonathan Bomford, Alison Skea and Paul Miller.

President's Musings

SIMA, Paris 2015

IAgrE President, MARK KIBBLEWHITE, takes a walk in the technology park

I was at SIMA 2015 to make a presentation at the EurAgEng seminar organised by David Tinker and afterwards spent some happy hours exploring the exhibits.

The EurAgEng seminar was about '*How engineers [can best] contribute to innovation for the sustainable intensification of agriculture*' - it's the big issue for our discipline and the getting on for two thousand exhibits at SIMA were a perfect chance to catch-up on the state of the art.

Let's start by walking slowly through some of the big boys stands each aglow with their distinctive pallet of colours. The stands have been set up to impress, almost overwhelm, and they do just that but with some intriguingly different messages.

The Deere stand is extraordinary: it has an almost family atmosphere and aims at responses to human emotions as much as technology. A big video screen shows an anxious woman watching her partner setting off from the farm gate with a super-size forage harvester, followed by reassuring scenes of him washing it down after returning safely. Good for Deere: these large machines are hazardous and engineers should have safety at the heart of development and product features. Their new AutoConnect which automates the pick-up and connection of towed vehicles won a SIMA Silver award. Of course, a good part of their stand was communicating that it really is fun to have a Gator and wear green overalls.

Now we are at the Claas stand and here are the panoramic cabs for which they just got a Gold medal but, joy of joys for me as a soil scientist, a 50 metre path crosses the stand diagonally and is devoted to soil, with sections imaging different soils and information boards set up for each one. I read them all carefully and checked Claas really do know their Luvisols from their Nitosols and Phaeozems!

The only disappointment is that none of the hundreds of visitors around me are showing any interest because they are blinded by machine lust. It is a pity because the strap line was spot on: 'Optimum yields from all soils'. The soil display was exactly in-line with the brand image I took away, which could be summed up as 'We stay calm but are technically exciting and optimise performance through technological sophistication.' It puts engineering and science centre stage and I like it a lot.

From a business perspective, once again I was intrigued and impressed by AGCO's carefully promoted set of brands, each with a definite market segment. I reckon that works well in a fragmented and complex global market. The best projection of scale and power was by New Holland and Case and these stands were packed when I got there, including by young boys sitting in cabs actually controlling articulation. And for the exotic, nothing beat the Italians in cowboy hats on the Lamborghini stand.

Well I could go on and on because the tractor and combine stands were endless. Actually, as a Danish colleague remarked to me at tea time, all tractor stands are great because one can never tire of looking at tractors. And it was easy to see who was selling the most tractors, namely the numerous stalls selling models and toys for grown-ups.

Now let's walk around the hundreds of smaller stands.

It is shocking for a soil scientist to see so many powered harrows that literally pound soil to bits. It is encouraging, however, that one of the big current themes is soil management and the tools to process and incorporate crop residues and minimise soil disturbance. There appears to be a quiet revolution going on in the development of mulchers and crimpers and as a Bavarian visitor told me, "There are some interesting British innovations in cultivators", although the number of cultivator brands is large and the competition very keen.

Precision soil-plant interaction is not done yet and there is new attention to precise seed depth placement and efficiency - witness Deere getting a Gold medal for their high speed precision drill.

On we go, and here is a large crowd pressed several deep around the small Garford stand. They are transfixed by videos of mechanical inter-row weeding and have 'I am seriously interested in buying one of these' facial expressions. It looks like an export winner. There is, however, competition from Carre who have won a Special Mention award for their robot for hoeing.

Talking of robots, Energreen's tracked autonomous mowers look man enough to be useful in grassland agriculture and are definitely up to it for amenity management, although whether they can operate truly autonomously is not possible to discern from a static display. They do look handy for small and often steep-sloped grassland fields in Western Britain. And the Swiss also have something to offer: it's a fully articulated, low centre of gravity, tractor (the Rigitrac) with implements to match.

I was on the lookout for water management technology but only found one trenching machine for drain installation and although the irrigation exhibits were substantial, they were not exciting and strangely calm because they had hardly any punters on them. That contrasted with the area devoted to precision agriculture software which was buzzing and full of earnest demonstrators with hands on mice. Software demonstrations without real data are generally dissatisfying - but perhaps I moved on a bit too quickly.

Machinery were the main actors at SIMA but other things were important to note.

Firstly, many stands had job adverts pinned up for engineers and for sales representation outside France; I picked up a list of more than 100 current technician and sales position vacancies from SEDIMA (Syndicat National des Enterprises de Service et Distribution du Machinisme Agricole et des Espaces Verts).

Secondly, I saw little evidence of whole agricultural system thinking and its application. The focus remains on metal and machines, albeit with digital controls. In my view, increasing yields to match much higher future food demand while reducing Greenhouse Gas emissions and other environmental impacts requires a holistic application of biological systems engineering, supported by innovation of appropriate tools.

The current technological path that is just doing more of the same but better is not going to take us where we need to get. There may even be space for new global companies to emerge that embrace a truly ecological systems approach, if the existing ones do not wake up soon.

MANIFESTO 2015

A *Landwards* panel from across the industry put forward their proposals for an IAgrE MANIFESTO.

Measures that the incoming Government must consider to ensure the efficient and timely production of food, environmental concerns and care of the countryside.

Electioneering - ALASTAIR TAYLOR CEnv IEng MIAgrE, CHIEF EXECUTIVE, IAgrE

In case you hadn't noticed, we are in the run up to an election. 'Too close to call' say the pundits and to be honest it is quite difficult to predict what might happen although I have always had much more trust in the common sense of the electorate than those who speak into microphones outside Westminster Palace.

In this edition of *Landwards*, we have pulled together a few thoughts on what Agricultural Engineers would be doing were we in power.

Where do you start? There are all of the obvious things like cutting red tape for manufacturers, freeing up the bureaucracy which stands in the way of progress, and making sure that our businesses, both supply and demand side, can flourish in the global economy. This is much more than the Europe debate! In agricultural and associated engineering we have been operating in a global economy for a long time now.

A big issue for us is recruitment into the Agricultural Engineering industry. How do we persuade more young people to take up science, technology and engineering subjects? We know that our industry is exciting, stimulating, rewarding (although not always financially) and deeply founded in the traditions of providing for a hungry world. More needs to be done to persuade those people who influence young people's career choices - parents, teachers, careers advisors and the media - that engineering is a great career. This would probably be first on my own manifesto shopping list.

Then there is a roundup of engineering topics and solutions, and in this edition of *Landwards* we have tried to include a few thoughts from a few of our members.

Where do you start?

Soil and water management, reducing food waste, connectivity in order that we can harness the Internet of Things, engineering solutions to sustainability, precision farming technologies, the supply and demand of graduates, prioritised research. Every one of these is important, as are a whole range of others which we have not included.

I hope you find our various comments of interest. I am sure you have your own list of manifesto wishes. I hope we are able to look beyond the political rhetoric and that the next government - whatever colour - will meet at least some of your hopes and aspirations. I always was an optimist!

Fantasy Cabinet

I once worked with a very interesting guy - massive intellect - and one of these people with whom you could enjoy a great 'off-the-wall' conversation. There were two conversations I remember well.

One was around the question that 'were time travel possible, what point in history would you like to visit?'

The answer generally varied according the people around the table and ranged from the Iron Age at the one end, through to Crewe railway station at the height of steam power in about 1955. For the most part, people often opted for Victorian times and I would certainly concur with that in terms of what we would have seen had we been visiting a place like Lincoln, Ipswich or Birmingham. I think a trip back to the industrial revolution would have been fascinating (providing there was a return ticket to a place with modern dentistry!).

I also recall a very humourous conversation about who from history we would have around the cabinet table. The obvious names such like Jeremy Clarkson as minister of transport, and John Lennon as culture secretary often came up with a few more outlandish suggestions which it would be inappropriate to print here.

As I think about this now, it is obvious to me, that all you really need is a cabinet table comprised of Agricultural Engineers. We are creative, disciplined, inventive, cultured and resourceful. After all, it is only agricultural engineers who can keep things running when most other engineers would have committed them to the scrap yard. We are also frugal - we have to be for the customer base we serve - so that would mean we would be great as Chancellor of the Exchequer. As for education, we know what we want and if we don't get it from the centre, we sort it out for ourselves - take the Land-based Technician Accreditation (LTA) Scheme as an example.

As a discipline we are well grounded - perhaps it is our connection with soil - but more than anything, we have a common sense approach to the world and as such, I would definitely want a cabinet table of agricultural engineers. The world would be a much better place!

Come to think about it, any engineer would do. Looking at the current crop of politicians, do we have a single engineer, scientist or technologist amongst them? I am not sure.

Manifesto

Why the UK needs to and how this can be achieved

by
MARK KIBBLEWHITE
CEnv FIAgrE

BACKGROUND

The Society of the Environment (SocEnv) asked IAgrE to contribute a section on soil resources policy to its briefing for the General Election: '*Environment: Priorities for the Next Government*', which covers about ten themes relating to natural resources, energy and environmental regulation.

2015 is the United Nations International Year of the Soil and both nationally and globally there is increasing concern that soil resources have to be conserved better to underpin future food security.

IAgrE has joined the FAO Global Soil Partnership and we need to make sure that soil and water engineering are centre stage in policy developments, with a strong emphasis on targeted innovation matched by public investment in new technology and knowledge partnerships.

That is why the Executive agreed the following policy statement for inclusion in the SocEnv briefing, which was launched at the House of Commons on 16 March 2015.

INSTITUTION OF AGRICULTURAL ENGINEERS:

POLICY RECOMMENDATIONS:

- Agricultural land use should be consistent with nationally agreed land capability assessments that recommend uses that do not present unacceptable risks of soil degradation
- Farm soil management plans should include and demonstrate adherence to measures of proven efficacy that -
  - Sustain soil organic matter levels and where possible enhance them
  - Reduce the risk of erosion by avoidance of bare soil, including the use of appropriate cover crops
  - Prevent field operations when the soil is wet and the risk of soil compaction and other physical damage to soil is high.

CONTEXT:

Overarching policy aim

UK soils will be protected and where possible enhanced to provide a strategic resource to reduce future risks to food security and from climate change.

Policy objectives

1. Best and most versatile agricultural land will not be lost by further extension of the built environment and infrastructure.
2. Agricultural land use decisions will take

to protect soil better

full account of land capability including soil quality, ensuring that the stock of soil resources is not degraded by its inappropriate use for short-term economic benefit.
3. Excellence in the practice of soil management will be a priority on all UK farms.

RATIONALE

Soil resources support services of strategic importance, most importantly food production, but also water regulation that reduces the risks of flooding and inadequate water supply. Carbon sequestration is another key service provided by soils.

Global food security is threatened by higher demand from an increasing population, limited supplies of land and water for irrigation and by a slowing down of growth in agricultural productivity[1].

Climate change is expected to make matters worse - yield losses are forecast equivalent to as much as one fifth of current global food production by 2050[2].

The UK has limited but high quality agricultural soil resources. These are a strategic national resource for future food production that must be protected. Strong demand for development land is threatening this resource and this demand needs to be diverted away from the best soils, by re-use of already developed land and, where this is not possible, to lower quality agricultural land and soils.

Soil intercepts rainfall and moderates surface water runoff so that flood risk is lowered and aquifers are re-charged. This can moderate the impacts of higher winter rainfall, more intense summer storms and more frequent drought, all of which are forecast for the United Kingdom due to climate change.

The current economic costs of soil degradation are large and estimated[3] at about £1billion per year for England and Wales. Moreover, around 80% of these costs (such as those from increased flood risk from soil compaction and carbon emissions) are external to agriculture, which nonetheless is itself carrying very large soil degradation-related costs to production.

Without improved soil management, all these costs will rise due to climate change impacts. Public policy needs to set in place measures that support farmers to reach higher performing soil management that conserves soil resources for the future, while reducing the ongoing costs of soil degradation being borne by both the wider community and farmers.

This will ensure soil resources and conditions are ready to provide resilience to global food shortages and climate change.

Specific policy measures required

The Planning regime should protect all Best and Most Versatile (BMV) agricultural land (Agricultural Land Classification Grades 1, 2 and 3a)[4] from extension of the built environment, infrastructure development and minerals extraction. This will ensure that this strategic resource remains available for future food production.

The cross-compliance requirements relating to soil management that have to be met by land managers receiving agricultural subsidies under the reformed Common Agricultural Policy (CAP) rules[5], should be sophisticated and robust.

The existing requirement for soil management plans should be built on in terms of their efficacy and efficiency (by streamlining processes and adopting innovative technology to reduce transaction costs for farmers).

The approach should be one of being truly effective in the application of the CAP requirements, avoiding a simple focus on minimising requirements to the lowest level acceptable to the European Commission.

