Landwards

Agriculture • Horticulture • Forestry • Environment • Amenity

IAgrE Professional Journal www.iagre.org Volume 69, Number 4 Winter 2014

SPECIAL ISSUE
PRECISION LIVESTOCK FARMING

How engineering is playing a major part in the adoption of new technologies within the livestock sector

In this issue...

Professional Registration

AGCO in LTA scheme

No-Till systems

Council at Fullwood

Biosystems Engineering

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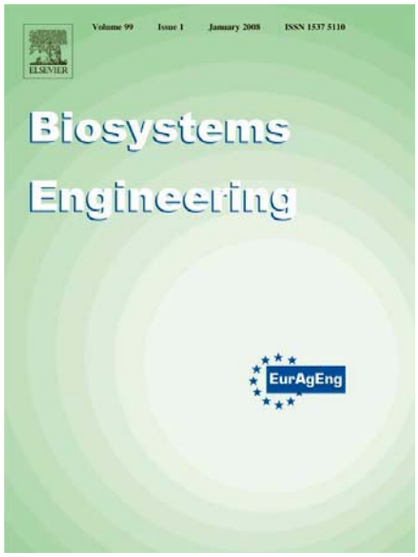

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The Managing Editor of ***Biosystems Engineering***, ***Dr Steve Parkin***, has kindly summarised some of the papers published in the last three issues which he thinks may be of interest to IAgrE members

Biosystems Engineering
Volume 124, August 2014, Pages 8-15

Automation and the situation awareness of drivers in agricultural semi-autonomous vehicles

Behzad Bashiri, Danny D. Mann,
University of Manitoba, Winnipeg, MB, Canada

With the introduction of advanced automated systems in agricultural machinery, farmers are now working with semi-autonomous vehicles. A human factors perspective is needed to ensure the safe and efficient operation of such systems. This simulator study investigated the effects of automating vehicle steering and implement control and monitoring task automation on the situation awareness of drivers. Experiments were conducted using a tractor driving simulator. It was found that implement control and monitoring task automation significantly affected the situation awareness of operators. Situation awareness increased as the level of automation support increased although the highest level of automation, where the participants were removed from the task loop, resulted in low situation awareness at a level similar to the condition with no automation support.

Volume 125, September 2014, Pages 128-14

Structural design of corrugated boxes for horticultural produce: A review

Pankaj B. Patharea, Umezuruike Linus Opara
Faculty of AgriSciences, Stellenbosch University, South Africa

Corrugated boxes are used extensively for transporting and storing fresh produce in the horticultural industry. Stacking compression load capacity of corrugated boxes is important to study the response of existing packaging to mechanical stress or to design new boxes. Good design of vented packaging is important in optimising the cooling and ventilation uniformity, minimising quality deterioration of packed produce and maintaining the mechanical integrity of the box. Various experimental and modelling tools are used to investigate the design and mechanical performance of packaging. Experiments include compression, impact and vibration analysis. Finite element analysis and simulation is useful for the structural design of ventilated corrugated packaging, considering the shape, location and size of the vent. Advances in ICT offer new prospects for development of user-friendly software toward integrated design and performance analysis of fresh produce packaging.

Volume 126, October 2014, Pages 69-81

Advances in agricultural machinery management: A review

Dionysis D. Bochtis, Claus G.C. Sørensen, PatriziaBusato
Department of Engineering,University of Aarhus, Tjele, Denmark
DEIAFA Department, University of Turin, Italy

The introduction of intelligent machines and autonomous vehicles will allow for increased efficiency as well as for reduced environmental impact. Currently, innovative sensing and actuating technologies together with improved information and communication technologies provide the potential for such advancements. Exploitation of these engineering advances requires the traditional agricultural machinery management process to be revisited. Traditional agricultural operations planning methods, must be supplemented with new planning features, such as route planning and sequential task scheduling. The review outlines current and required advances in agricultural machinery management to prepare for future intelligent manned and/or autonomous sustainable operations in agriculture. Five key management tasks for agricultural machinery management are selected; capacity planning, task time planning, scheduling, route planning, and performance evaluation. Future requirements for fully implementing future agricultural management models and tools are discussed.

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

Landwards

EDITORIAL:

Four wheels to four legs

CHRIS BIDDLE
Editor
chris.biddle@btinternet.com

FOR the final issue of *Landwards* in 2014, we are focussing attention on the role engineering plays in the development and enhancement of the livestock farming sector.

In the context of agricultural engineering, we tend to think of all things mechanical. Of tractors, combines, harvesters and the progression into new fields such as robotics, precision field mapping even now the use of drones.

Drones? I thought I had reached the pinnacle of engineering sophistication when as a demonstrator for Ford Tractors back in the early 1960s, we were tasked with showing off the new Ford Select-O-Speed automatic transmission. It was an 'ahead-of-its-time' development, which today might find a place in a heritage museum next to a Sinclair C5.

It is clear that Precision Livestock Farming has recently emerged as an important focus for IAgrE and its membership - but it's probably true that those IAgrE members who work in the sector might have felt a bit left out in comparison with the more 'trendy' engineering developments.

However, if you look at the intense level of sophistication and new ideas that are emerging from the livestock sector and highlighted in this issue, then we can be proud as an industry of our contribution to animal welfare and husbandry.

From Hugh Crabtree, who has journeyed from a slightly rebellious student with a vision, to providing practical solutions for real time monitoring of pig units, to Professor Toby Mottram and his eCow development, finding the right medium for a wireless linked bolus placed in the cow's rumen - and many others - we can boast engineers and scientists who are at the forefront of research in this vital field.

Now we have to ensure that their ongoing work is recognised, supported and funded by those who hold the purse-strings.

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

AEA link with EEF

The Agricultural Engineers Association (AEA) has announced a new partnership with the Engineering Employers Federation (EEF) to strengthen its representation within Government and provide members with an opportunity to work together and present a unified voice on government policy and areas of shared interest.

EEF is dedicated to helping manufacturing businesses evolve, innovate and compete in a fast-changing world. It is the largest membership organisation dedicated entirely to the manufacturing industry and is uniquely positioned to represent manufacturers' interests at the highest level in Brussels, Westminster, Whitehall and at regional level.

Some recent policy wins by EEF have included reducing the cost of energy to business, reducing the headline rate of corporation tax and increasing the rate of R&D tax credits.

AEA members are now entitled to become an Affiliate Member of EEF, giving direct access to additional services that provides you with opportunities to network with over 6000 manufacturers, share best practice and regularly influence policy-makers.

IAgrE member recognised for contribution to apprenticeships

City & Guilds honour for Richard Trevarthen

Richard Trevarthen, IEng MIAgrE, former lecturer at Brooksby Melton College, has been recognised nationally for his exceptional contribution to the City & Guild of London Institute (GGLI) land-based engineering apprenticeships.

In recognition of this outstanding achievement he has been awarded Honorary Member status for his significant involvement in, and contribution to, the furtherance of the work of the Guild in technical and vocational education and training.

"This is really an honour and I feel extremely proud to receive this recognition," said Richard.

Alastair Taylor, CEO of IAgrE commented, "Richard is the 'can do' of the industry. He has contributed greatly to the area of agricultural education and has done so with boundless enthusiasm. Over the years, he has instilled this ethos into the many hundreds of young engineers and apprentices who have crossed his path and has passed on his infectious enthusiasm and passion for the industry to many others."

Richard was head of the Engineering Department at Brooksby sMelton College and was closely involved with John Deere UK with the development and introduction of the John Deere Ag-Tech apprenticeship programme. An industry first, the programme won many awards including the prestigious National Training Award.

Richard Trevarthen

His determination to excel resulted in some of his students achieving the highest levels of recognition, including 12 City and Guilds Medals for Excellence, students winning the Learning and Skills Council Modern Apprenticeship of the Year Award and the UK Skills competition.

In 2004 Richard also won the national Star Award from the Learning and Skills Development Agency for his outstanding contribution and achievements and he also received a Highly Commended Medal of Excellence for delivering quality training from the City & Guilds.

Scrapping of chief scientific advisor post condemned

The Presidents of the four UK farming unions have criticised the decision by the European Commission to scrap the post of Chief Scientific Advisor to the President.

Professor Anne Glover, who has been in post since 2012, confirmed yesterday she would be leaving the post at the end of January and that the position would then cease to exist.

Speaking on behalf of Nigel Miller, President NFU Scotland, Ian Marshall, President of the Ulster Farmers Union and Stephen James, President of NFU Cymru, the NFU President Meurig Raymond said, "We warmly welcomed the appointment of Professor Glover as we firmly believe that strong and independent science should be at the centre of policymaking in the EU.

"It is deeply troubling that the new European Commission has taken this decision. This appears to be a backward step for science. At a time when we need to address serious concerns around food security, energy security and the collective EU response to the threat of climate change; it is deeply concerning that the voice of science should be stifled.


Professor Anne Glover

"We would like to put on public record our sincere thanks to Professor Glover for her work. Professor Glover has championed the importance of science and innovation to drive growth in the EU. We now urgently seek assurances from the Commission as to how the role that she and her office played will be continued."

The industry is a 'ticking time bomb'

Due to a severe lack of engineers

A severe lack of engineers today due to too few coming into the industry 10 years ago, not enough people promoting the industry at school level and too many companies not employing apprentices, are just some of the findings of a survey carried out by the Landbased Engineering Training and Education Committee LE-TEC, which comprises AEA (Agricultural Engineers Association), BAGMA (The British Agricultural and Garden Machinery Association) and IAgrE (The Institution of Agricultural Engineers).