Better incentives are required to promote higher standards of soil management. Therefore alongside cross compliance requirements there should be public investment in product certification schemes and sector-led advisory and training initiatives.

Some but not all of the technologies and practices needed to achieve high performance soil management exist. Investment in innovation of smart tools and approaches is critical.

This should include exploitation of current and rapid advances in scientific understanding of the soil system, sensor technology, informatics and materials science, as well as more traditional soil management tools. The priority[6] should be to establish and maintain new regional innovation centres that trial and demonstrate leading edge practices and that are closely linked to farm advisors and form a connecting hub for farmer-led innovation and the sharing of best practice.

Primary agriculture is an unusually fragmented industry composed of dispersed operating units with small numbers of staff. The connectivity needed to support rapid and effective innovation that will reduce external costs of soil degradation to the wider community will not occur without policy interventions and this justifies public investment in a supporting innovation infrastructure.

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[2] IPCC (2014): Summary for policymakers, in: '*Climate Change 2014: Impacts, and Vulnerability. Part A: Global and Sectoral Aspects*', Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [**Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White** (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

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[4] Natural England (2012), '*Agricultural Land Classification: protecting the best and most versatile agricultural land*', Natural England Technical Information Note TIN049, Second edition 19 December 2012.

[5] Defra (2014) Common Agricultural Policy (CAP) Reform, *https://www.gov.uk/government/collections/common-agricultural-policy-reform*, last accessed 19 December 2014

[6] **Kibblewhite, M. G.; Deeks, L. K.** & **Clarke, M. A**. (2010), '*Gap Analysis on the Future Requirements of Soil and Water Management in England*', Final Report to Royal Agricultural Society of England.

Manifesto

Land-based Engineering

A powerful industry

by
RUTH BAILEY MIAgrE
CEO, AGRICULTURAL ENGINEERS ASSOCIATION

The AEA represents the UK's agricultural and outdoor power equipment industry which has an annual turnover of some £4billion.

The industry leads in innovation and design equipping the farming, local authority, golf, amenities and consumer sectors with the latest technological advancements. We are producing and managing far more (crop or area) with far less input and resources and our equipment is providing a leading edge in the sustainability of the environment.

The same application drivers for the technologies found in aerospace, defence and motor sports dominate the agricultural engineering sector including mobile diagnostics, remote sensing, big data, robotics, autonomous systems and precision applications. Our ultimate goal is to attain a sustainable intensification programme which promotes output without damaging the environment or our heritage - mechanisation plays a pivotal role.

For this to happen the AEA believes that it is essential that any future Government recognises the role agriculture and Land-based Engineering has to play in a long term growth strategy. The Association sees recognition as absolutely vital both in terms of the national economy in output and jobs (the Government has a clear role in this) and in the wider context of a European and world market place, a global society and a sustainable planet.

Like many players in the land-based industries, the AEA believes that a new Government must look to productivity and growth to bring about a healthy and wealthy economy which is able and ready to face the challenges ahead and take advantage of the opportunities a changing world has to bring.

We will never meet these challenges unless stable long-term policies are set down which bring about:

- A fair commercial environment in the UK for small and large businesses alike;
- The delivery of a long-term growth strategy which builds on the existing Agritech Strategy, bringing strategic connection research and development and industry;
- The recognition of the importance of skills in the land-based engineering sector and agriculture;
- Clear and appropriate regulation from Europe which balances environmental objectives with a balanced market for goods and production;

FEEDING THE WORLD

The global population is set to increase to 10 billion by the year 2050 but the area of viable productive farm land is decreasing at a rapid rate.

How do we feed the world with fewer inputs?

Facing this challenge equipment designers and suppliers are now working under new parameters and frameworks, where the need for optimum yield is balanced with a sustainable environment, with energy efficiency and health and safety as premier considerations.

A PROGRESSIVE INDUSTRY

This industry provides a wide spectrum of products which cover both professional and

domestic use.

Many products are highly developed. Electrics and electronics are being integrated into intelligent equipment whilst guidance systems are becoming normal. New fuel sources are being trialled. The prices of cordless products are now falling as battery technology improves making them available to an extensive consumer market.

However, like other sectors, the industry seeks a stable, favourable economic climate in which to operate and in which its customer base can make investment decisions. Major uncertainties such as the debate over our continued membership of the EU are not helpful.

ENVIRONMENTAL CONCERNS

Through greater engine efficiencies the industry has achieved a 97% reduction in NOx and particulates since 1999. This has been achieved at great expense and diversion of R&D funds that might arguably have been used more productively elsewhere.

This is a European debate but national government is encouraged to assist in ensuring appropriate targets are established. Our European body is seeking a delay of 6 months in the introduction of the extremely rigorous Stage V engine emissions requirements.

Precision application techniques allow us to reduce and vary input levels and decrease the release of greenhouse gases; compliance with the European Sustainable Use Directive the controlled application of fertilisers, pesticides and fungicides is thoroughly embraced within the farming sector and there is an industry-led partnership designed to reduce the release of greenhouses gases (the GHGAP).

Regulation of chemical ingredients on public health grounds may be desirable but it must be related to risk and based on scientific evidence. We need a balanced approach to legislation from Europe.

SAFETY

The safety of operators is paramount in designing equipment and extensive effort is made in participating in the development of international standards as well as contributing practical expertise to the detail of the regulation and legislative process.

Nevertheless farming in particular remains a dangerous industry and the AEA aims to promote good practice by engaging closely with Health and Safety measures with respective authorities to enhance awareness and prevention.

Local authorities and groundcare managers take their responsibilities very seriously and today offer comprehensive operator training, supported by the suppliers and dealers.

CORPORATE RESPONSIBILITY

Rural theft is problematic and the AEA has promoted the CESAR registration and identification system which has made marked equipment 6 times less likely to be stolen and 4 times more likely to be recovered.

In parts of our industry counterfeiting is encountered and non-compliance with standards is not unknown. Greater effort is required in surveillance and combating the importation of unapproved and often potentially dangerous goods.

Equipment used by consumers is covered by ever more demanding standards which the industry adopts but there may in some areas be limits to what can be achieved - as an example it is difficult to reduce lawnmower noise levels further when the limiting factor is the actual noise of the cutting process.

AN EFFECTIVE LOBBY

The AEA are effectively lobbying for what it sees as a sustainable programme of intensification, promoting output without damaging the environment and it aligns itself with several influential committees enabling the Association to have a voice with weight and influence.

These organisations include: CEMA - Comite European Groupements de Constructions de Machinisme Agricole; EGMF - The equivalent committee for OPE members in Europe; the European Garden Machinery Federation and ATVEA - All Terrain Vehicle European Association which looks after the interests of ATV and Quadricycles in Europe.

It is also very active in the UK, playing its part in EAMA - Engineering and Machinery Association; the VI - Voluntary Initiative - which is the UK's voluntary association of organisations which ensure that as a member state we comply with the Sustainable Use Directive; the EEF - the AEA is an Affiliate Partner of the Engineering Employers Federation; and IAgrE - the AEA represented on the Council of the Institution of Agricultural Engineers.

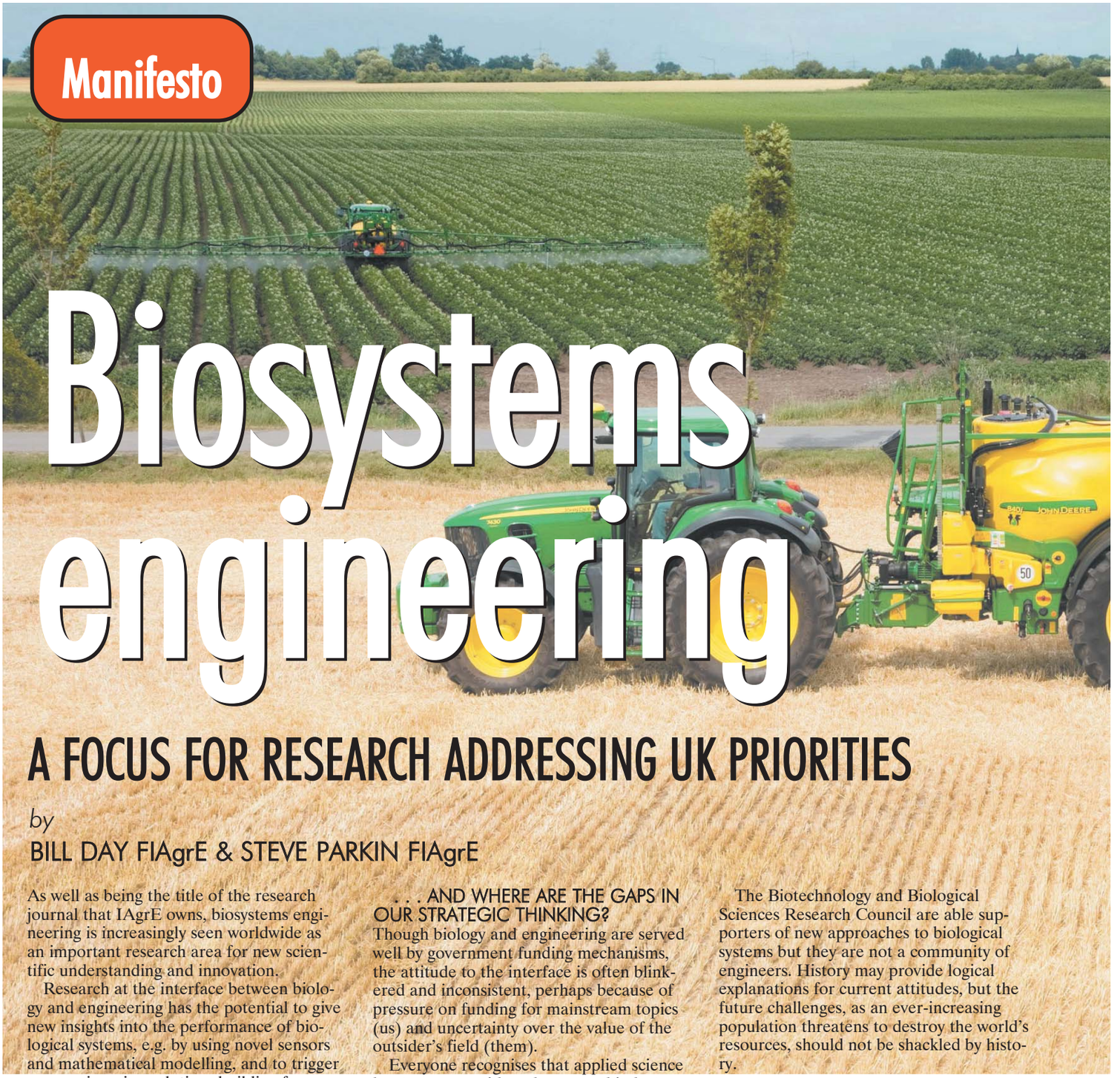
The AEA also provides the Secretariat for the Milking Equipment Association (MEA) - *www.milkingsystems.co.uk*.

So how can the future Government support our land-based engineering industry and enable it to reach the full expectations of the UK and global context?

The AEA asks the UK Government of 2015 to focus on the following fundamental issues within the UK and Europe to ensure a healthy UK land-based economy which plays a key role in a global environment:

- **Recognition of the land-based technology sector as an Advanced Engineering sector and integral to the Agri-tech Strategy as a driver and platform for growth;**
- **A business environment which offers access to finance for growth with reasonable terms and in a responsible context;**
- **Incentives for capital investment to be maintained, in particular the avoidance of any dramatic reduction from the current level of Annual Investment Allowance;**
- **Government initiatives which encourage British manufacturers to export and which provide adequate assistance to SMEs in promoting their products overseas;**
- **The recognition of the importance of public spaces, grounds, parks and sports areas in enhancing community life and as a fundamental part of a healthy society;**
- **A government that backs British farming and the provision of local produce;**
- **A government that fights for British farmers in the application of existing CAP regulations and backs their interests in forthcoming reviews of the CAP;**
- **The promotion of 'best practice' in farming with commitments from the Red Tractor and Farm Assured schemes to seek only LTA or Parloursafe accredited farms;**
- **The introduction of an increase in tractor/trailer train weights when associated with a voluntary testing regime;**
- **The continued support of Member state compliance with the Sustainable Use Directive through the Voluntary Initiative;**
- **Assured compliance of the Amenity sector with the Sustainable Use Directive;**
- **The recognition of the importance of skills in agriculture within the UK education system as a whole, promoting and providing a qualified and professional pathway for the UK's young people: Trailblazer Apprenticeships, Land-based Technician Accreditation (LTA) courses and University graduate engineers;**
- **The provision of an appropriate platform for research and innovation which ensures the continued advance and application of technology in the key areas of development including hybrid machines, robotics, drones and precision farming;**
- **The delivery of a long-term growth strategy which builds on the existing Agri-tech Strategy in looking for a strategic connection between industry and research and development;**
- **A healthy relationship with Europe seeking better market policy alignment, eliminating technical barriers to trade and reducing the cost of compliance**
- **Clear and appropriate regulation which balances environmental objectives with the market for goods and the need for food security - particularly allowing retention of essential plant protection products;**
- **Full backing of the prevention of counterfeiting and surveillance measures to deter non-compliance of foreign equipment.**

Manifesto



Biosystems engineering

A FOCUS FOR RESEARCH ADDRESSING UK PRIORITIES

by
BILL DAY FIAgrE & STEVE PARKIN FIAgrE

As well as being the title of the research journal that IAgrE owns, biosystems engineering is increasingly seen worldwide as an important research area for new scientific understanding and innovation.