The survey, sent out to agricultural machinery dealers was designed to understand the challenges facing the landbased engineering industry such as, funding of technical education, apprenticeships, upskilling the work force to meet the demands of modern business practices, attracting new recruits of the right calibre and raising the awareness of the industry and the career opportunities available.

"The survey has revealed very clear themes across the country, which will allow the committee to focus and prioritise appropriate action plans. The industry is starved of both fully and semi-skilled technicians either wanting to work on land-based equipment or having the relevant industry specific experience to support both today's and tomorrow's technologically advanced equipment," said David Kirschner Land-based Technicians Training Accreditation (LTA) Coordinator.

"There really is a challenge to lift the profile of landbased engineering in the eyes of many young people. We have to engage with young people, schools, colleges and those advising about careers. We must inspire people considering career options about what an exciting and rewarding career landbased engineering can be," said Alastair Taylor, CEO of IAgrE.

Roger Lane-Nott, CEO of AEA commented: "We need well trained technicians to deal with the ever increasingly technical complexities of machinery and farm equipment. We want to be in a position to attract the very best young people to our industry and have recently started designing a new website to help promote careers for those people with an interest in land-based engineering."

"LE-TEC is working on a variety of initiatives to promote the fantastic opportunities that are available in this sector. We are in the process of organising a series of road shows and events to promote the benefits of apprenticeships to machinery dealers and young people thinking about a career in land-based engineering," said Keith Christian, CEO of BAGMA.

. . . The industry is starved of both fully and semi-skilled technicians

David Kirschner, Land Based Technicians Training Accreditation Coordinator

Where are tomorrow's agricultural engineering trainers?

A snap poll of leading figures from the education and training sector reveals the agricultural engineering industry is still finding it a challenge to attract trainers and lecturers into the industry.

Alastair Taylor, CEO of IAgrE, said, "We approached a variety of lecturers and technical training providers and asked them what's the biggest issue facing training and education in the agricultural engineering sector."

Clive Bound, Vice Principal of Easton and Otley College the specialist land-based college with campus in Suffolk and Norfolk said, "Finding good engineers to teach is probably my biggest challenge and could in the future have a major impact on our ability to deliver high quality courses."

"There seems to be a shortage of new entrants, keen and willing to put in the effort required to succeed. In this modern age the image of agricultural engineering is not as good as it could be. This is a shame as the technology we are dealing with is now so far advanced that we are in some ways far ahead of other industries," said Richard Jenkins, technical trainer at Babcock International.

Summing up Jane Rickson, Professor of Soil Erosion and Conservation in Cranfield University's Soil and AgriFood Institute said, "We need to secure sustained funding of education and training from the Government, NGO's and industrial sources. The reputation of the UK for agricultural engineering training and education is still high around the world, despite the recent decline in provision.

"Training overseas students can establish major relationships with developing countries and there is a real opportunity to rebuild this bridge to the benefit of the UK's global development agenda."

Event indicates increased interest in agricultural drones

Sell-out seminar held at Harper Adams University

More than 100 precision farming enthusiasts joined together at Harper Adams University recently, to hear about the latest developments and potential uses of drones in agriculture.

The one-day specialist seminar was hosted by the National Centre for Precision Farming (NCPF) Unmanned Aerial Systems (UAS) Interest Group, in partnership with agricultural data company, URSULA Agriculture and sponsored by Bayer CropScience.

Attracting delegates from across the country and beyond, the event included talks from a host of relevant speakers, workshops and a live-demo by surveying equipment provider, KOREC.

With the use of drones in precision farming growing, the event explored their potential whilst focussing on the practical options currently available to adopt the new technology.

Dr Richard Green, Senior Lecturer and Academic Lead for the UAS Interest Group chaired the seminar. He said, "The fact that this event was heavily oversubscribed and full to capacity indicates that interest in agricultural drones is increasing rapidly.

"Events such as this are designed to keep the farming industry abreast of the latest developments and to bridge the gap between the UAV industry and farmers.

"It is clear that UAVs and satellites are now able to collect large amounts of data. The key to farmers' adoption of this technology is the speed at which useful tools are developing for processing that data, to turn it into financially beneficial information."

Speaking at the event was Nuffield scholar, Andrew Williamson; Keith Geary of G2Way Ltd; Eric Ober from NIABTAG; Jonathan Gill of Harper Adams University, David Whatoff from SOYL Ltd and Mark Jarman of URSULA Agriculture.

Research Assistant, Jonathan Gill, spoke about the economics of agricultural drones, and the associated costs. He said, "As this cutting edge technology has developed, prices have fallen to a point where it is now financially viable for an arable farmer, or farm manager, to go out and buy a drone.

"However, it is not always fully appreciated that the purchase price is only part of the cost of collecting, processing and producing images.

"My presentation provided the background information needed for landowners to be able to work out their own true cost per hectare of producing images using drones. Only after they have determined how much financial benefit they will derive from these maps, are they in a position to determine whether investing in this technology is financially justifiable."

> "..The key to farmers' adoption of this technology is the speed at which useful tools are developing for processing the data"
>
> Dr Richard Green, Senior Lecturer and Academic Lead for the UAS Interest Group

AGCO signs up to LTA Scheme

"The industry is leading the way with its commitment to training and education"

Roger Lane-Nott, CEO AEA

The Land-based Education and Training Committee (LE-TEC) is delighted to welcome AGCO to the Land-based Training Accreditation (LTA) scheme.

The scheme started in 2007, aims to establish a clear career path for technicians through the achievement of four qualification levels, Entry (LTA1), Standard (LTA2), Advanced (LTA3) and Master (LTA4).

The move to join the scheme was spearheaded by Freddie Pullan, Manager, Technical Training UK and Ireland for AGCO Ltd. "The LTA scheme provides a clear and accepted means of benchmarking, monitoring and assessing the competence of technicians employed nationwide within the land-based sector," commented Mr Pullan.

"AGCO was keen to ensure that the training it provides to technicians employed by the Challenger, Fendt, Massey Ferguson and Valtra dealers matched this standard, providing a clear and documented career path for AGCO apprentices and technicians wishing to progress within the agricultural engineering industry."

Alastair Taylor, LE-TEC Chairman and CEO of IAgrE commented, "I am delighted AGCO is promoting Technician Accreditation through LTA for service engineers working across their range of products. This means that all of the main manufacturers are committed to the concept of developing and recognising the professionalism of technicians working on their products.

"With more manufacturers and importers actively looking at how this approach will add value to their products and service, LTA is gaining support and working towards achieving its initial objectives of offering a career path in order to assist in the recruitment, development and retention of skilled technicians within the industry".

"These are exciting times," added Keith Christian, CEO of BAGMA. "We have been at the cutting edge in developing new apprenticeships in Land-based Engineering."

Roger Lane-Nott, CEO of AEA commented, "As machinery and farm equipment becomes ever more complex, we need well trained technicians to keep these working at optimum performance.

"The industry is leading the way with its commitment to training and education and having AGCO on board can only add to the success of the technician accreditation scheme."

Farm data 'underlines volatility'

The latest Farm Business income data from Defra, which covers the period from March 2013 to February 2014, show some significant swings in profitability across different sectors.

Average Farm Business Income fell on cereals, general cropping, mixed and grazing livestock farms in 2013/14 but increased on dairy, specialist pig and specialist poultry farms.

On dairy farms, average Farm Business Income increased by more than two thirds to £87,800, returning to 2011/12 levels. Agricultural output was around 20 percent higher driven by both increased milk prices and production.

In the cropping sector, the wet Autumn of 2012 continued to influence profitablity. Drilling was disrupted, leading to increased areas of lower yielding Spring crops harvested in 2013. Crop prices were lower due to weakening global markets

This was partially offset by increased input costs, particularly for feed due to increased levels of production and the prolonged winter. The upward trend in average herd size continued and the average milk yield per cow increased by approximately 4 percent to just over 7,900 litres.

However, the NFU says this snapshot does not reflect the current market or changes in recent months, most notably the dramatic downturn in the fortune of the UK's dairy industry.

NFU Deputy President Minette Batters said, "The dynamics of agricultural commodity markets have shifted and this really is a new trading environment for all in the food chain. It's essential that we have a long term approach in our farm businesses given the long production cycles involved, and we need to see a similar injection of longer term thinking from our partners in the supply chain."

CEO View

So just what is the Internet of Things?

Alastair Taylor

Just occasionally I find myself having a conversation where I nod in approval (at the same time as being a little unsure as to exactly what is being talked about).

I had one of these moments the first time I heard about 'The Internet of Things' I now know a lot more about this concept but still come across people who haven't quite got their head around its potential. Let me explain.

The concept is quite simple. The Internet of Things (IoT) is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems and the Internet.

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, a car that has built-in sensors to alert the driver when tyre pressure is low - or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

So far, the Internet of Things has been most closely associated with machine-to-machine (M2M) communication in manufacturing and power, oil and gas utilities. Products built with M2M communication capabilities are often referred to as being smart. This technology is already prevalent in farm machinery so again, we agricultural engineers are at the forefront. Let's then imagine what the IoT might do for us.

The sensor on my car provides information on my location and behaviour which allows the central computer (probably cloud based) to work out that I am on my way home. Things in my kitchen wake up (I am not including my wife as one of these by the way - as she is also at work and will be arriving home at a similar time to me). The fridge works out the pizza is close to its 'eat by' date and my 'heads up' display suggests that I might like to have that when I get home. The same message is conveyed to my wife. My wife and I confirm (voice recognition and not using a mobile device whilst driving) that we would like the pizza.