Research at the interface between biology and engineering has the potential to give new insights into the performance of biological systems, e.g. by using novel sensors and mathematical modelling, and to trigger new engineering solutions building from the rapid advances in biological science.

More generally, it is widely recognised that research at the interface between scientific disciplines will be crucial for the major advances in the 21st century.

WHAT IS THE UK DOING WELL?

Nobody would argue with the statement that the UK is a strong player in international science in biology and engineering science. Successive governments have recognised that investment in underpinning science is vital both to the status of the UK and more importantly to economic advantage through innovation.

Equally they have also identified shortcomings in translation of science insights into practical benefits, and many new concepts have been wheeled out in recent years seeking to bring scientists and business together so that innovation can flow into practice.

. . . AND WHERE ARE THE GAPS IN OUR STRATEGIC THINKING?

Though biology and engineering are served well by government funding mechanisms, the attitude to the interface is often blinkered and inconsistent, perhaps because of pressure on funding for mainstream topics (us) and uncertainty over the value of the outsider's field (them).

Everyone recognises that applied science has to engage with end users and industry funding sources, but many of the challenges that fascinate scientists at this interface require underpinning science approaches to realise the opportunities for innovative applications. In many areas of applied science, our engineering community in the UK is encouraged to look at engineering in the context of real world problems.

Yet this is not the case in major priority areas of agriculture and the environment. If aeronautical engineering, why not agricultural engineering? The Engineering and Physical Sciences Research Council needs to reassess this.

If sustainable food production requires sustainable intensification of agriculture, then improved understanding of key processes through novel engineering science will be needed to spark off new innovations that can advance productivity or reduce impacts.

The Biotechnology and Biological Sciences Research Council are able supporters of new approaches to biological systems but they are not a community of engineers. History may provide logical explanations for current attitudes, but the future challenges, as an ever-increasing population threatens to destroy the world's resources, should not be shackled by history.

SO WHAT IS GOING ON THAT DEMONSTRATES VALUE?

There are many examples from around the world that show real benefits from getting this right (and the journal *Biosystems Engineering* would be keen to publish more at this interface):

- Though the science of modelling complex plant and environmental systems has been developed over many years, recent work in the Netherlands has provided the first real demonstration that optimisation of the engineering design of greenhouses can be soundly based on a thorough-going integrated mathematical model of crop, greenhouse structure and environment. Such an enterprise could now be used to link in other aspects of energy efficiency, pest management and environmental impacts as this energy intensive production system seeks to respond to environmental challenges.

> **There should be no room for hiding behind old clichés of agricultural engineers being blacksmiths or solely addressing tractor maintenance**

- High resolution imaging can provide critical information on the performance of complex biological systems - and there is little more complex than roots exploring the soil for nutrients. High resolution X-ray imaging has been developed and, opportunistically, has been used to provide quantitative information about the interaction between roots, the soil matrix and fertiliser particles. The information has the potential to validate and extend aspects of the modelling of plant soil systems, and to support critical analyses of ways to enhance the efficiency of fertiliser use and minimise risks of environmental damage.
- Computational fluid dynamics modelling linked to building design can provide low greenhouse gas emission solutions for livestock production at low energy cost. The challenge is to optimise the complexities of air flow for both optimal livestock environment and for effective handling of GHG and other gas flows. We are dealing with potent greenhouse gases like methane when producing a growing component of human diets worldwide, in meat and dairy products. Innovation is essential, as the 264 million dairy cows worldwide would tell you.
- New tools in physical science are providing methods to understand the flight patterns of bees and pests, and to interpret large scale data structures in ways that inform and open opportunities for precision management and control . . .
- . . . while new biological science is providing insights at a molecular and cellular level that will be translatable into new sensing and systems analysis tools

These kind of problems require an active interface between biological scientists who understand the quantitative performance of their systems, and engineers at the cutting edge of their craft.

WHAT SHOULD WE EXPECT GOVERNMENT TO DO?

The clear priorities set by governments over recent years recognise that food production is an international challenge and that sustainability of production must also address energy efficiency and environmental damage if we are to maintain the diversity of the planet's natural resources.

There should be no room for hiding behind old clichés of agricultural engineers being blacksmiths or solely addressing tractor maintenance. The presence of agricultural and environmental problems as test beds for new advances in engineering advances would be good for science, good for the problem owners, . . . and good for a widening education for young scientists in the challenges of the real world.

AND WHAT ABOUT THE REST OF US?

Well, complacency is not the preserve of governments alone. Research at an interface requires a strong relationship between quite distinct scientific disciplines.

We know the value that engineering delivers to the industry, but we must also open our hearts and minds to engineers that do not yet appreciate the challenge and opportunity of tackling such complex problems - and to biological scientists who know the beast, but perhaps don't realise it can be tamed by numbers and controlled by algorithms.

Manifesto

Opportunity knocks

with more sustainable business models

by
CAROLINE DRUMMOND
CHIEF EXECUTIVE OF LINKING ENVIRONMENT AND FARMING

A general election always provides an opportunity to embrace change, and to set out a bold vision for economic growth, a healthy population, environmental concern and a safe and happy country!

As Heraclitus once said, "big results require big ambitions", to really make an impact on the global, European, national and local challenges we face we are going to need a government with strong leadership, together with bold and ambitious plans to drive and deliver change.

For many industries in the UK, the paths for delivering more sustainable business models are relatively straightforward. However, for the food and farming sector it is made all the more complex due to our variable climate. Extreme weather creates challenges, as does our increasingly urban society, wanting richer diets while becoming less in touch with the countryside, meaning less knowledge, understanding and appreciation of nature, seasons and the environment, all of which emphasise the need for the food and farming sector to drive efficiency in a responsible way.

I firmly believe the next government should look to the farming industry as a real solution provider to many of the woes facing society.

While the space sector is often heralded for its innovation it is the agricultural machinery and engineering sector that have really got it stitched up. The inventiveness and adaptation developed over the years, such as by the members of the IAgrE, is something we should be really proud of.

The advancements in tractors and implements; the developments in our livestock sector, such as robotic milking, our capability to identify individual weeds in a field through satellite imagery; the use of drones and GPS; and more, provides us with the capacity to understand so much more about our soil, water and environment and it is critical going forward we build on these successes. Indeed, so many of the agricultural universities and machinery manufacturers have provided a real step change in how we farm and provide increasing evidence to ensure that we can embrace more sustainable agriculture.

At LEAF (Linking Environment And Farming) we develop and promote more sustainable farming through the adoption of Integrated Farm Management (IFM), the development of the environmental farm assurance scheme LEAF Marque, and the significant success of Open Farm Sunday - the industry's biggest event welcoming the public to discover more about farming.

To address the challenges of the future we need farming systems that are flexible and site-specific - IFM delivers just that, bringing together the best of modern and traditional methods. We need more enabling policies to support business to be more resilient in the face of weather and market volatility, as well as less of the restrictive regulations that curb the innovation and technology so clearly required of the industry.

The monitoring, evaluation and attention-to-detail, which are core to IFM, mean continual improvements in performance, resilience and profitability. IFM provides the framework where the interdependency of food production, both with crops and livestock has the environment at its core. Businesses farming to IFM principles use it as a means to make informed decisions to achieve productive farming while at the same time maintaining and enhancing the environment.

The site specific nature and the attention to detail demanded of IFM means farmers are using the best of traditional and the best of modern technology. Such practices include: precision farming; reduced and zero tillage; cover crops, good scouting of insects and taking action based on threshold levels; the development of field margins for both productive and environmental purposes, new skills and a hunger for knowledge; protection and enhancement of valuable habitats and key resources, including biodiversity, soil and water.

Moving forward there is a real opportunity to build on the industry's successes.

While crop and livestock production has made great strides in using new kinds of technology in its work, there is more we can do in conservation. There remains considerable untapped potential, and a growing need for dedicated technical expertise to help conservationist understand, adapt and deploy new and appropriate technologies.

Many approaches to conservation are fashioned within the framework of tradition and existing practices - more could be done to introduce new ideas, technologies and innovation. We need more monitoring and strengthening of the habitats we have created and to 'grow' conservation in a way that farmers grow their crops.

Precision farming is already used to identify and establish areas of high seed and nectar bearing habitats for birds and pollinators, drones are being used to identify elephant poachers in reserves, conservation drones have focused on gathering high resolution data to monitor the distribution of species in their habitats and we already exploit the use of biomimicry in crop protection, engineering, design and architecture. But there is more we can do.

WHERE DOES THE FUTURE TAKE US?

When the then UK Government's Chief Scientist Professor John Beddington in 2009 warned of a 'perfect storm' with food shortages, scarce water and insufficient energy resources threatening to unleash public unrest, cross-border conflicts and mass migration as people flee from the worst-affected regions, many farmers across the world listened hard as they summed up the pros and cons of increases to farm gate prices with crop failures.

The challenge for the future is to ensure that we develop farming systems that are truly sustainable and engage with the public all along that journey.

Many of the solutions to address future challenges lie with the food and farming sector. Smart and inspiring leadership is required to bring together resolutions for improved health, more resilient farming businesses and a thriving environment, together with a more engaged society. Joint policies across government are going to be needed, bringing together Defra with the Departments of Health, Education and BIS.

The future is challenging and there will be trade-offs, but what we would like to see in the election manifestos is bold and ambitious leadership to help build more sustainable farming through IFM and public engagement with food, farming and nature.

Get connected

The Broadband Imperative

by
PROF ANTHONY FURNESS MIAgrE, VISITING PROFESSOR
DR TOM NORTON AIAgrE, SENIOR LECTURER
ENGINEERING DEPARTMENT, HARPER ADAMS UNIVERSITY

Energy, food and water, essential needs for human existence, have been brought into sharp focus in the last few years by the global food security challenge; a challenge to meet the needs of an exponential growth in the world population, which is expected to reach 9 billion people by 2050[1].

This is a challenge directed primarily at the farming and food providers around the world, and made even more demanding by the need to consider solutions that favourably accommodate climate change, water shortage, and the burgeoning requirements for sustainable energy and growing competition for resources[2].

In meeting these inclusive challenges the need can also be seen for radical interventions, innovation and profound attention to engineering and technological developments as the means of satisfying them. The developments include the evolving Internet, the associated fixed and mobile Broadband coverage and the concept, and manifestation, of the Internet of Things (IoT) as an important enabling, multi-technology discipline.

Coupled with other radical and revolutionary general purpose technologies (GPTs), including solar energy and environmentally conducive technologies for ameliorating waste and environmental damage, these essentially information and communication-based developments are being seen to have particular relevance to the furtherance of modern farming.

With information and communications technology (ICT) now being viewed as GPT, significant open-source, Future Internet, enabling technologies in the form of cloud-based FI-WARE architecture is providing a powerful platform for agricultural development through the realisation of an optimally connected, 'totally connected' farm concept.

The FI-WARE enabling technologies encompass developments in -

- **Advanced Middleware and Web User Interfaces**
- **Applications/Services Ecosystems and Delivery Framework**
- **Cloud Hosting**
- **Data/Context Management**
- **Interface to Networks and Devices**
- **Internet of Things Services Enablement**
- **Security**

continues over

all of which have relevance to possible improvements in agriculture, food production, distribution and environmental management and, very importantly, reliance upon effective broadband coverage.

While total connectivity is also about physical, business and social connectedness, a very significant part is concerned with communications and broadband coverage.

Connectivity and integration are intrinsic features in the GPT developments and present the opportunity for optimising much of our production and economic capability, not least in farming. The 'Totally Connected' Farm concept seeks to define this opportunity and capability, while recognising 'totality' as a dynamic determined by economic viability aligned to economic needs.

Central to the communications connectivity are the provisions for coverage of 3G and 4G and super-fast broadband to accommodate the emerging potential in future Internet and Internet of Things, as well as other network and object-connected technologies in the network and object-connected portfolio, including WiFi, Bluetooth, Zigbee, radio frequency identification (RFID), 6LoWPAN and associated technologies.

Super-fast broadband is key to the total connectivity concept and yet the rural coverage is patchy at best and without sufficient attention to the potential it offers for agricultural and supply chain development in considering a totally connected farm concept and its importance in relation to food security.

A current inquiry into rural broadband seeks to examine the current coverage in rural areas together with newly introduced digital-only services. This is coupled with the UK Government aims to provide universal access to standard broadband (with at least 2 Mbps speed) and superfast broadband (download speeds in excess of 24 Mbps) coverage of 95% by 2017.

With the requirement that all applications for the new Common Agricultural Policy (CAP) schemes will have to be made online, a more immediate need is seen for assurance of broadband coverage and support for those who currently have no access facility and or no skill in using on-line facilities. The Rural Payments Agency is committed to providing "a range of additional support" measures in this respect. Despite these measures the need can be seen for a more incisive look at the rural and agricultural needs that go beyond the current inquiry.

> "Super fast broadband is key to the total connectivity concept and yet rural coverage is patchy at best"

Part of the existing problem of broadband coverage would appear to reside in the quasi-monopoly position of BT and an apparent limitation, expressed in the 2013 Rural Broadband Programme report[3] to provide "access to both the wholesale and retail markets, to the detriment of the consumer".

Commercial viability in rural areas has been an important consideration in the roll out programme and has seemingly presented a barrier for some agricultural and supply chain businesses. With the dynamics of technological change and opportunity now being presented in the Future Internet and Internet of Things, coupled with burgeoning and associated opportunities for acquiring and exploiting 'big data', the need can be seen for a radical reconsideration of commercial viability in the agricultural sector and with special attention to food security.

With local authorities contributing over £230 million more than was initially assumed by the Department for Culture, Media and Sport in its 2011 business case, and BT over £200 million less, BT is likely to benefit from £1.2 billion of public funding[4].

In view of the key importance of broadband to rural and agricultural development and seizure of the opportunities presented by ICT developments a critical need can be seen for government, in consultation with BT, and agricultural engineering representative organisations, to extend its rural inquiry and urgently address the significance and a potential that super-fast broadband presents for agriculture and food security as articulated in the 2011 Foresight Report[5] and reports from the Institution of Agriculture Engineers (IAgrE) and Institution of Mechanical Engineering (IMechE).

Moreover, it is urged that such an initiative should also encompass the opportunity to provide a supporting scheme for exploiting the superfast broadband in agriculture and associated supply chain developments, in conjunction with developments in 'big data', Cloud services, the Future Internet and the Internet of Things.

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[1] Food and Agriculture Organization of the United Nations - FAOSTAT - FAO Statistical Database

[2] **Foley. J A** et al., (2011) *Solutions for a cultivated planet, Nature*, 478, 337-342, Oct 2011

[3] The rural broadband programme Twenty-fourth Report of Session 2013-14: *Volume 1: Report, together with formal minutes and oral evidence Written evidence is contained in Volume II, available on the Committee website at www.parliament.uk/pacOrdered by the House of Commons* to be printed 11 September 2013

[4] Ibid

[5] **Beddington, J** (2011) The Future of Food and Farming, Foresight Report.

Update on HAU and what students really want from their Institution

The February Council Meeting took place at Harper Adams University and members were welcomed to the University by Vice Chancellor David Llewellyn.

David introduced the council meeting and talked about the University's role in promoting the importance of precision farming and the Agri Tech Strategy focus on food production. He commented that he felt the government was definitely more aware of the risk of not putting engineering on its radar - it sits at the heart of food security issues and this was one of his key priorities.

Upholding one of Harper Adams aims to promote agricultural higher education to the world he said, "We have achieved and work hard to maintain, the highest educational standards and are widely recognised for the quality of our provision. In the *Sunday Times University Guide* we were named University College of the Year for six years in a row and our performance placed us within the top 10 higher education institutions in the UK.

"Harper has had a long and proud tradition of working closely with the rural sector and we will continue to do so, to add relevance to our teaching and research and to act as a focal point for transferring research into practice. Some of the most pressing global concerns involve the future provision of food and the impact of climate change and the management of rural land and the environments. We believe that we make a vital contribution by producing graduates with the capacity to address these issues, helping develop those already in work who need to acquire new skills and by creating knowledge that will help the rural sector, its businesses and its communities to flourish."

The UK Science Minister heaped praise upon the university recently for its world-leading teaching and research, for its continuing focus on agriculture and for applying it to the cutting edge of technology.

Dr Llewellyn took this opportunity to talk about the University's work with the Marches Local Enterprise Partnership in the area of agricultural engineering where they are helping to deliver new jobs, increase research income to the University, forge new international collaborations and engage in new partnerships with industry, all of which are expected to help with local economic development.

"Young people can offer innovative high-tech skills across a range of sectors but perhaps they don't always realise what extraordinary opportunities exist in agriculture. Our job is to bring the two together for the benefit of all," Mr Llewellyn added.

Following the council meeting a variety of students from first years to researchers were invited to join members to discuss what membership and professionalism means to them and how the Institution can improve and retain membership.

"It was certainly a very frank discussion and very stimulating to hear higher education students expectations from membership," said Alastair Taylor IAgrE CEO.

One student said he never received any information about the Institution and failed to understand the value of membership unless it was to gain chartered status.

Member Peter Redman urged the students to think of the Institution as a community and that it was well worth investing time and money and that they had the power to make it what they wanted it to be. For many it has been the place to meet people, make contacts, network and develop careers.

Landwards came in for some critique too as the students said they would like to read more technical articles perhaps promoting how 'smart' some of the members were with what they had achieved and how technology is changing, wanting to read more about design and new innovations.

Alastair responded that a focus group was looking at the case for creating a magazine that would sit between *BioSystems Engineering* and *Landwards*.

Past President Andy Newbold warned that there was a need to be careful and not become too 'niche' oriented as the Institution has such a broad membership, representing so many landbased sectors.

Robert Fillingham, student council representative, who brought the group together, asked how the council intended to feed back to the students on the comments made and what action plans would be taken to move forward. Alastair replied that the Secretariat had a team meeting scheduled for 18th March where all the comments would be discussed and fed back to the Council. A comprehensive list of points and actions would also be compiled.

In the afternoon Council members were able to tour the engineering facilities, which included an update on the role of unmanned aerial vehicles in agriculture and developments in the control of weeds through the use of lasers.

MEMBERSHIP ENQUIRIES
IAgrE
The Bullock Building, University Way
Cranfield, Bedford MK43 0GH
Telephone 44 (0) 1234 750876
Fax: 44 (0) 1234 751319
e-mail: secretary@iagre.org
www.iagre.org

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MEMBERSHIP MATTERS

BRANCH REPORTS

NORTHERN IRELAND BRANCH

DEVELOPMENTS IN TRACTOR AND MACHINERY MARKETS

The November 2014 meeting of the Northern Ireland Branch of IAgrE at Hillsborough, Co Down centred on a talk on '*Development in Tractor and Machinery Markets*' by Michael Moroney, from the Irish Farmers Journal (IFJ)

Michael is an acknowledged authority on the agricultural machinery industry in Ireland having, until recently, been Machinery Editor of the *Irish Farmers Journal* for many years and he is a previous chief executive of the Farm Tractor and Machinery Trade Association (FTMTA) in Ireland.

During his career, he has regularly travelled internationally to shows, machine launches, research seminars and field demonstrations and is still closely involved with the agricultural machinery industry reporting through the Irish Farmers Journal on a range of agricultural machinery, vintage and motoring related topics.

He began his career with the IFJ after completing studies at Athenry Agricultural College before graduation from University College Galway (UCG) and University College Dublin (UCD).

Tractors

His talk traced developments in agricultural machinery from the 1970s when the expanded tractor ranges of the time were introduced.

They can now seem very basic when compared to today's models. Most tractors then had simple transmissions and innovations of the time like Multi Power, Select-o-Speed, Dual Power and Synchro were just appearing in a move towards giving drivers some 'change on the move' convenience. Although some of these tractors are still working examples in good condition are now valued as collector's items. Multi-ratio power shifts and auto or continuously variable ratio transmissions are now common.

Overall size and power has also steadily increased to the extent that 120hp plus is normal in Ireland for new tractors in response to the increased working width of arable / grassland machinery and a declining agriculture labour force. There is also a strong market for powerful, compact and manoeuvrable tractors, often with a loader, for use on livestock farms.

Although most tractors in the 1970s were 2WD front axle drive conversions were being offered by specialist manufacturers. Names like Roadless, County and Muirhill were associated with their versions based on Ford skid units. Massey Ferguson produced the artic-steer equal wheel 4WD concept with its MF1200 / MF1250 models until more powerful rigid-frame four wheel drive tractors, from them and other mainstream brands, became popular. Today most new tractors are supplied with 4WD.

Comfort and safety features have progressed with power steering and quiet safety cabs. The technical sophistication of some modern cabs means that they now account for about a third of the total cost of the tractor.

Transport role

Recognition of the amount of time spent by tractor / trailer combinations in transport work led to innovative vehicles such as the Trantor, JCB Fastrac and MB Unimogs. These vehicles have suspension and braking systems designed for faster towing and are also equipped to lift and power implements in field work.

The provision of a wider range of gear ratios on agricultural tractors has made faster travel speed possible. Cab and axle suspension has developed along with it. Higher trailer speeds mean that much more energy has to be captured during braking and initially some users expected the tractor to do most of it!

As the result of the inevitable premature wear on tractor braking systems manufacturers had to promote more effective trailer brakes to reduce excessive warranty claims. 40k and 50k transmissions are now popular even if legislation, governing speed on the road for agricultural vehicles, has been slow to keep pace. Recently this aspect has been resolved in Ireland by the adoption of new clear guidance in the form of the Revised Standards for Agricultural Vehicles to take effect from 1st January 2016.

Until recently the tractor market in Ireland for new tractors has averaged around 1,900 units per year and about 1,300 for used imports. There is also a significant market for new and used telehandlers / loaders.

Carrying heavier weights

The increasing size and weight of agricultural machines on the land has prompted the continuing development of tyres, with very flexible walls, capable of carrying loads at lower working pressures over a wider range of travel speeds.

The bigger tyres needed, especially on the larger combines, tend to excessively increase transport width so rubber tracks are now being used to provide a longer footprint. Although surface ruts can be minimised there is still concern about the long term effect of compaction lower in the soil profile and the cost of trying to correct it by cultivation.

This has increased interest in maintaining soil structure by the use of controlled traffic systems. In some countries, such as Holland, travelling gantries have been developed to carry implements over wide working widths between wheel tracks. The powered wheels swivel through 180 degrees for end-on travel on the headland and road. An example of innovation in Ireland to spread the load is the Co Tipperary developed Stealth slurry tanker fitted with a pivot drawbar so that the wheels track offset to those of the tractor in the field.

Another aspect of minimising soil compaction is to reduce the weight of individual machines. The use of a gang of smaller, lighter robot machines controlled by a computer program is now an option. The technology already exists for unmanned slave tractor units to follow one driver operated version in the field as has already been demonstrated in Germany. However, present legislation in EU Member States and the United States, may still be a barrier to its wider commercial adoption.

Electronics

This has been a major revolution in machine design enabling field data to be collected, stored and utilised in agriculture.

The Massey Ferguson Datatronic system introduced in 1980s was an early example. Field mapping of yield data collected by combines is now widely accepted in the arable sector along with GPS systems automatically controlling application rate on sprayers and fertiliser spreaders. Cameras mounted on programmed, unmanned, drones can record crop images from the air to monitor plant disease levels and nutrient status.

The most recent tractor cab information systems can accept and utilise data from tablets or iPads. Mobile phone apps can quickly provide up-to-date information for the operator. Fleet managers can now use telematics, such as those available from JCB, John Deere and Claas to monitor machine activities.

Electronics are also central to the operation of engine management systems in complying with the latest emission standards. The increasing numbers of engines using

selective catalytic reduction (SCR) technology for economy and exhaust gas treatment is demonstrated by the amount of urea based Add Blue fluid now being sold.

Some tractor manufacturers (such as Case New Holland) have also been testing engines using alternative fuels like hydrogen or methane (biogas). Hybrid designs, based on a generator and electric motor(s) will become more common on mainstream tractors. Electric drive power outlets to power and control machines like fertiliser spreaders and sprayers without the need to route mechanical drives to individual components are already an option with John Deere and Fendt tractors.

Manufacturing

The biggest companies now work on the basis of a world market and modular designs are common. To exploit the unit cost benefits of scale of production components like axles and transmissions (e.g. GIMA and ZF) are designed and shared, even if the end products are marketed under competing brand names.