The computer then goes on to analyse progress on our homeward journey and twenty minutes before we get home, turns on the oven so that it is preheated to the right level. The fridge has a different section for drinks and understands that a nice cool beer would be well received when I get home. The fridge normally runs in eco-mode but switches to rapid cool mode so that the beer is just the right temperature when I get home. I am sure you get the idea. With everything connected (even some sort of sensor on the pizza package), this is a scenario which is perfectly achievable with the IoT.

Let's look at a similar scenario in agriculture. A range of sources are interconnected through the IoT. A remote sensor in a standing crop of wheat is measuring the microclimate and through complex modelling, suggests the exact point when the grain will be at 14% moisture content. This is also drawing information from The Met Office super computer which tells us that the weather is set fair for the next five days so we can wait until the optimum moment.

The sensors on our combine harvester tell the central computer that the grain losses on this machine might be overly affected by the topography of the field (other sensors have analysed the impact of going up a slope upon how much grain passes over the straw walkers). We make some adjustments on that basis. The sensor in the central fuel store suggests that we will not have enough diesel for the harvest campaign and goes on to shop around to find the best value source of supply. I am sure you get the gist of all of this. And we haven't even mentioned animals and Precision Livestock Farming.

> "We can't have effective IoT without robust connectivity"

I love the idea of all of this but can't help but think that there is a risk of it being technology for technologies sake, and it all feels a bit 'big brother'.

You can already start to think of ugly scenarios in which the consumer might make demands on the basis that "the IoT tells us that the machine was operating with a spare part sourced from a rogue state and therefore we will sanction you". I have always believed that there has been some comfort in not knowing all of the information. These days, we often have too much information.

However, the IoT has one major flaw. It is highly dependent upon strong connectivity to the World Wide Web and on a local basis, a stable mobile phone signal. So there is the problem. In my view we have a very poor infrastructure - especially in rural areas. My mobile phone frequently flicks from 3G to 4G and then back to 'Searching for Signal'.

We just can't have an effective and reliable IoT without robust connectivity. What to do? There is much debate about this. Do we need a separate (and probably more expensive) mobile phone network for commercial use? Should we take up the bandwidth made available by the move from analogue to digital television and radio? Should we set up new local systems?

These are difficult questions to answer but need to be answered if the IoT is to flourish. However, the Department for Business, Industry and Skills (BIS) is on the case and recently we were represented on a government committee to look at all of this. It is a fascinating debate.

Were Wallace and Gromit and W Heath Robinson ahead of their time?

As I write about this, I can't help but think about the lovely Wallace and Gromit film in which Wallace has automatic breakfast making facilities which apply all of the concepts of the IoT but in a more mechanical form.

As a child I remember having a book with some lovely W Heath Robinson drawings showing the most tremendous autonomous systems. Was W Heath Robinson therefore ahead of his time and was he in fact the inventor of the IoT? Perhaps not but it is interesting that we talk of 'Heath Robinson' in mocking terms.

I have often thought that many early agricultural machines had an element of Heath Robinson about them and for that we should probably be congratulated. However, it is time that we rubbed out this image.

Perhaps the IoT will help us in demonstrating that Agricultural and Biosytems engineering is truly at the forefront. I believe it is.

Report launch highlights potential of no-till systems

A REPORT launched at Harper Adams University on behalf of The Worshipful Company of Farmers recently has highlighted the need for effective pest control and selective crop rotations when striving for a successful no-till farming system.

Visiting Professor in Agricultural Engineering, Professor Dick Godwin, launched his 30-page report entitled the '*Potential of no-till systems for arable farming*' to the audience, which included farmers currently using the techniques.

No-till agriculture is a method in which seeds are directly drilled into the soil without tillage, and weeds are controlled by alternative means.

Professor Godwin's report states that no-till practices can offer significant potential operational, economic, soil and environmental benefits for the UK.

It also states that further research is required to address the control of grass weeds, slugs and snails, and to further improve the operation of equipment in wet soils with high residue loads. The participants, during the post-presentation discussion, were in agreement with these conclusions.

Professor Godwin, working on behalf of the Soil and Water Management Centre at Harper Adams, said, "The discussions following the presentation not only supported the report, but also shared new perspectives on the subject, such as the importance of crop rotations and the use of cover crops.

"An example given was the need for an alternative to oilseed rape within the crop rotation, as it appears to attract pests such as slugs, which are damaging to yields.

"The value of cover crops was also apparent, and that some may prove successful in controlling grass weeds.

"Having case-study farmers at the event gave a real-life perspective to the discussion, and will enable us to prioritise areas for future research."

Other reoccurring themes during the event included the need for improved mechanisation from the point of manufacture, and that educating the next generation is key for a greater uptake of no-till.

Following discussions, presentations were given by Harper Adams' Professor Shane Ward on soils and water management, and Professor Simon Blackmore on developments in mechanisation.

Having case study farmers at the event gave a real-life perspecitve to the discussion

Professor Dick Godwin

The day concluded with a series of demonstrations, including Vaderstad's Spirit disc drill and Seed Hawk tine drill, Michelin's low-pressure tyre system and Controlled Traffic Farming by CTF Europe.

This is the second report to be commissioned by The Worshipful Company of Farmers, part of the Company's Education and Research.

Weight increase must go further

Tractor & trailer limits still not enough says NFU

The Department for Transport (DfT) will cut outdated regulation to allow higher tractor speeds and heavier tractor and trailer combinations from spring 2015. The government has also committed to develop detailed proposals for a roadworthiness test for tractors and trailers.

Under the changes, the maximum combination weight limit for tractors and trailers will increase from 24.39 tonnes to 31 tonnes and will set a new effective speed limit of 25mph (40km/h), up from 20mph - saving time and money. Tractors allowed to exceed 25mph will continue to be subject to tighter design and regulatory requirements.

The increase in combined weight means bigger tractors can pull trailers without sacrificing cargo to meet the top weight limit of both tractor and trailer. This will maximise the amount of produce transported in each journey.

These changes will also result in farmers having to make fewer journeys on our roads and so reduce the risk of accidents. The second phase of changes will see a further consideration of increases in weight and speed limits and a roadworthiness test for some agricultural tractors and trailers by summer 2016.

In response, the NFU has said that weight increases proposed by DfT are a step in the right direction but need to go further in the next phase to realise the maximum improvement in farm transport efficiency.

NFU Vice President Guy Smith said, "The NFU has been campaigning for tractor and trailer weights to increase for a number of years, and I'm sure many people who've found themselves caught in a queue of traffic behind a tractor will have sympathy with our calls to reduce the number of tractors on the road by increasing their effective payload.

"While an increase in speed limit to 25mph is welcome news, the benefits will not be as great as a meaningful increase in the effective payload. While an increase to 31t is a step in the right direction - keeping the specific limit of 18.29t on the trailer will continue to restrict many trailers from being used at anywhere near their safe engineered design capacity.

"The proposed changes remove the £62m cost to the industry of having to comply

with limits set in 1986. Because the overall weight limit for the tractor and trailer has remained static, the tonnage that can be carried in trailers has actually decreased as tractors have become bigger and safer. To achieve a change which fully reflects improvements in technology, including those that improve safety, it is essential that weight limits are increased further to the level suggested by the industry.

"If weights had been increased to 33t this wheat harvest, journeys could have been reduced by roughly 46 per cent. Farmers had to drive an extra total 5.8 million miles on average to bring in the harvest legally. This undoubtedly adds to rural road congestion affecting safety, and adds an additional 20,000 tonnes of CO2 to the environment. Maintaining the current trailer weight limit will still leave UK agriculture at a significant disadvantage to other European Member States where weights are significantly higher.

"It is essential Government provides a further increase to tractor and trailer weights and recognises the unique role that tractors play transporting our food from field to farm. We welcome the commitment to increasing the weights further for the 2016 harvest, but we are disappointed that such an increase was not deemed possible at this stage given the extensive consultation that had been undertaken."

Girl power at JCB

A record number of young women have started work at JCB as apprentices - nine females have joined which is almost double last year's intake.

They have been recruited as part of the company's Young Talent initiative which attracted more than 1,000 applications for more than 100 new jobs for apprentices, graduates and undergraduates. A total of 59 of the new positions are for apprentices.

Goodbye Sylvia!

After working for the IAgrE for 7 years Sylvia Harris is leaving as she will be relocating to the South West early in the new year.

Elizabeth Stephens of IAgrE said, "I am sure you join us in wishing her all the very best for the future."

Interviews for the role of 'Membership and Events Support and Office Administrator' based within the Secretariat at Cranfield were due to take place in early December after *Landwards* went to press.

President's Musings

Is small and local electric better than big and foreign diesel?

IAgrE President, MARK KIBBLEWHITE, muses on how agricultural innovation is the key to sustainabilty

I once heard a very large landowner from East Anglia remark that there is no serious agriculture west of Wiltshire. This jarred with me being as I am West Country born and bred and I can confirm from deepest Dorset that there is some very serious agriculture here, as well as in what we call 'foreign parts' like Wiltshire and the counties to its east.

However, the remark is an interesting one because it reflects a perspective - one that focuses on yields and correctly identifies that a moist climate and steeper slopes limit the versatility and overall productivity of land in Western Britain. The connective issue is that the going is much harder in the West than the East, not least because of the unremitting work required to care for farm animals, which are now rarer than some exotic birds in Eastern England but remain at the heart of farming in the West Country.

And it is not just the wear and tear on farm workers that is high, the soil and water is also under great pressure as animal numbers chase an ever-rising break-even herd size that is driven by weak output prices and rising input costs.

Frankly it does not look at all sustainable, especially if interest rates take a hike, and has the characteristics of what the economists call a market failure and most of us would ascribe to a failure of policy. So what can engineering do to help?

A delight for me is that my office window looks out on to a lane which is the only access to several dairy farms.

It means that from my desk I can often see a nice parade of very large machines in shades of green, blue and red. It is impossible for me not to be excited by them, of course, but in a sense they are aliens in the landscape: they really belong in those foreign parts in Eastern England or even in the great expanses of the Prairies, the Steppe and the Pampas. I very much doubt that they were designed with the landscape of Western Britain uppermost in the engineer's mind; one of forage production in uneven mainly small fields of irregular shapes bounded by hedges in a landscape dissected by narrow medieval lanes.

One thing is for certain, these imported machines cannot get bigger because if they do they will not be able to travel to the fields! It makes me think there could be an opportunity for a new range of smaller more versatile machines that can be deployed at a lower overall economic cost.

I reckon the greatest innovation in dairy farming mechanisation was the arrival of electricity rather than the tractor. I am old enough to have heard family stories about life in the milking shed without electricity and its arrival must have been truly revolutionary. However, electricity has not made it in to the fields yet and perhaps it needs to.

My calculations suggest that current production of a litre of milk uses more than 20ml of diesel - if the energy inputs required are all expressed as diesel - and that a good part is from direct use of diesel in field operations. This does not sound sustainable if the cost of diesel increases further, even putting aside issues about greenhouse gas emissions.

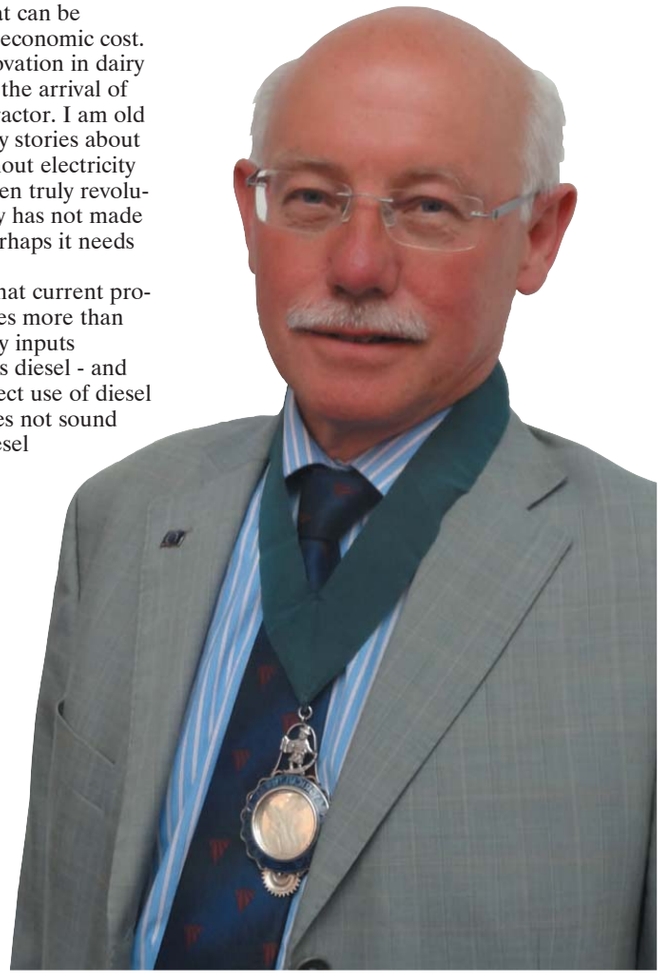
So, what options might there be to produce electricity on the farm to power electrical vehicles, as well as taking the milking shed off-grid?

Perhaps my musings are a bit dreamy.

However, solving the deepening crisis on West Country dairy farms offers interesting opportunities for radical engineering innovation that could, not just make them more sustainable, but deliver new products for export that will support growth in manufacturing.

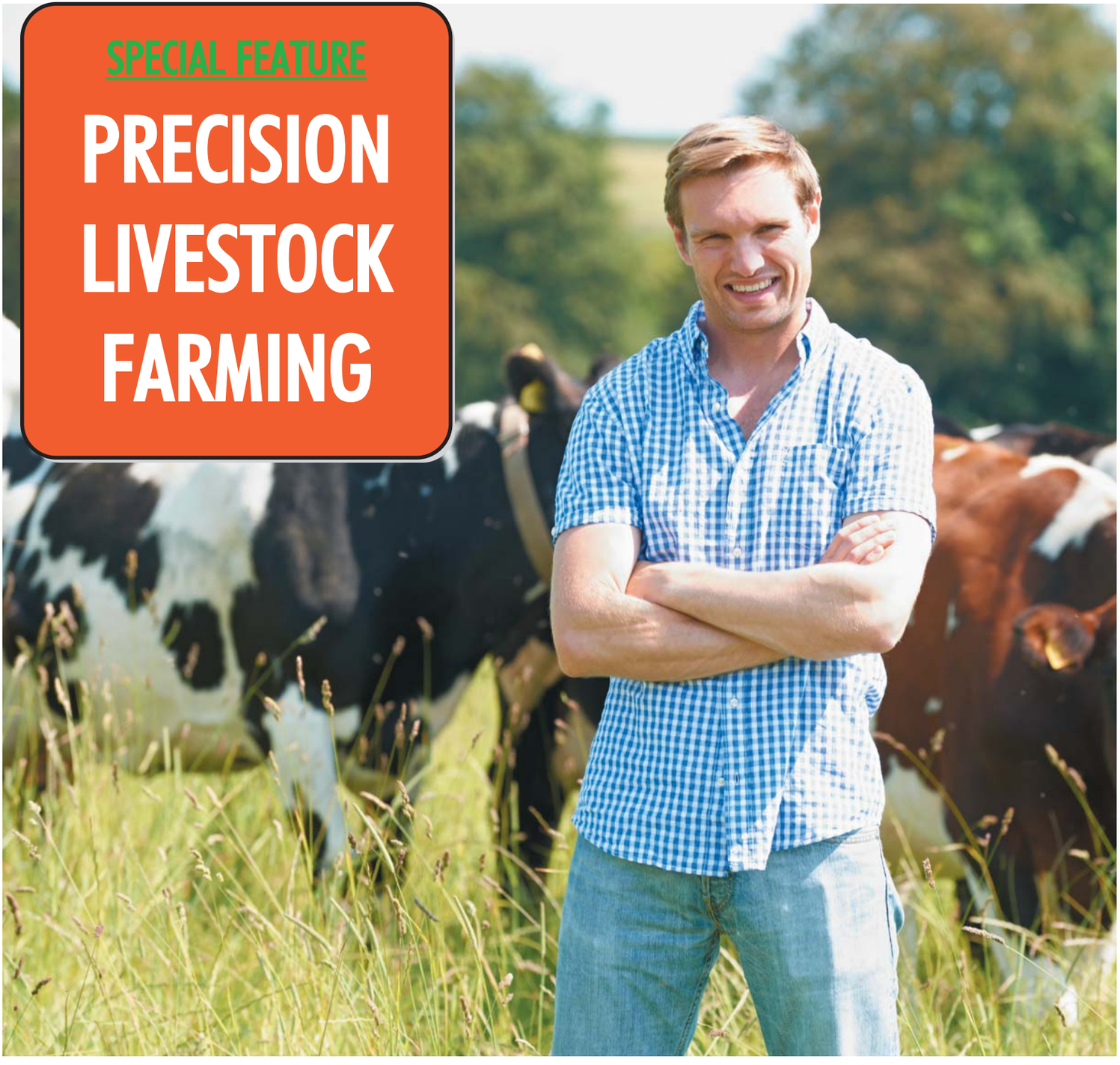
Who amongst us is up for leading the design of a range of electric machines for field operations in Western Britain and similar landscapes across the globe?

. . the greatest innovation in dairy farming mechanisation was the arrival of electricity



SPECIAL FEATURE

PRECISION LIVESTOCK FARMING



A reluctance by UK farmers to adopt new technologies coupled with negative public perception were the threats to successful Precision Livestock Farming identified by a recent conference at Harper Adams University.

In this special Landwards Feature, we talk to those at the forefront of PLF in the UK in the dairy, pig and poultry sectors - as well as with a leading dairy farmer to get his view of current developments

Livestock farming is facing a tremendous challenge.