Engines from manufacturers like Deere Power Systems (DPS), Fiat Power Train (FPT), AGCO Power (Sisu), Kubota, Perkins, Deutz and others are widely shared, and other components are increasingly contracted in from specialist suppliers. Brand acquisitions still occur, such as Kubota's take-over and imminent re branding of the Kverneland / Vicon group ranges. They are also building a new tractor factory in France.

Some customers still do not see all the new electronic management options on tractors as a priority. The used market still caters for much of this demand and basic brands from China and India have appeared but none have yet achieved significant market share.

Major manufacturers are also responding to this market sector. For example, AGCO has recently announced its Massey-Ferguson MF2700 / MF4700 ranges which will be built as both whole tractors and components in their new factory in China. This will network with their plants in Brazil, India and Turkey for the world market. The tractor specifications will vary from basic platform through to safety cab versions according to local demand.

New agricultural tractor prices have tended to increase steadily during the last 10 years. By comparison, mainstream car manufacturers seem to have managed to keep their prices relatively steady in real terms.

Other market trends

Round baling and wrapping is a sector in which Irish manufacturers like McHale have established a strong international reputation and market share. European manufacturers like Krone already have or intend to develop 'non-stop' balers.

Some Big Square balers can now print bar-coded labels with details such as crop type, dry matter and harvest date as part of the information system for food traceability within product quality assurance schemes.

The development of high capacity self-propelled forage harvesters in Europe, partly driven by demand for short-chopped crop material to feed anaerobic digesters, continues with the Fendt Katana as the latest example alongside the existing ranges from Claas, John Deere, Krone and New Holland. Engine power management systems which reduce fuel consumption when working in light crops, during headland turns and for road travel, are already popular. The latest machines have options such as Infra Red sensors to monitor crop condition and can measure / map yield on the move. It may not be long until the on-board computer can compile and transfer account invoices directly to the customers' smart phone or tablet.

Self-loading forage trailers (SLFTs) first appeared in Ireland during the 1980s. Since then, improved higher capacity versions have won a new market share as a versatile and fuel efficient system suitable for a small team taking multiple cuts. Chop length has improved and is less critical with most clamp silage now taken out by shear grab. In some areas contractors operate multiple SLFT teams.

In Ireland, the number of silage cuts, taken per season, varies between areas. Intensive dairy enterprises may take 5 or more compared to other enterprises where the average is 1.6.

Some of the larger cattle units are "zero grazing" (direct cutting and hauling of grass to the housed animals) and there are specialist machines built in Ireland for this purpose.

Engineering innovation in Ireland

There is a natural practical interest and ability in rural Ireland to solve agricultural engineering issues and this innovation shows itself in the form of many home-grown successful brand names supplying both home and export markets.

Irish brand names are well represented not only in fields such as slurry handling equipment, balers / wrappers and tractor hitches but also specialist items like Cross Engineering's Elephant Beet Washer. This mobile high capacity unit has found a market in Europe for washing fodder beet being fed to anaerobic digester energy plants. Another example is the Farm Hitch system for remote implement connection(from Glenn Cruickshank of Co. Monaghan based Shanks Engineering). As well as securing the implement, the hydraulics, PTO and road lights are all connected without the driver having to leave the tractor cab.

The branding of Irish food

The agrifood industry in Ireland is a significant export earner and the publication of the official Food Harvest 2020 document sets out the national vision to maximise its role.

L-R: Terence Chambers (branch chairman); Michael Moroney (guest speaker); Padraig O'Kane (branch vice-chairman)

The Brand Ireland concept seeks to maintain a sustainable industry with good environmental stewardship. A large part of this centres around the natural wholesome image of grass- based food production systems and this vision document concept aims, amongst other aspects, to take full advantage of it for both home and export markets.

Origins of the IFJ

These go back to the Agricultural Trust and Macra Na Feirme (the Young Farmers organisation) during the mid-1940s. The John Mooney Trust set up the IFJ with the aim of providing relevant, unique and useful information to the agriculture industry. Its subject material was and still is presented by specialists for each enterprise to present the most up-to-date and accurate information to the readers. It is available in both hard copy and electronic versions and video-based information is presented on line via outlets such as YouTube.

The Journal has top sales, within the agriculture sector across Ireland, of 72,000 copies sold each week. More details of its range and subject areas can be viewed on *www.farmersjournal.ie*

Discussion period

Michael's presentation created a lot of interest around the topics presented and the following discussion session showed how much the audience had enjoyed and appreciated it.

Examples of the areas explored in more detail included:-

- Price increases on tractors and machinery compared to mainstream car brands.
- User and dealership implications for the increasing complexity of machine management systems
- Why do tractors just seem to get bigger?
- Is legislation in Europe and its interpretation a negative factor in the progression of agricultural engineering developments?
- Reorganisation of dealer franchises with regard to specialist diagnostic service cover

The chairman thanked Mr Moroney for coming back to visit the Northern Ireland Branch and for his most informative and enjoyable presentation.

Terence Chambers

WESTERN BRANCH

LECTURE REPORT - 'THE DESIGN AND APPLICATION OF MAN MARINE ENGINES'

Andrew Mellard, General Manager, Engines and Components, MAN UK, Lackham College, 12th November 2014.

The second Western Branch lecture of the 2014-15 season held at Lackham College was attended by around 13 members and guests. The lecture had been organised by ex Western Branch Chairman Nick Handy who also works at MAN UK in Swindon.

MAN have been part of the Volkswagen group of companies since May 2013 along with companies such as Audi, Seat, Skoda, Lamborghini, Porsche, Scania and Ducati. Overall the group has a turn over of around 200bn Euros per year. Andrew mentioned that the Volkswagen board prefer each individual division to compete in their respective markets and therefore there was little co-operation between MAN and Scania either in Truck, Bus or Engine products.

MAN itself had a turnover of 8.3bn Euros in 2013 and is mainly comprised of the Truck division, Bus division (MAN and NEOPLAN brands) with the engine division being worth 5% of the total turnover. Engine production, R&D and sales functions are headquartered in Nuremburg, Germany - the 'N' or 'MAN'.

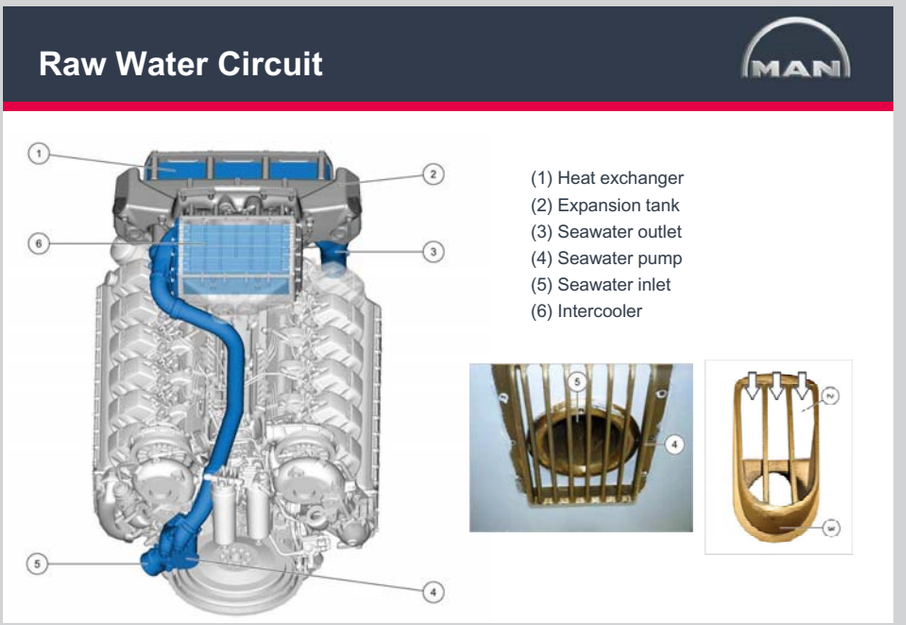
The engine range starts at 137kW and goes up to 1328kW and are built on two main production lines. The main line is for the volume truck and bus engine range producing between 40,000 and 50,000 units per year. The second line is for the marine and industrial range where smaller volumes are built on Automatic Guided Vehicles.

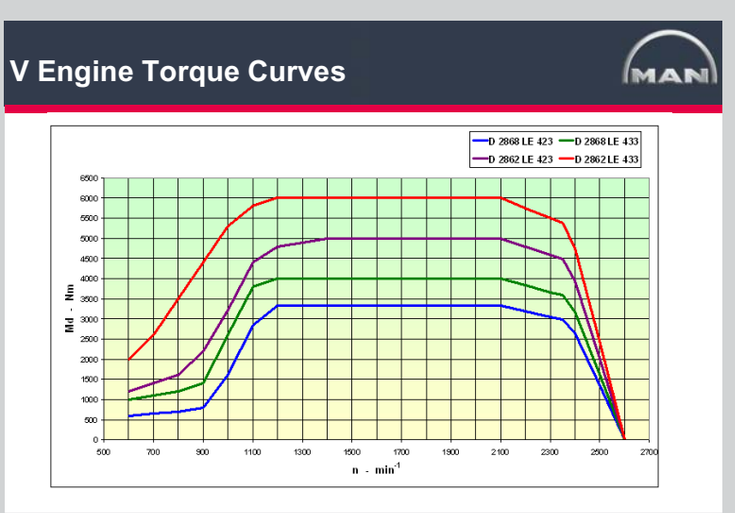
Every marine and industrial engine is tested whilst, due to the higher volumes, the truck and bus engine are dry tested in batches using amongst other techniques a laser process to measure for out of tolerance vibrations. In some instances the marine engines are witness tested by the class societies such as Lloyds or DNV as the engines are to be used in passenger carrying vessels.

The largest UK customer is Sunseeker International in Poole, manufacturers of luxury yachts. A typical example is their 55' vessels with an installed power of 1600hp which gives a maximum speed of 34knots.

Another commercial customer is Supacat in Devon who build wind farm support vessels to get supplies and technicians to the turbines as fast as possible. Demand for these is currently high with around 50 vessels per year being built. These are capable of up to 28knots.

One of the main design constraints of naval architects especially in the luxury market is the physical size of the engines for a given horsepower. The smaller the engine the more room there is for cabins, galleys and other communal areas of the vessel. Also light weight is another feature which an engine supplier can use to his advantage when tendering for a new vessel build. MAN engines have a low weight vs output power figure against their competitors.





The power rating of the engine will be based on the duty cycle expected, for example a light duty application can use the same engine as a heavier duty application but set at a higher power rating. Light duty is designated as spending less than 20% of its time at full power, medium duty is less than 50% time at full power and heavy duty would be up to 100% of time at full power. Therefore the same engine could be rated at a higher power in a luxury yacht than in a wind farm support vessel.

Technical features of the engines include air to seawater type intercoolers rather than the more common air to air. This same 'raw' water is then used to cool the engine coolant, via a heat exchanger, gearbox oil, then finally the exhaust gas with the use of an exhaust spray head before passing overboard.

In the past 5 years the pistons have changed from aluminium to cast iron which results in an increase in Mean Effective Pressure from 23Bar to 28Bar hence increasing the power output. Multi-stage turbos plus multiple intercoolers are used on the highest powered engines as a way of reducing turbo lag and increasing performance.

With MAN using common rail technology 'diesel knock' has been reduced by having a pre injection stage in the injection process and the engine mapping being designed in such a way that maximum torque is available from low rpm, which is a major selling point for MAN over there competitors (see attached)

Richard Robinson of Autoguide Equipment summed up the meeting and gave thanks to Andrew for his lecture.

Rupert Caplat

WEST MIDLANDS BRANCH

THWARTED BY THE SEA, OR HOW THE UNEXPECTED CAN INTERRUPT A WORLD RECORD ATTEMPT

9th December 2014

Dean Cottery of Claas UK gave an introduction to the talk about how Claas gained the world record for the most wheat harvested in an eight hour period.

Well, it takes a lot of organising including help from the manufacturer both in equipment and supporting staff as well as very experienced combine drivers. A key part is locating where the crop yields are most 'efficient' and that was in England on the eastern side of the country where there are also suitably large fields.

Whilst there are good wheat yielding areas elsewhere in Europe the specific density of the crop over here was that important little bit better. Included in the organisation is a very enthusiastic farmer with a lot of crop ready to harvest and the farm buildings to receive it at speed plus a suitable weighbridge. This particular record attempt also included five tractors and trailers.

Claas had tried a few years previously but after five hours it started raining and so the attempt had to be abandoned. This time they hoped it would be better!