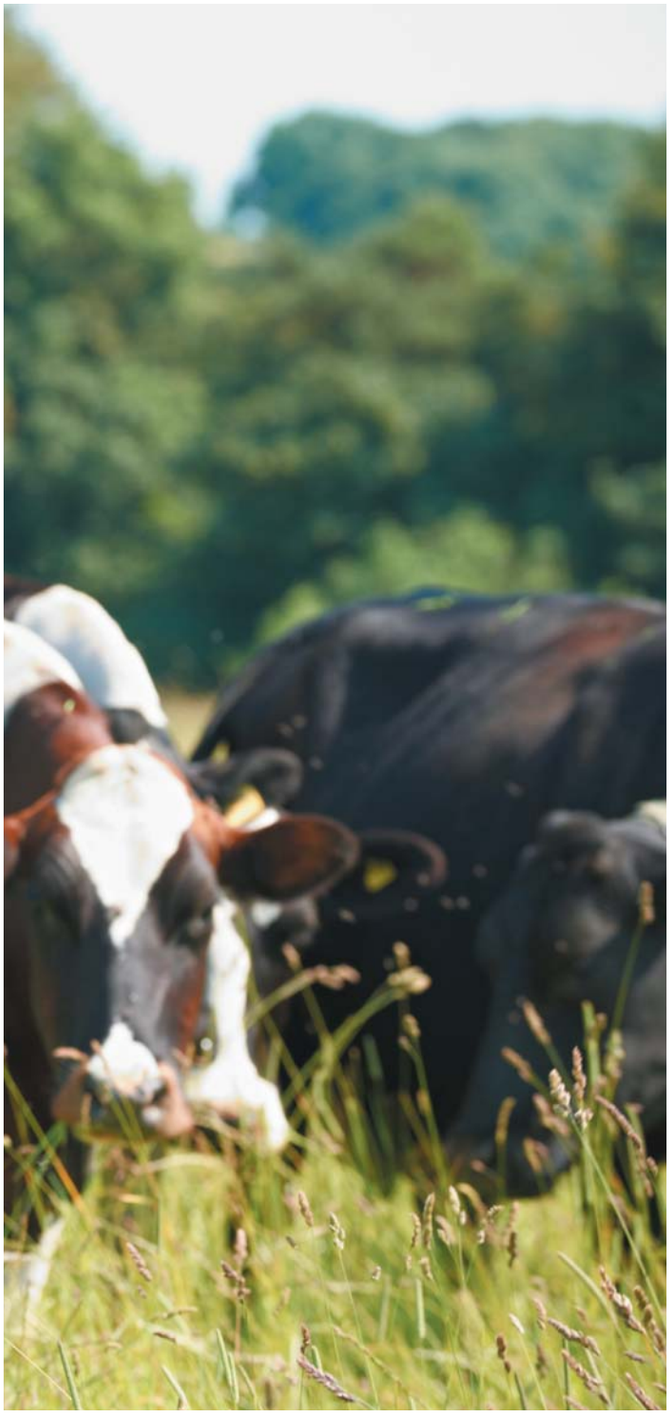
The FAO predict world meat production will double by 2050. Demand is growing because an increasing number of people are adopting protein richer diets, which means technology solutions adopted by agricultural and livestock production systems are set to play a starring role in addressing this challenge.

But what about the livestock? Who is looking after their welfare? Because, although it's crucial to find ways of minimising the environmental footprint of livestock farming, it is also just as critical to make sure high levels of health and welfare practices are followed.

And according to Dr Mark Rutter of Harper Adams University, Precision Livestock Farming technologies could also hold the key to finding solutions to help farmers manage large numbers of animals in a fitting but profitable way.

"Precision Livestock Farming (PLF) is already benefiting animal welfare and the environment but we need more research and development on monitoring and bench marking for managing extensively reared livestock. One concern though, is that the general public might believe that technology is simply about making production more intensive, when in reality there are likely to be considerable benefits for animal welfare as a result of improved animal monitoring."

PLF is today an essential part of a farmers' business from helping to sustainably increase livestock production to focussing on animal care in terms of feeding, milking and housing.



Management tools being introduced enable the continuous, automatic monitoring of animal welfare, health, environmental impact and real-time production.

They can help farmers collect and manage detailed information to ensure livestock production is safe, environmentally sustainable and in compliance with the highest health and welfare standards. Currently most PLF techniques are focussed on the husbandry of pigs, poultry and dairy cows but the technology is also expanding to other areas.

Farming Futures, a joint initiative between IBERS at the University of Aberystwyth, NIAB, Harper Adams University, East Malling Research, Agri-Food and Biosciences Institute (AFBI) and SRUC advise that regardless of the size of operation, the monitoring and measuring of animal behaviour, performance and their environment can help farmers make more informed management decisions leading to increases in production, welfare and on-farm efficiencies.

There are a range of products on the market tailored to improve livestock performance while optimising efficiency and profitability. So what is there around?

*Landward*s takes a look at a few examples below:

COW TRACKER

This is an intelligent dairy herd monitoring system designed to be used with large indoor herds.

Sensors are set up to record the location of every cow in the building with the server updating information every second.

It allows farmers to use their time more efficiently by monitoring cow standing time, frequency and time spent in cubicles, time walking, how far and how fast, frequency of visits and time spent feeding.

The information can be used to help with heat detection and for early warning of health risks. If an animal's behaviour changes the farmer is alerted immediately.

RUMEN PH BOLUS

Designed by Professor Toby Mottram's company E-Cow, it measures real time pH and temperature data from inside the reticulo-rumen of the animal, every minute.

Data is downloaded onto a handheld tablet and sent for analysis. It gives farmers an insight into feeding and drinking patterns and can provide vets and nutritionists information so they can diagnose sub-acute rumen acidosis (SARA) more easily and adjust rations accordingly. Other benefits are improvements in milk yield and animal health.

See Toby Mottram's article on pages 16-17 for more details.

SMART PHONES FOR COWS

Can you believe it but San'Phone, Vel'Phone and HeatPhone can detect ct temperature, calving and oestrus.

They all require a GSM radio base to collect the data. ThermoBolus measures the reticulo-rumen temperature every 5 minutes to within 0.5C accuracy with the San'Phone analysing and alerting the farmer of any abnormal changes in temperature.

A vaginal canal thermometer monitors the temperature, imminence of calving and water breaking which the Vel'Phone communicates to the farmer via SMS.

An axel sensor placed on the cows' collar records parameters of its activity every 5 minutes, which the HeatPhone analyses to detect signs of oestrus. A SMS message allows the farmer to get closer to the animal sooner to plan for optimal insemination.

All these devices are designed to alert the farmer to any chances that might need prompt action.

FARM WIZARD

A device to help farmers manage their cattle online.

Farm Wizard has developed a series of cloud-based farm software solutions that allows all data to be held in one place including herd book data, quality assurance reporting, beef monitoring, drugs record, permit printing, feed and grassland records.

MILKING ROBOTS

A great example of a large adoption of PLF systems are automatic milking machines. These robotic systems can handle up to 65 cows - an average of 2.7 times a day.

ROBOTIC SCRAPERS

The flexible, silent animal friend. They are highly mobile, fully automated and can often work in any barn layout with slatted floors.

Battery powered and travelling at 4m per minute it clears manure from up to 250 cows a day five times a day then recharges for the next round - and it doesn't disturb the cows.

STABLE AND FARM MANAGEMENT SYSTEMS

Support and monitoring systems using cameras and microphones act as the farmers eyes and ears at all times.

These systems are useful to help farmers monitor chicken behaviour, while weighing scales, feed and water gauges can be used to calculate bird consumption and growth.

SPY IN THE STY

An In-pen Voluntary Access Scale, a growth sensor, will enable farmers to 'see' how their pigs are performing while they are still growing. It even allows pig producers to record growth rates and feed conversion on a daily and even hourly basis.

Early results from a £306,000 three-year research project have shown how monitoring growth rates of pigs can be linked to environmental, nutritional and health factors via sophisticated software. This is enabling producers to take strategic management decisions during the growing and finishing period, rather than using historical data.

IAgrE Fellow and former Director of the Centre for Animal Welfare at the Royal Veterinary College, University of London, Christopher Wathes has been reported as saying that given the scale of PLF challenges and the timescale needed to overcome them, current effort should focus on the development of monitoring systems for livestock that satisfy the demands of consumers and regulators for safe, nutritious food produced from farm animals of guaranteed standard of welfare within acceptable limits of environmental emissions.

SPY IN THE STY

Monitoring what pigs do 'after-hours'

Hugh Crabtree is a founder member of Farmex Ltd. The company has become a market leader in ventilation systems for pig production in the UK. Three times winner of the New Equipment Award at the British Pig & Poultry Fair, Farmex is now at the forefront of real-time production monitoring both in the UK and the States. Hugh is a Fellow of the Institution of Agricultural Engineers and a past Vice Chairman of the National Pig Association.

CHRIS BIDDLE talked to him at the Farmex HQ near Reading

STUDENTS get thrown out of university for a variety of reasons, often for disruptive or illegal activities.

However, for a group of agricultural post-graduate research students working on a project at Reading University in 1979, their 'crime' was to become so excited and enthusiastic about the opportunities opened up by their development of the first P + I (proportional integral derivative) ventilation control for pig farmers, that the University decided that taking the project from the drawing board to the production line was simply 'too commercial' - and asked them to leave!

But that was simply the kick-start needed for two of the students, Hugh Crabtree and Nick Bird, to join up with Jeff Owen, head of buildings in the engineering section at Reading University, to set up a company (Farmex). It was Jeff that got it all moving because it was largely his research and consultancy work that lead to the desire to commercialise the ventilation system (Hybrid Recirc). They were joined by another engineering lecturer David Brooke (deceased) and an electronics expert Harry Butterworth (brother of Bill Butterworth).

Together they developed a hybrid recirculating system using polythene ducts to maintain temperature levels in pig units at a time of rising energy costs. The system was immediately well-received and won the company the New Equipment Award at the Pig Fair in 1981.

> . . we decided to concentrate on the clever bits

But the use of polythene ducts to spread heat was never going to be a long-term solution, what was needed says Hugh Crabtree were automatic controls to operate a variety of ventilation systems for pig production.

And so DICAM was born (Digital Interactive Control and Monitoring). A system which leant heavily on microchip technology used in the car industry.

Over the years, DICAM has become the pig industry's most commonly used device for temperature control. In the past, Farmex sold complete packages to pig farmers. "But," says Hugh, "we often ran into resistance over the cost of a package. Trouble is, you ask a pig farmer (or any farmer) what they would like to fully install a monitoring unit and they'll give you a comprehensive wish-list.

"But come up with everything required to meet that wish-list - and all of a sudden cost becomes a stumbling block.

"So we decided to focus our attention on the clever bit, the control system itself."

And it was this that really opened up new opportunities, not only in the way that DICAM was able to monitor ventilation, but in all aspects of pig production including temperature, water, feed, growth and pig flow.

And this is where the exciting bits kick in - and why Hugh Crabtree is a crusader for greater awareness and activity from the engineering community. "Precision Livestock Farming has got to be as important a focus for IAgrE and the universities as the arable and dairy sectors where technology is streets ahead of that in the pig and to poultry sectors.

"For efficient food production, the maxim 'You cannot control what you cannot measure' has to underpin everything we do."

Which is why a system like DICAM is really only a means to an end. "For a company like Farmex, we build units that last and last, so whilst there are always new sales opportunities and indeed new applications (the control of firework displays for instance), our 'currency' is really data. Capturing data, using data, analysing data.

"That has to be one of our major skills and assets. The availability of quality data which has been drilled down, simplified and presented clearly is obviously of great benefit to farmers, the suppliers and indeed the industry itself."

The company, and Hugh himself, were dealt a sad blow in January 2013 when his partner Nick Bird died suddenly from a heart condition at the age of just 60. Apart from the fact that the pair had worked so closely together since University days, Nick had a real talent for interpreting data. "Nick was a very accomplished analyst, a clever and original thinker," says Hugh.

They had been busy promoting systems that allowed farmers to remotely collect, analyse and act on vital performance information gained through real-time data-logging

"What farmers would not want to know what pigs did 'after hours' when the pig-man closed the door and the animal's behavioural patterns might change? It would be true to describe the DICAM system as the spy in the sty, collecting information 24/7."

RECENTLY Farmex have taken part in two separate but related research programmes. The first, PIVIT (Pig Improvement Via Information Technology) was a two year programme involving commercial pig farmers in Yorkshire which received funding from Defra and the EU's Rural Enterprise Investment programme.

"The objective was to focus on the people involved and find out how commercial advantage could be routinely gained from remote monitoring of production sites using existing tools and knowledge.

"With farmers having to manage more pigs with fewer man hours, units will have to rely increasingly on information and communications technology - or 'smart pig farming'. Agriculture is joining the machine-to-machine communication revolution with automated data analysis. This will lead to producers getting more things right, more of the time.

"For instance, we were able to prove that monitoring the performance of their units, pig producers could target a 5 to 10-day reduction in finishing time, an 80% cut in water waste, a 50% saving in fossil fuel use and performance variation narrowed by 50%.

"This makes it possible for farmers to define their normal levels of performance, compare them with what they thought they were achieving and what they wanted to achieve. Whilst it is not necessary to measure everything, the key factors remain temperature, feed, water, energy consumption and growth rates."

It was growth rates that were the focus of the second of the research programmes, a three year project under the Technology Strategy Board - Sustainable Protein Programme (TSB-SPP) which looked to develop new IT tools to automate data analysis and simplify the access to it. It involved a consortium of partners, Farmex Ltd, Dicam Technology (the Farmex software developer based in Suffolk) and Staffordshire-based ARM Buildings Ltd.

A by-product of this project has been the launch by the consortium of The In-pen Voluntary Access Scale, a growth sensor, which enables farmers to 'see' how their pigs are performing while they are still growing.

It continuously records the animals' weights as they wander in and out of the scales. This is sent wirelessly to the computer network and then to an online database (sample data shown above).

This constant stream of information, is then integrated with other recorded factors such as temperature, ventilation, water and feed consumption which will allow daily fine-tuning for optimum pig performance as well as providing invaluable information to nutritional advisers and vets.

Hugh says, "The development has been described as a 'real game-changer' on a par with significant genetic and pharmaceutical advances. It could give British pig producers their best chance since the 1970s of establishing a world lead in sustainable pig production.

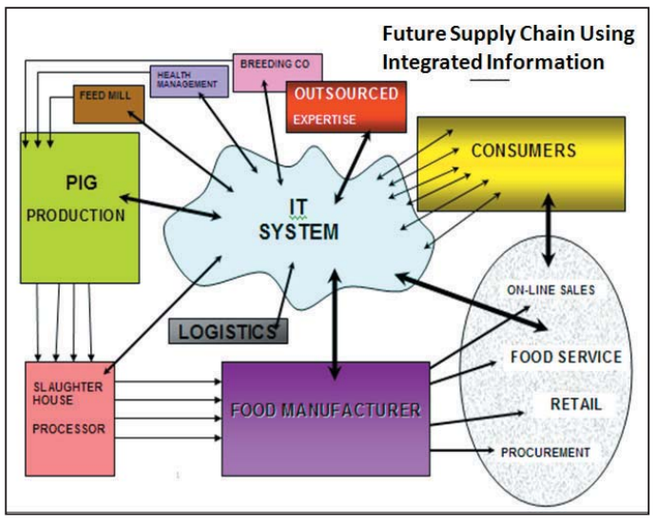
"And IT systems will be at the heart of the whole process from production to the plate of the consumer." *(see image left)*

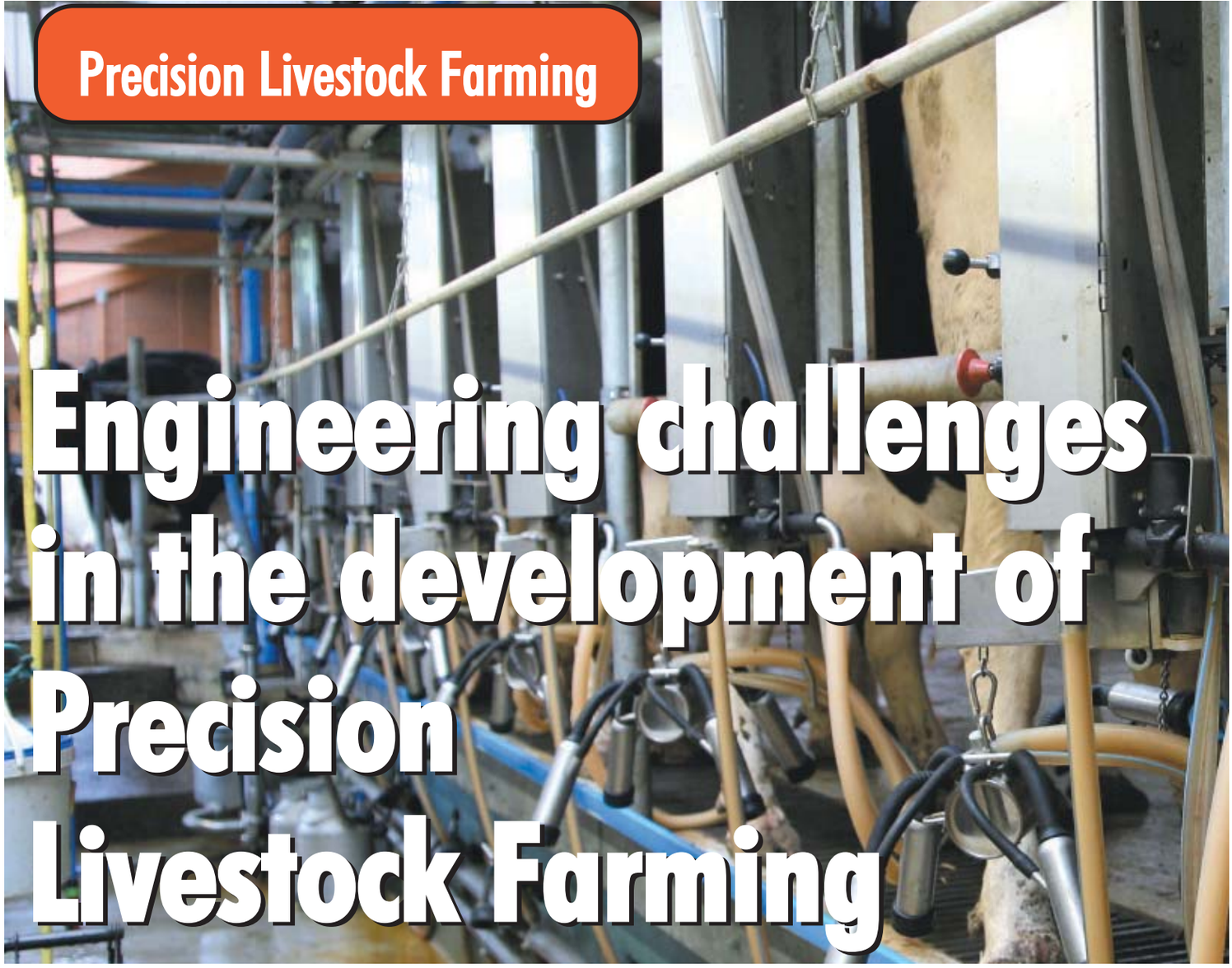
There is little doubt that communication resources, particularly increasing spread of broadband into rural areas, is providing Farmex with a much more effective platform than might have been possible a few years ago.

It's 35 years since exciting research days at Reading University - and for Hugh Crabtree it's been a 35-year learning curve during which time the emphasis has shifted from providing the technology (of course) to understanding the value and importance of data.