All the equipment had to be fully prepared and this included fully fuelled tractors which had been pre-weighted. This meant that the whole tractor and trailer could be weighed to save time recording the yield. The Guinness book of records people sent an observer and and insisted upon an independent expert to oversee the technical operation. In this case it was Bill Basford who had until recently been a crop mechanisation adviser with ADAS.

Although the Guinness observer had little knowledge of combine harvesting they were there to observe that the correct procedures were followed according to the stringent conditions for work. Bill explained the independent nature of his invigilation, looking at and checking all the aspects of combine performance and parameters used in verification regarding claims for the world record.

Combining started at 10.00am when they were confident all dew had gone and after a hectic 8 hours they had gained the world record and were proudly presented with the appropriate certificate.

The farmer then encouraged the team to keep going and see if they could gain the most harvested grain in 24 hours. By this time we, the audience, were getting excited by the 'thrill of the chase'. But it was not to be.

The selected farm was in Lincolnshire and only six miles from the sea and as the pre-dawn sea-mist rolled into the fields the straw became too damp and so after nearly 16 hours the record attempt had to be abandoned.

Since then New Holland managed to gain this coverted eight hour record. So will Claas regain the record?

We now know a lot depends upon the growing conditions and that we know is very weather dependant. So let's keep our fingers crossed for 2015!

William Waddilove

SOUTHERN BRANCH

BROOKLANDS VISIT

A interesting and very enjoyable visit was made to Brooklands by 23 southern members.

We went first to Mercedes Benz where we were dazzled by the luxurious three storey venue where top-of-the-range Mercedes cars and accessories were on display as well a replica of the first Mercedes ever made.

Also there was a modern Mercedes Formula 1 car with each of its component parts suspended from the roof above by near invisible ties, rather like an exploded diagram.

We admired and touched a Mercedes Formula car displayed in a prime position It was driven in the 2014 Malaysian Grand Prix. We were taken around the exhibits by an excellent guide who made the visit truly memorable.

Lunch was taken in the top floor restaurant which overlooked the old race track and Mercedes being driven on the test track and skid pan.

In the afternoon another guided tour took us around the range of old Brooklands race track buildings and the famous banked track The site was built in 1907 and is the birthplace of British Motor sport and aviation. It is the home of Concorde and the site of many engineering and technological achievements since the beginning of the last century.

Pride of exhibits was the 24-litre Napier-Railton giant racing car. There is a unique collection of Vickers and BAC aircraft plus WW2 Wellington bomber also a BAC One - Eleven, VC10, Viscount and of course a Concorde. We did not have time to visit the London Bus Museum.

In fact there was so much to see and do one day was not enough.

Denis Welstead

WESTERN BRANCH

VISIT TO GREENMECH

On 28 January 2015 members and guests of the IAgrE Western Branch visited the premises of GreenMech Ltd at Kings Coughton Warwickshire.

The visit began with a welcome from GreenMech's Chairman, Tony Turner, before a company and product presentation by Martin Lucas, Sales Director. Tony has a long career within the engineering industry beginning as an apprentice to Douglas Bomford before founding his own engineering group over 50 years ago.

Martin began with the history of the company which had been founded by Tony over 20 years previously, which has now grown to become the largest chipper manufacturer in Europe, employing over 85 staff and producing over 1000 chippers and shredders per year. The site at Warwickshire has 65,000sqft of factory space and the company also has warehousing facilities and sales operations in France and Germany.

The company operates a wholesale business model in the UK, preferring to go to market through a network of dealers who take care of retail sales.

Martin talked about the growth of chipper use which is attributed to various factors which include a 6:1 reduction in bulk volume and the reduction in the need for burning. He then gave the group an overview of the company's product portfolio from the CS-100 to the ArbTrak 190 which can handle forest debris from 100mm to 190 mm diameter respectively.

We also saw the SAFE-Trak which is a self-propelled tracked chipper with the ability to be levelled so that it can work safely on inclines up to 35 degrees.

GreenMech's machines have many benefits which include amongst others: reduced noise, letterbox aperture, excellent quality control and a rather ingenious patented disc blade system.

After the presentation, Martin and his colleague Spencer Southall, Technical Support Manager, then gave a tour of the factory. This was an excellent tour covering the whole process of machine production from initial fabrication of raw materials using laser profiling and welding, through the powder coating facility and final assembly. The group were also shown the drawing office where GreenMech's product range and designed.

The group were also fortunate to see a machine demonstration where the latest in chipper technology made short work of chipping some tree branches.

At the end of the visit Richard Robinson, IAgrE Western Branch Committee Member, gave a vote of thanks to Martin, Tony and Spencer, and all present agreed that the visit was most enjoyable.

Nick Handy

WEST MIDLANDS BRANCH

'GLOBAL FOOD - WASTE NOT, WANT NOT'

Speaker, David Williams

David William besides being a branch member is an associate consultant with Reading Agricultural Consultants Ltd and he deals with agricultural machinery and crop storage issues.

He has worked extensively overseas advising on storage management and distribution and how food can be better used.

His talk was in four parts.

Firstly some statistics about the amount of agricultural land that was available and how much was in use or could be used and how much was being lost and then how many people there were now and would be in the future.

The second part was related to 'food losses'. This was food that was grown or produced and then 'lost' before it got to the consumer. This was illustrated by examples; Food grown to excess or unable to be harvested or even was harvested but could not be dried adequately or kept in poor quality stores or even one example a whole train load of grain he saw which was produced in Russia and due to not being dried adequately when it reached the hotter south had sweated and mouldy and gone completely beyond any use. Often these problems were because of the need for reliable or adequate power supplies. Examples such as canning used a lot of power at processing and little later, whilst cold stores need less power but in very reliable way for a long time. Often the supply was just not there. This was also coupled with need for water and most water for processing needed to be 'potable' but the production was often in areas where there was little water. Some of the problems were political examples including food produced in the Palestinian areas but held up by having to pass through Israel or Afghan lorries not being allowed into Pakistan

The third part; 'waste' he saw as being different and that was food that was 'on the shelf' ready for eating or taken by the consumer but by being in excess or for other reasons was then dumped. One example was the over diligence on imposing 'use-by' dates, excessively strict supply contracts or excessively strict grading whereby 'out-graded' food was dumped and not even sent to secondary uses like anaerobic digesters.

And the solution? Some were mentioned. Designing solar drying ovens of size appropriate to the production areas, ensuring that projects had the infrastructure to support the project and even basic tasks like ensuring a grain store had good roofs, gutters and was kept bird and rodent proof.

In some way the talk was depressing in that we were made aware of how much need there was for food and yet how much was lost before it met those who needed feeding. However some of the encouraging points were that if a lot less was lost or wasted it would go a long way to reducing world hunger.

Much of this presentation was based upon a report he helped prepare for the IMechE (pictured left).

William Waddilove

SOUTH EAST MIDLANDS BRANCH

UAVS & REMOTE SENSING FOR AGRICULTURE - USEFUL TOOLS OR SIMPLY TOYS?

This was the 'seasonal' question posed by Cranfield's Dr Toby Waine at the end of his presentation to the South East Midlands Branch on 1 December 2014.

Unmanned Aerial Vehicles (UAVs) are all over the media, leading to a recent explosion in their use both for research and commercially, across many industrial sectors. Yes, they are brilliantly engineered bits of kit, but can they add value to crop production systems? In his presentation, Toby examined the technical capabilities of UAVs within the context of commercial farming, presenting results for field trials conducted last summer on lettuce and onion crops.

Toby's talk concentrated on the sensors for which UAVs simply provide the platform for their deployment. He gave an illuminating background to alternative sensors and the levels of resolution that are possible from satellites, conventional fixed wing aeroplanes and UAVs. He also described the research going on to improve the correlation between different spectral responses and the underlying physical attributes of whatever one was wanting to sense at ground level.

He also highlighted the continuing importance of Normalised Difference Vegetation Index (NDVI) as the underlying standard by which soil is differentiated from crop. This was developed in 1973 for use with the first satellites and has stood the test of time - although other indexes can be used for specific purposes. Optimum results are obtained in full sunlight and when there is about 50% crop cover up to canopy closure.

So, the ability to use NDVI is limited by (our more typical) cloudy conditions, and UAVs by only being permitted to operate within 'line of sight'. With UAVs there is also considerable trade-off between payload, sensor quality and coverage. The higher the quality of sensor, the probable greater payload (particularly if a gimble mount is required to keep the camera steady) while the maximum height allowed by the Civil Aviation Authority (CAA) is limited to 120m (400ft), meaning coverage is confined.

The implication of confined coverage and high payload is that battery-powered UAVs have a limited flight time (many only about 15 mins), so many hours could be spent acquiring data from just one large field!

Add to this the processing time required for compiling and analysing multi-overlapping frames and limited availability of multi-spectral sensors, and one has a system that might initially look promising in reality but has some serious shortcomings. This could change of course with improvements in technology such as the development of 'structure from motion' photogrammetry software which has transformed multiple frame processing time, so it is hours now rather than days for results to be displayed! Improvements in battery life and size, as well as hyper-spectral sensors and lens technology, will also enable further development and wider use of UAVs for remote sensing.

However, the technique has been used successfully to target closer, land-based examinations of crops in hostile environments - such as measuring potential yield of opium poppies, where it has the additional benefit of reducing the risk of ground surveyors getting shot, and consequently reducing the cost of military interventions! It has also been used in rather more benign situations (and crops!), such as on lettuce and onions in the Fens.

Our interested and intrigued audience challenged Toby with plenty of questions and suggestions for other areas where the sensor technology could be used- even if not using UAVs as the platform. For example, in measuring growth stage of cereal crops from sprayer booms. Estimating actual and potential soil erosion was also suggested.

Toby gave us a fascinating glimpse behind the scenes which on the one hand demonstrated the huge developments which have already occurred but also the need for even greater advances in technology (and legislation) to allow UAVs to become much more than just an exciting toy!

Tim Chamen and Alan Plom

EAST MIDLANDS BRANCH

WINTER 2014 / SPRING 2015 PROGRAMME

It is hard to believe that our Winter 2014 / Spring 2015 programme is almost over.

Since the last report we have attended the IET/EMESP, Prestige Lecture, (held November 28th) which was in lieu of a December meeting. The lecture was entitled '*British Motor Sport: Engineering the Future*' and as per usual the members who attended enjoyed a very interesting and informative evening.

Following that we reverted back to our meeting on the second Tuesday of the month format, and have enjoyed the January and February meetings.

January 13th, at quite short notice Brian Knight of Knight Farm Machinery Ltd hosted the meeting at his factory. Brian gave a superb presentation detailing the family history, (proving that his ag eng talent really is in the genes), as well as the present and future of the company, followed by a tour of the factory. A very interesting and informative evening attended by some 36 members, guests and students.

February 10th the branch visited Household Sprayers Ltd, and again those who attended enjoyed another superb event. The team at Househams split us into small groups, and each group received detailed explanations of the major departmental roles within the company. The evening ended with a Q&A session whilst making the most of the super refreshments provided.

So, 2015 has got off to a terrific start. We really have had two superb visits and we thank them most sincerely for taking the time and trouble in having us. We really are so lucky in having such hi-tech, go ahead companies in our region.

I can't believe there is only one visit left this session. More details of this and our AGM will be found under the EVENTS section in this issue of *Landwards*.

Richard Trevarthen

NORTHERN IRELAND BRANCH

THE SLURRY GAS PROBLEM - AN ENGINEERING PERSPECTIVE

The Northern Ireland Branch recently convened a meeting to learn something of the science of slurry gas production and hear about the latest research from the AgriFood and Biosciences Institute and Teagasc on this important issue.

The Institution members and guests then considered what more can be done to reduce the risks for farmers and contractors, with a particular emphasis on improved engineering.

A comprehensive report of the proceedings has been produced and is available to download from the NI Branch page of the Institution's website *www.iagre.org/brgp/15*.

All those regularly mixing and pumping slurry from livestock houses, and especially those involved in education and the promotion of improved health and safety in agriculture, are strongly urged to obtain and read this report. The information contained in it will inform all involved and help to ensure that slurry is mixed and pumped as safely as possible.

Future Challenges

Following on from this useful meeting the Northern Ireland Branch of the Institution wishes to place the following challenges before the industry and those agencies and Departments with influence and responsibility for improving the health and safety of the workforce.

EDUCATION AND GUIDANCE

Challenge 1. Communication

To deliver communication of a clear unequivocal message effectively to those people mixing and working with slurry.

The message needs to be simple and communicated in a way which is innovative and professional, making effective use of social media and other cost-effective methods.

The message must be realistic and aimed at reducing risk to acceptably safe levels, rather than eliminating it entirely.

Challenge 2. Monitors

To produce clear guidance on the ways in which monitors can be used to enhance safety.