"Ultimately," he says, "it is all about people.

"In a nutshell, use monitoring to get people to do more things, more accurately, more of the time."





Engineering challenges in the development of Precision Livestock Farming

DEFINITIONS AND SPECIFICATIONS

Engineers generally enjoy a challenge where the outline specification is clear and the detailed specification can be worked out.

In precision livestock farming the words used by the owners of animal health (usually veterinarians) sometimes get in the way of a clear definition. For example, I was once asked to measure milk quality.

These words have different meanings dependent on who speaks them. To the milk buyer it generally means a measurement of microbiological quality, meaning the fewer bacteria the better. To a milk processor and geneticist it generally means the milk solids (how much fat, protein etc) and to a veterinarian it may mean the number of somatic cells indicating udder disease.

Each of these parameters can be measured but by different systems. Extracting the required parameter in numerical measures is even more difficult as biological factors are usually expressed qualitatively. The first challenge then is to get the specification defined in engineering terms.

Even when you get a specification the different disciplines have their own units of measure and you need reference charts to ensure you can translate between. For example if you want to measure NH3 in water the chemists will quote concentrations in mols when setting up a calibration solution, the sensor specification will be in ppm and the biologists will quote mg/ml.

Most husbandry techniques have been based on human skills reinforced by attempts at standardisation an example being body condition score in dairy cows (BCS). A human examines a cow by eye and by palpation of the flesh around the back and creates a score from 1-5. Clearly a 4 point scale is very crude and so we end up with 0.5 increments.

In the late 1990s we tried to apply image analysis techniques to BCS by looking at the changing shape of cows around the tail-head area. I calibrated the technique by bending a soft piece of aluminium strip over the cows back to match the contours. The image analysis exactly mapped the shape of the aluminium strip but it did not correlate well to the BCS recorded by the human. It matched at the very thin and very fat ends of the scale but in the mid range the human was clearly using information more than shape with comments such as “well she’s more of a Friesian than a Holstein so I expect a bit more fat”.

The gold standard used in the industry may have numbers in it but also a lot of non-numerical judgements. In my view we should redefine many of these indices (mobility score, BCS etc) with numerically based objective systems that may not be as skilled as a human but will be repeatable.

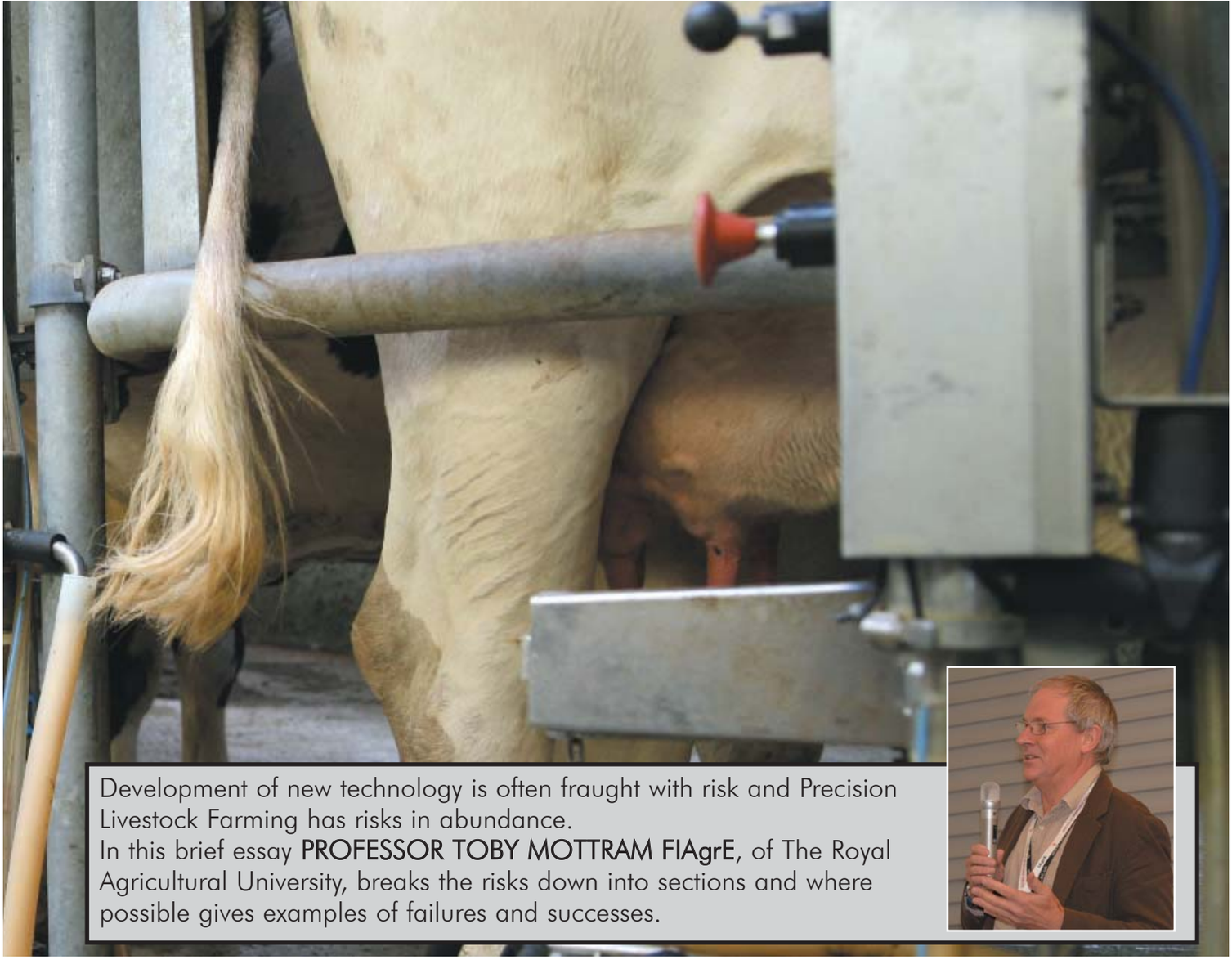
The presence of a human in the system may also affect the measurement. We have shown that measuring the speed at which a cow walks from point A to point B can be correlated to mobility score but only when she walks at her own speed. If a human scorer appears she may change her behaviour but her behaviour is not affected by a camera system or RFID system.

ENVIRONMENT

PLF systems always need electrical power and supplying and protecting this from the environment is a challenge, particularly if the system needs to interact with animals.

Animals are kept in a variety of locations and environments. Outside we have to ensure that our equipment is weather proof but inside environments can be even harsher with high levels of ammonia, condensation, dust, rodents and farmers all having an impact. A member of staff with a pressure washer can destroy most equipment whatever the IP rating may say.

The animals themselves use their mouths to explore any tactile object within range and will chew and lick anything in range. I remember when milking cows in a conventional parlour in the 80s a cow leaning over my shoulder and biting the soft rubber keypad of the parlour controller and exposing all the contacts and wires inside. Only metal, concrete and hard plastics are resist-



Development of new technology is often fraught with risk and Precision Livestock Farming has risks in abundance.
In this brief essay **PROFESSOR TOBY MOTTRAM FIAgrE**, of The Royal Agricultural University, breaks the risks down into sections and where possible gives examples of failures and successes.

ant to chewing and even the latter can get degraded by constant scratching.

With my own technology of the wireless telemetry bolus protecting the electronics inside the cows rumen requires careful attention to protective materials, even small changes in epoxy resin formulation can cause major changes in resilience.

Even materials that are resistant to degradation in chemical works do not survive in the rumen. Because the rumen is as little explored and characterised as the surface of Venus you are in the dark until you find a test process that reproduces each mode of failure.

SKILLS REQUIREMENTS

In founding eCow the greatest challenge we have found is in recruiting and training staff with the right skills for our sector.

The animal sciences turn out good graduates but with no understanding of engineering especially hands-on electronics while standard engineering training prepares no-one for the complexities and rhythms of farming. Many people from outside the industry are shocked by what they see, on even well managed farms, such as the visit of the knackerman to collect the casualties. Very often just the mess, dirt and smells can put people off.

Those who have a bit of experience in working in other engineering sectors very quickly enjoy the unsolved problems in a sector that is important and unpretentious. Most engineers enjoy the challenge of solving problems daily rather than working in a bland environment in large anonymous companies.

These challenges have led us at Royal Agricultural University to develop course modules for final year undergraduate and Masters programs. The first, Cloud Computing and Ground Truth Data introduces agricultural students to capturing data from sensor systems and linking it to data from the internet and programming scripts in Python to do more sophisticated and continuously updated analysis than is possible with spreadsheets.

Next year we will be offering a new module Managing Automatic and Robotic Systems which will teach the issues associated with the flood of data, the safety and compliance issues that come with increasing sophistication of automated systems in dairy, pigs, poultry and high value production indoors and out.

I have designed the courses around what I have seen as the vocational training needs of the several people who have been employed by eCow over the past 8 years some of whom have gone on to greater things and others have stayed with us.

RESEARCH BASE

There are virtually no research facilities to support companies in Precision Livestock Farming in the UK.

There is research capability but it is fragmented and needs to be hunted down on an individual basis. There is as yet no place one could go for guidance as to where the expertise resides although the internet is a great tool for searching.

The British Society of Animal Science has now recognised Precision Livestock Farming as a developing discipline and we inaugurated a PLF session in the 2014 annual conference at Nottingham with invited speakers and which I was privileged to convene and chair. We intend to make this an annual feature.