These devices are now comparatively cheap, convenient and readily available but have their limitations. Current guidance on monitor use should be reviewed in the light of recent technical developments.

Challenge 3. Face Masks and Emergency Hoods

To produce clear guidance on the selection and use of Face Masks and Emergency Hoods during slurry mixing operations and emergency situations.

The improved design, availability and relatively low cost of these items needs to be taken into account in developing practical guidance to the industry. It is the view of this IAgrE Branch that appropriate filter masks and emergency escape hoods have a place in providing a back-up to safe working practices and that provision of realistic guidance will accelerate their adoption.

Challenge 4. Course content and availability

a) To review the content of all relevant education programmes - not just safety courses - to ensure that the safe handling of slurry is adequately addressed.

b) Training needs to be provided by suppliers and/or educators on the safe use, care and selection of monitors, face masks and emergency escape hoods.

> . . funding invested in research in the topic of slurry gas on farms and the promotion of safe systems of work needs to be increased

RESEARCH

Challenge 5

Provide funding to augment and verify existing work which suggests that intermittent low volume aeration systems offer high levels of safety as well as management advantages for slurry storage and handling.

Research at AFBI and Teagasc strongly suggests that intermittent low volume aeration systems offer high levels of safety as well as management advantages. The existing work needs to be validated and extended to provide confirmation and confidence in a wider range of situations and establish design parameters for the equipment.

Overall the funding invested in research on the topic of slurry gas on farms and the promotion of safe systems of work needs to be increased.

ENGINEERING

Challenge 6. Design of new livestock housing

a) Ensure that high levels of ventilation at slat level are provided over all slatted tanks.

Thorough ventilation at slat level must be provided in all houses - if this cannot be done through large doors at each end then fans should be used. e.g. the T Mac-Safeair-Unit. Portable electric fans are also available.

b) Ensure that safe slurry systems are an inherent primary element of the design brief for all livestock housing.

IAgrE question whether simple deep slatted tanks, even with outside mixing points, can in many cases provide a sufficient degree of safety. Either scraping into external stores or using bubbler systems in tanks beneath slats should become the design norm.

Increasingly, systems need to be capable of safe slurry mixing and removal in situations where stock are housed all year.

Challenge 7. Retrofitting intermittent low volume aeration

Stimulate development of intermittent low volume aeration (bubbler) systems which can be installed from the top into existing tanks.

Many deep tanks exist without outside mixing points. Modification to allow outside mixing can be expensive and requires complete emptying of the tanks. Current bubbler systems also require tanks to be completely emptied for safe and effective installation. The ability to retrofit bubbler systems without having to empty tanks and remove slats would be a major advantage.

Challenge 8. Robots and remote working

Stimulate the application of cost effective robotic systems for mixing slurry and monitoring gas levels in houses during mixing.

The issue with both current pumping systems and gas monitors is that they both require the operator to be in the danger zones when being operated. With robots now used in many aspects of agriculture, from slurry scraping to milking, it should be possible to develop robotic systems that can carry remote sensors as well as being able to observe and operate jetters remotely. To do so at reasonable cost will be the core of the challenge.

Challenge 9. Funding of safety improvements

Generate the political and policy enthusiasm to use existing funding streams such as the rural development programme to support programmes to enhance slurry management safety.

The NI rural development and capital funding programme now under development, provides a good opportunity to allocate funds to address the serious slurry gas problem through the proposed Business Investment Scheme and other funding streams.

While large sums are being provided to fund environmental enhancement and stimulate economic growth, no less importance should be given to investments which improve the health and safety of those who live and work in the countryside.

In the context of reducing the risk of farm accidents involving slurry gas, the IAgrE NI Branch believes that work should progress on two fronts.

i) On-farm improvements should be funded to enhance the infrastructure - very much along the lines of the recently announced Farm Safety Scheme in the Republic of Ireland.

ii) Consideration should also be given to funding a scheme to utilise the extensive design capability, experience and expertise within the local slurry equipment manufacturing industry to develop innovative solutions. Support will need to be generous to overcome the concern that the returns from the market will be insufficient to justify the investment involved in research and development.

Terence Chambers

The main speakers at the event.
L-R: Dr Jim Stevens; Dr James Browne; Mr JJ Lenehan; Dr Peter Frost

OBITUARY:
Frank Moore

Francis Pepys Dure (Frank) Moore, one of the lawnmower industry's leading innovators has died at the age of 90.

A war veteran, Frank served with the 1st Airborne Division and took part in the Battle of Arnhem in 1944.

On demobilisation he started work with Rotary Hoes' distributor in Surrey. After some farming experience he became a spreading contractor, which brought him to the attention of Rotary Hoes Ltd for whom he worked until 1962, being responsible for Export Sales initially, visiting 71 countries, and subsequently Manager of the Technical Sales Department.

Following five years as Sales Manager at Webbs of Exning, Frank returned to Rotary Hoes Ltd becoming Sales Director until 'official' retirement in the late eighties.

During this time, Frank became President of the AEA, and on his retirement was presented with a gift of a large set of taps and dies by the AEA which he used to build a workshop at home in Dorset.

He then set about designing and building the Moore Mower, a 36" cylinder mower which he first made as a prototype. It was put into limited production and manufactured by Griffith Elder at Bury St Edmunds, with accessories such as mulching head made by Autoguide and first shown at the IOG SALTEX show in 1999.

In 2004, Frank presented one of his machines to the Commonwealth War Graves Commission for use in the Airborne Cemetery at Arnhem where most of the 44 members of his old regiment who were killed in the 9 day battle lie buried among some 1700 others who took part in the operation.

The Moore Mower was later taken and manufactured by Autoguide Equipment but is no longer in production.

Frank was presented with an IAgrE Award for his contribution to the Land-Based sector in 2009. He is pictured above receiving his award from Richard Robinson.

Membership changes

Admissions

A warm welcome to the following new members:

Member

Bailey R E (East Midlands)
Doe A E (Essex)
Williams A (Gwynedd)

Associate

Bilbrough A J (West Midlands)
Bonnett S E (Essex)
Browne J (Northern Ireland)
Collins G J E (Avon)
Gumbe L O M (Kenya)
Kilmurray K (Ireland)
Leah N A (Leicestershire)
Mawenu C (Uganda)
Mitchell B (Western)
Pickering J (Hampshire)
Pollock D R S (Cheshire)
Ross D R (Scottish)
Yusvana R (Malaysia)

Student

Cranfield University

Anyaoha K E
Atichat C
Delmer A
Hollands R
Lopez A
Moran Montero E J
Trenciansky

Harper Adams University

Alvarez J
Biggin R
Bone E W
Bradley R C
Brisbourne J J H
Bromhead R
Burman J L
Butterly D
Clarke D
Conway A
Corfield J
Crouch S T
Dakin G P
Davies I
Davies R M
Deane M P
Denford A
Foulkes R I
Glen J R
Gordon C
Harris S
Hayes B S
Herbert J
Howes T M
Huddlestone R C
Hynard T
Lockey C A C
McDonnell S R
McSheffrey A
Morris B S
Mutter M
Newton J W
Oughton J
Palmer M
Patterson A D
Quigley A J
Record B J J
Reid C
Stanger J
Stewart J
Surtess R
Walker A
Winnington N

Hartpury College

Baker H J
Benbow O
Dymott R
Evans M D
Fellows H
Gallop S
Heeks D
Hopkins W J
Jeynes T
Knight T
Newman J
Plumb F O D
Powell W B
Sealey W
Smith W
Waddoups M
Wood J

Limerick Institute of Technology

Barry C
Bracken K
Breen J N
Callanan P
Cogavin E
Collins J
Condell N
Connell C
Connolly J
Dennehy P D
Doheny S
Eames J
Fenlon C
Fenton C
Fogarty L
Gorman E
Hastings G
Horan S
Ledingham M
Mahon D
McElligott A
Miller C
Morrissey M
Mulholland P
Murphy S
O'Connor A
O'Donovan B
O'Dowd S
O'Regan C
Prendergast M
Roulston J
Rowe A
Ryan P
Sheridan S
Tennyson G
Walsh M
Walshe C E
Watchorn B
Williams K
Williamson P
Woods R
Wynne P

Pallaskenry Agricultural College

Burke B
Burke P
Callery M
Collins S
Cosgrove I
Coughlan S
Coyle D
Crowley C
Doherty K
Doyle D
Finnerty T
Horgan W
Matthews T J
McGrath J
Mulhall M
Murtagh P
Nolan P
O'Connor Y
O'Donoghue K
O'Reilly J
O'Sullivan M
Payne D
Rowe C
Dunne D

Newcastle University

Jacskon P

Reaseheath College

Alcock D
Allan A
Allcock B G
Andrews S
Ansell S H G
Bascome X J
Bates H
Beal S T S
Benson C
Bickley S J
Boland M
Bowden R
Bromley G
Bull C
Burgin D
Cant S
Carpenter J
Chater J
Codling M
Colwell J
Copley C
Crawford T
Curnock R
Dale J
Dalrymple C G J
Daly L
Davies F C
Davies M
Dyer L
Ellis T
Evans M
Everall-Pettersen J
Fairgrieve W
Flint J
Forkings-Russell O
Fraser B A N
Harvey W
Haynes M
Heading F T
Heaps A
Henry R M
Hewer A
Hibbert E
Hibbert J
Hilton J
Hodgetts C
Hogger B
Holland J
Hanneghon L
Howlett M
Hulse-Beckett D T
Hynes C
Jennings L
Johnson K
Jones M
King A W
Klopper J
Lake B
Lewis B H
Lindley C
Liversidge L W
Love H
McDonough J C
McIntosh J
McKenzie C M
McLaughlin C
Macey T
Maddox T
Mangan A
Marsh B
May J R
Medlock A
Middleton A
Mitchell C
Morcumb C
Morgan H
Morris C
Morrison S
Murphy S
Neville A
Olive D
Parrish H
Parry D
Philp W G
Price G
Price S
Pritchard D
Ratcliffe G
Randles T
Rea E
Read J C
Richards G J
Richards O D
Richardson E
Richardson G
Roberts L
Roberts T
Rook R
Sewell R
Sherratt M
Shore J
Slade L
Slater C
Slater J
Smith M
Sankey W
Storr B
Stubbs J
Symons J H
Taylor A
Taylor R
Thomas A
Thompson A
Thompson L J
Thompson-Edwards E
Tomkinson J
Tomlinson J
Treweek C
Tunney J
Underwood H
Vaux A R
Wakelin O
Walker J
Ward T
Wellsbury T
Weston A
Whittaker A J
Whittaker J
Winter-Brown W
Witcomb L J
Woollacott D

Univeristy of Hull

Duffus W

Riseholme College

Barley I
Bennie A
Cook S
Gray C
Green J
Green J A
Harrison K
Lewis G
Lightbody S J G
Marshall T A
Meakin K
Musgrove J L
Shaw T W D
Sykes J S
Wallhead B E

Royal Agricultural University

Cottam M

Tralee, Institute of Technology

Ahern D
Bourke D
Bowham A
Brabazon A
Breathnach C
Buckley B
Burke L
Carroll J
Carroll M
Carter C
Claxton B
Connolly J
Corcoran L
Coughlan R E
Curraoin P
Donegan P
Dowling C
Dunne K
Dwyer N
Farrell A
Finnegan P
Fitzpatrick M
Gaffey S
Gilsenan G
Godwin F
Gregory T
Griffin D
Harmon A
Hayes S
Healy A
Hurley E
Hyland C
Jordan C
Kelly E
Koh J L
Lenihan J
Linnane S
Loughrey E
Lucid M
Lynch A
Lynch N
Manas C T
McCarthy E
McDermott C
McEvoy C
McGloin C
Moloney S
Moore R
Moriarty M J
Morris C
Moynihan J
Mulvaney P
Murphy L
Needham C
O'Brien E
O'Connell L
O'Driscoll P
O'Meara S
O'Neill S
O'Rourke J
O'Sullivan B
Phelan M
Quille P
Ring D
Samuels C
Scully S
Swanick S
Teahan K
Whitford L
Wilson M

Transfers

Associate Member

Cooke A (Northamptonshire)

Deaths

We have recently learned of the death of the following members and we send our condolences to their family and friends

Mr Geoffrey Wynn Canning (AIAgrE) (Hampshire) - a member since 1984

Mr Cyril Arthur Dyke (FIAgrE) (Jersey) - a member since 1985

Mr Stephen Michael Hawes (CEng FIAgrE) (Suffolk) - a member since 1946

Mr Keith Dalton Seiler (CEng MIAgrE) (Cambridshire) - a member since 1969

Mr Sidney Walter Reginald Cox OBE (CEng HonFIAgrE) (East Sussex) - a member since 1968

Mr Francis Pepys DurieMoore (FIAgrE) (West Sussex) - a member since 1954

Engineering Council

Congratulations to the following member who has qualified as Chartered Engineer entitling them to use the designatory letters CEng after their name.

Registrations

CEng

Gittings J T (Staffordshire)

Long Service Certificate information is on page 35

Academic members

Babcock Training Ltd
Babcock
Ruddington Fields Business Park
Ruddington
Nottingham
NG11 6JZ

Bicton College
East Budleigh
Budleigh Salterton
Devon
EX9 7BY

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

Easton & Otley College
Easton
Norwich
Norfolk, NR9 5DX

Greenmount Campus
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

Myercsough College,
Bilsbarrow
Preston
Lancashire
PR3 0RY

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

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

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

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

FEC Services
Stoneleigh Park
Kenilworth
Warwickshire, CV8 2LS

Huntaway Consulting
Ivy Cottage
Torlundy
Fort William
Inverness-shire
PH33 6SW

John Deere Ltd
Harby Road
Langar
Nottinghamshire
NG13 9HT

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,
Headly Road,
Hindhead, Grayshott
Surrey, GU26 6UK

We want to hear from members

Send branch reports or correspondence to:
The Editor, Chris Biddle
Email: *chris.biddle@btinternet.com*
Or the IAgrE Communications Officer, Marion King on:
pressroom@iagre.org

Landwards

EVENTS

IAgrE Branch Meetings and Events

Wrekin Branch
Monday 16 March 2015, 6.30pm
AGM AND TECHNICAL PRESENTATION 'DEFINING NATIONAL PRIORITY AREAS FOR SOIL PROTECTION: RISK ESTIMATION AND EVALUATION'
Speaker: Prof Mark Kibblewhite
Venue: Agricultural Engineering Innovation Centre, Harper Adams University, Telford, Shropshire TF10 8NB
For information on this and other Wrekin Branch meetings, please contact the Branch Secretary, David Clare.
Tel: 01952 815087
Email: dclare@harper-adams.ac.uk

IAgrE
Tuesday 17 March 2015
2015 IAgrE'S YOUNG ENGINEERS COMPETITION
Venue: GreenMech Ltd, The Mill Industrial Park, Kings Coughton, Alcester
Annual competition for students with cash prizes as well as products from our sponsors. Visit the Young Engineers page of our website for more information.
Tel: 01234 750876
Email: secretary@iagre.org
Web: www.iagre.org/careers/devcareeryecomp

Northern Ireland Branch
Thursday 19 March 2015
BRANCH AGM AND ADVANCES IN DAIRY TECHNOLOGY - TBC
Speaker: tbc Venue: CAFRE Greenmount College
For further information contact Branch Secretary Ian Duff.
Tel: 028 8673 6977
Email: duffi@iagre.biz

East Midlands Branch
Tuesday 24 March 2015, 7 for 7.30pm
BRANCH AGM AND SOCIAL EVENING
Venue: Quorn Lodge Hotel, 46 Asfordby Road, Melton Mowbray LE13 0HR
A two course meal (main course followed by a choice of cold sweets off the trolley and coffee). Parking is available at the rear of the hotel. Numbers will be required so please notify either Branch Chairman, Richard Trevarthen (richard.trevarthen@gmail.com), or Branch Secretary,Paul Skinner, if you are planning to attend.
For more information on this or any East Midlands Branch Meetings contact Branch Secretary: Paul Skinner
Tel: 01205 353754
Email: paulskinner57@btinternet.com
Web: www.quornlodge.co.uk/

South East Midlands Branch
Tuesday 21 April 2015
TBC BUT WILL FOCUS ON OFF-HIGHWAY DEVELOPMENTS FROM A MAJOR VEHICLE MANUFACTURER (JOINT MEETING WITH IMECHE)
Venue: Auditorium, Vincent Building, Cranfield University, Cranfield, Beds MK43 0AL
Details of this meeting are tbc but will highlight developments of off-highway vehicles, particularly through projects funded by Innovate UK (was Technology Strategy Board).
This is a joint meeting with IMechE Automobile Division Eastern Centre.
For further information on this contact either Dave Tinker on 01525 750337 d.tinker@ntlworld.com or South East Midlands Branch Secretary, John Stafford.
Tel: 01525 402229
Email: john.stafford@silsoe-solutions.co.uk

IAgrE
Thursday 30th April 2015, 10.30
AGM, COUNCIL & PRESENTATION OF AWARDS 2015
Venue: AGCO Ltd, Abbey Park, Stoneleigh Stareton, Kenilworth CV8 2TQ
Provisional programme to include Lunch and an AGCO presentation & visit to training centre
Tel: 01234 750876
Email: secretary@iagre.org Web: http://www.agcocorp.com/

South East Midlands Branch
May 2015 - TBC
FIELD TRIP: JORDANS MILL - TBC
Venue: TBC
No details available yet. TBC
For further information on this and other South East Midlands Branch meetings contact Branch Secretary, John Stafford.
Tel: 01525 402229 Email: john.stafford@silsoe-solutions.co.uk

Wrekin Branch
Monday 11 May 2015, 7pm for 7.30pm
JAGUAR LAND ROVER'S TYRE MODELLING DEVELOPMENT
Speaker: Jan Prins, Jaguar Land Rover
Venue: Agricultural Engineering Innovation Centre, Harper Adams University, Telford, Shropshire TF10 8NB
Jan Prins, Jaguar Land Rover's tyre modelling technical specialist, will be giving a presentation on the latest techniques for modelling tyre performance.
For information on this and other Wrekin Branch meetings, please contact the Branch Secretary, David Clare.
Tel: 01952 815087
Email: dclare@harper-adams.ac.uk
Web: www.jaguar.co.uk/index.html

West Midlands Branch
Tuesday 19 May 2015 7.30pm
SUMMER VISIT TO MARTON MUSEUM OF COUNTRY BYGONES
Venue: Marton Museum of Country Bygones, Marton, Warwickshire CV23 9SA
If you intend to attend this event please contact the Branch Chairman, Ian Moore (Tel: 0121 704 5700 ianm@whale.co.uk) or Branch Secretary, Michael Sheldon so that your name can be added to the attendance list and so you can check the status of the event.
Tel: 01926 498900
Email: michael-c-sheldon-iagre@outlook.com
Web: www.martonvillage.com/index.php/museum

Full details of forthcoming events can be found on www.iagre.org/events

IAgrE
Wednesday 20 May 2015
LANDWARDS 2015: TOO MUCH OR TOO LITTLE WATER? ENGINEERING INNOVATION FOR AGRICULTURAL WATER MANAGEMENT IN A CHANGING CLIMATE
Speaker: Various
Venue: Great North Museum, Newcastle
We have a full programme of events and networking and discussion time. Please see the download for more information - Early Bird Booking held until 31 March 2015 Tel: 01234 750876
Email: conferences@iagre.org
Event details and booking:
www.iagre.org/eventbookpay/landwards2015

Wrekin Branch
July 2015 TBC
SUMMER VISIT - TBC
For information on this and other Wrekin Branch meetings, please contact the Branch Secretary, David Clare.
Tel: 01952 815087Email: dclare@harper-adams.ac.uk

Long service certificates

Name	*Grade*	*Date of anniversay*
60 years		
John Brian **Finney**	HonFIAgrE	11/01/2015
John Vaudrey **Fox**	HonFIAgrE	29/03/2015
50 years		
Robert James **Burcombe**	EngTech MIAgrE	04/02/2015
Roger Donald **Dines**	EngTech MIAgrE	04/02/2015
Rlobert John **Painting**	IEng MIAgrE	04/02/2015
Bryan **Webb**	EngTech MIAgrE	04/02/2015
Barry **Linton**	IEng MIAgrE	04/02/2015
Christopher John **Darcel**	MIAgrE	11/03/2015
35 years		
Richard Walter **Langley**	CEng MIAgrE	24/01/2015
Robert James **Hunter**	AMIAgrE	20/02/2015
Terence **Massen**	IEng MIAgrE	20/02/2015
Frederick **Powell**	IEng MIAgrE	12/03/2015
Neal Alexander **Dodd**	IEng MIAgrE	12/03/2015
25 years		
George Peter **Hunt**	EngTech MIAgrE	01/01/2015
Philip Edwin **Lake**	AIAgrE	03/01/2015
Glen Trevor **Nash**	AMIAgrE	11/01/2015
Robert Anthony **Egan**	IEng MIAgrE	18/01/2015
Luke Jonathan **Edwards**	AMIAgrE	29/01/2015
William Andrew **Lapworth**	AIAgrE	29/01/2015
Peter Derek **Hickman**	AIAgrE	30/01/2015
Seamus Declan **Murphy**	AMIAgrE	31/01/2015
Francis Paul **Merrigan**	AMIAgrE	01/03/2015
Stephen Maelgywn **James**	AIAgrE	05/03/2015
Lloyd **Mwale**	MIAgrE	07/03/2015
Ian James **Muir**	MIAgrE	09/03/2015
Daniel Amedi **Mutuli**	CEng MIAgrE	15/03/2015
Graham Peter **Higginson**	IEng MIAgrE	22/03/2015
Charles Stephen **Parkin**	CEng FIAgrE	30/03/2015
Andrew Charles **Williamson**	MIAgrE	30/03/2015
Colin Scott **Cornish**	CEng MIAgrE	30/03/2015

EVENTS OF INTEREST

MARCH 2015

18-22	Country Living Magazine's Spring Fair - Business Design Centre, Islington *www.countrylivingfair.com/spring*
21-22	West County Game Fair, Shepton Mallet *www.westcountrygamefair.co.uk*

APRIL 2015

9	CountryTastic, Three Counties Showground, Malvern *www.threecounties.co.uk/countrytastic*
11-12	BASC Gamekeepers Fair *www.bascgamekeepersfair.co.uk/*
14-16	The Commercial Vehicle Show, Birmingham NEC *www.cvshow.com*

MAY 2015

4	North Somerset Show *www.nsas.org.uk*
7	Grassland UK *www.bathandwest.com/grassland-uk/194/*
9-10	Nottinghamshire County Show *www.nottinghamshirecountyshow.com/*
13-15	Balmoral Show, Belfast *www.balmoralshow.co.uk*
16-17	Royal Welsh Spring Festival *www.rwas.co.uk/spring-festival/*
19-23	Chelsea Flower Show *www.rhs.org.uk/shows-events*
21-23	Devon County Show *http://devoncountyshow.co.uk*
23	Shropshire County Show *www.shropshirecountyshow.com*
23	Fife Show *http://www.fifeshow.com/*
23-24	Herts County Show *www.hertsshow.com*
25	Surrey County Show www.surreycountyshow.co.uk
27-28	Staffordshire County Show *www.staffscountyshowground.co.uk/staffordshire-county-show/*
27-28	Suffolk County Show *http://suffolkshow.co.uk/*
27-30	Royal Bath & West Show *www.bathandwest.com/royal-bath-west/97/*

JUNE 2015

4-6	Royal Cornwall Show *www.royalcornwallshow.org*
6	Cumberland Show *www.cumberlandshow.co.uk*
7	Rutland Show *www.rutlandcountyshow.com/*
11-13	South of England Show *www.seas.org.uk/shows.asp?ID=2*
10-11	Cereals 2015, Boothby Graffoe, Nr Lincoln, Lincs *www.cerealsevent.co.uk*

INSTITUTION OF AGRICULTURAL ENGINEERS ANNUAL CONFERENCE

Wednesday 20th May 2015,
Newcastle University

Too much or too little water?

Engineering innovation for agricultural water management in a changing climate

"There is an urgent need for innovation in agricultural water management to cope better with more intense winter rainfall and frequent summer droughts"

Convenor, Mark Kibblewhite

Good water management is essential for high agricultural yields and farm environmental performance. Adaptation to more extreme weather requires renewed attention to irrigation, drainage and the management of surface water. Anticipated shortages of water for irrigation will increase demand for more precise water use. Many field drains are at the end of their useful life and there has been little innovation in drain design and control. There is justified concern about soil compaction increasing surface water run-off that can flood agricultural and urban land.

In May 2015, the Institution of Agricultural Engineers annual conference will report on new tools for water management and how engineering can develop these and support their adoption.

The conference will report and discuss . . .

- **The latest information on the implications of climate change for UK agriculture**
- **The current state of on-farm water management, highlighting where investment is needed.**
- **Novel systems for water management**
- **Actions required for effective development and deployment of new tools**

Landwards 2015

FOR FURTHER DETAILS:
IAgrE Secretariat: 01234 750876
conferences@iagre.org

ONLINE BOOKING:
www.iagre.org