Hopefully the new initiatives in the Agritech Strategy will create an infrastructure of research which will include engineering as the key discipline to deliver working systems to the industry. By the time this article is published we should see the results of the calls for Expressions of Interest but it is vital that we maintain pressure on BIS, Defra and InnovateUK to ensure that engineering is funded going forward.

Managing cattle safely

The group in the cattle pens with a visitor wearing the special glasses to simulate cattle vision. *Photo supplied by IOSH'*

Focus on animal psychology and design of handling facilities

WORKSHOP REPORT BY ALAN PLOM MIAgrE

IAgrE was well-represented at the '*Managing Cattle Safely*' Workshop, organised by IOSH Rural Industries Group (RIG) on behalf of the Farm Safety Partnership (FSP) at Askham Bryan College on 23 October 2014.

Whilst myself, Alan Plom (Vice-Chair of IOSH Rural Industries Group and Event Organiser), announced the launch of IAgrE's new Health and Safety Technical Group (HSTG) at the event, IAgrE Member Bob Ritchie and staff from his company Ritchies Agriculture played a leading role in describing and demonstrating good design features for permanent and mobile cattle handling facilities.

The event was aimed at FSP members and non-members, including manufacturers and designers, college lecturers and trainers, agricultural consultants, as well as farmers and livestock unit managers.

Speakers included representatives from the Health and Safety Executive, NFU, NFU-Mutual, the British Cattle Veterinary Association and experts from Ireland. They drew attention to a lot of useful existing guidance, including a DVD and related booklet.

HSE's analysis of the main causes of fatalities, injuries and ill health related to animal husbandry and cattle-handling in agriculture established the extent of the problem and provided food for thought.

Seven of the 27 workers killed in agriculture during 2013-14 died as a result of coming into contact with cattle and a total of 29 workers and 9 members of the public have died in cattle-related incidents in the past 5 years. Many others have been injured, some seriously.

Few are result of 'attacks' by bulls (or cows) - most occur during routine handling and as a result of inadequate precautions or facilities.

Further information about recent incidents and the format of the event is available via the IOSH RIG News page at **tinyurl.com/kgq5drf**

Some of the presentations are to be posted on the IOSH RIG Events page **[tinyurl.com/ojeskhx]** and summary report and recommendations for follow-up activities will be available soon from the FSP.

The interactive workshop included a series of short practical demonstrations of cattle

handling facilities and 'good practice' techniques - using the College's own facilities and Ritchies mobile equipment, including their new 'Stock Cube' concept.

The event also focussed on the influence of animal psychology.

Some might think '*what has this got to do with engineers*', but the importance of understanding animal behaviour is vital to improve animal handling techniques and the design of equipment and buildings.

Cattle have become bigger, and with less human interaction now due to there being less staff on farms, this provides new challenges. It is not only about providing an escape route for stockmen.

To help delegates understand why cattle react as they do in unusual situations or when they perceive a threat, they were able to view the world from the animal's perspective - through a special pair of glasses which simulated cow's vision - and walk through a cattle race.

This practical approach is an essential tool to help improve cattle handling methods and the design, selection and installation of facilities, tailored to the animals and the farm. Safe handling and understanding animal behaviour also ensures the safety and wellbeing of animals as well as their handlers, vets and others exposed to risk when handling or transporting cattle.

Bob Ritchie of Ritchies Agriculture explained the design features of permenant and mobile cattle handling facilities
Photo supplied by IOSH

The event also covered protecting the public on footpaths - prompted by a recent manslaughter trial. It enabled and encouraged delegates to share their own experiences, information and methods, eg alternative signs and fencing.

The Workshop has helped the FSP's Livestock Safety sub-Group to identify priority topics and will encourage joint working and production of further guidance and information.

A total of 29 workers and 9 members of the public have died in cattle-related incidents in the past 5 years

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Next generation robot

Raises the standard in automated milking

The latest incarnation of Fullwood's robotic milking machine - the Fullwood M²erlin - is a completely new machine, redesigned from the ground up to deliver significant benefits in terms of milking efficiency, cow flow and milk integrity.

It features a unique twin-exit gate configuration which enables the milking machine to act as a segregation gate: the robot's herd management software controls where each individual animal is directed after being milked, with cows exiting via either a side gate or straight ahead once the feed manger has automatically lifted out of the way.

By eliminating the need for additional segregation gates, the M²erlin requires less space and is more cost-effective to install than more traditional, modular systems. It is also available in either a side or straight entry configuration to further add to its flexibility and space-saving credentials.

It also features an all-electric milking arm that significantly reduces energy usage for teat cup attachment compared to previous robots and has fewer parts for improved reliability and serviceability.

Milking arm and HMI screen

The new milking arm does away with pneumatic and hydraulic drives and replaces these with energy efficient electric motors. This not only makes it virtually silent, but also significantly reduces energy consumption, and improves animal comfort and safety.

The new milking arm also enhances cluster attachment speed and offers cluster attachment accuracy. It also includes force sensing technology which prevents damage or injury to both machine and animal.

As well as an all-new physical design, the unit also features several key operating software upgrades which improve and simplify herd management protocols. These include the installation of Fullwood's recently launched MerlinView software, which simplifies the data available to herd managers by collating a series of key performance indicators (KPIs). Information such as individual cow milking data, cow activity, milk components, overall herd performance, bulk tank capacity and cleaning parameters are summarised and displayed in an easy to view format on a single computer display screen.

The new software can also be viewed via a smartphone or tablet application making it possible for herd managers to keep a close eye on their herd's live performance status from any remote location.

As well as the all-new milking arm, the M²erlin also utilizes a new crate design which enables cows of all sizes and breeds to be comfortably and safely milked through one standard machine. The new machine also features a number of additional fail-safes to protect the quality and integrity of the milk and comes as standard with Fullwood's new Herd Management Interface (HMI).

"The new HMI enables farmers to access key cow data and milk production records from a full-size touch-screen display mounted on the robot's housing," said David O'Hare, Chief Executive of Fullwood Limited. "As such, information such as milk flow rate, milk yield, heat activity and real time milk quality can now be accessed from the machine itself without having to consult the farm's main computer. That allows the robot's operator to keep a closer eye on each cow's performance and to investigate any potential management concerns as she is being milked."

The new machines are manufactured and assembled at Fullwood's Grange Road premises in Ellesmere, Shropshire, ensuring that spares and all the technical assistance required by the company's British customers are easily accessible.

A VIEW FROM THE SHARP END

Investment for the family future


Simon Martin

Wiltshire dairy farmer Simon Martin views investment in new technology vital for the future of his family farm, now in its fourth generation, but only if it can be guaranteed to make a return.

CHRIS BIDDLE REPORTS

Simon Martin runs one of the largest dairy operations in Wiltshire and Hampshire, an area of mainly arable and beef farming.

The Martin family have been farming at Nunton, a small village south of Salisbury since 1929 when John Martin established the farm with 29 cattle.

Today, grandson Simon runs the farm and has built up a herd of 750 cows, and recently invested heavily in a new rotary parlour which can take up to 1000 cows per milking. This replaced a 15-year old herring-bone parlour capable of taking 40 cows each side.

The new Milfos rotary parlour, was brought in from New Zealand after Simon visited systems in Australia and New Zealand as well as in the UK before making the final decision.

"Yes," he says, "it represents a significant investment for us at a time when the price of milk is so uncertain, but we have to keep moving forward."

When the parlour was formally opened in May 2014 by NFU deputy president, Minette Blatters who farms locally and local MP John Glen, Simon was receiving a farmgate price of 33p a litre for his milk. Barely six months later that price had dropped by almost 10p a litre.

But although, he reckons the new parlour will take up to 15 years to pay for itself, there are strong reasons why Simon recognises the need to keep modernising.

"In a way, there is no option, but we also look on it as our succession plan for the farm."

John Martin handed over to his son Peter, before Simon took over the running of the farm - and the new installation gives his son John (who studied at Reading University) the opportunity to build his future around an efficient and financially viable operation.

The new parlour has 70 milking points, with the big advance being the cows now feed during milking. The only human involvement being the attachment of the clusters which are automatically removed when the cow is empty.

This has reduced milking time from three and half hours with the previous herring-bone system to just over 2 hours

Simon keeps a keen ear open to new development in the dairy industry, and indeed participates in regular discussions groups with other farmers using the Milfos

"My £250 plate meter for measuring grass cover is probably the most important tool on the farm"

system where they can compare notes and benchmark their individual performance.

"It is easy to get a bit isolated on your farm," he says, "so I take every opportunity to compare notes with others and make farm visits when I can."

What about new technology, new monitoring systems, new engineering developments, new animal science . . ?

"Yes, of course I look and read up as much as I can - and we certainly considered robotics as part of the new installation, but at the end of the day it all comes down to money.

"25p a litre for milk is not going to pay for many robots!

"We've still got to be able to make money when prices are low. Investment in automation has to make a return, there is no other way of looking at it."

For Simon Martin however, a simple piece of kit costing just £250 is "probably the most important tool on the farm". The Jenquip Plate Meter, also from New Zealand, enables Simon to measure the grass cover in each of his fields. He'll walk the same route on a weekly basis taking dry matter measurements in each field which then helps him take decisions on which fields to graze next, and which fields to rest - particularly in January and February. That helps determine the budgeting of feed requirements for the grazing cattle.

The next piece of technology that Simon is looking at is automatic teat spraying after milking. "It is a job we do manually at the moment, and I believe that it would be not only a time-saver but improve the cows' welfare particularly against mastitis".

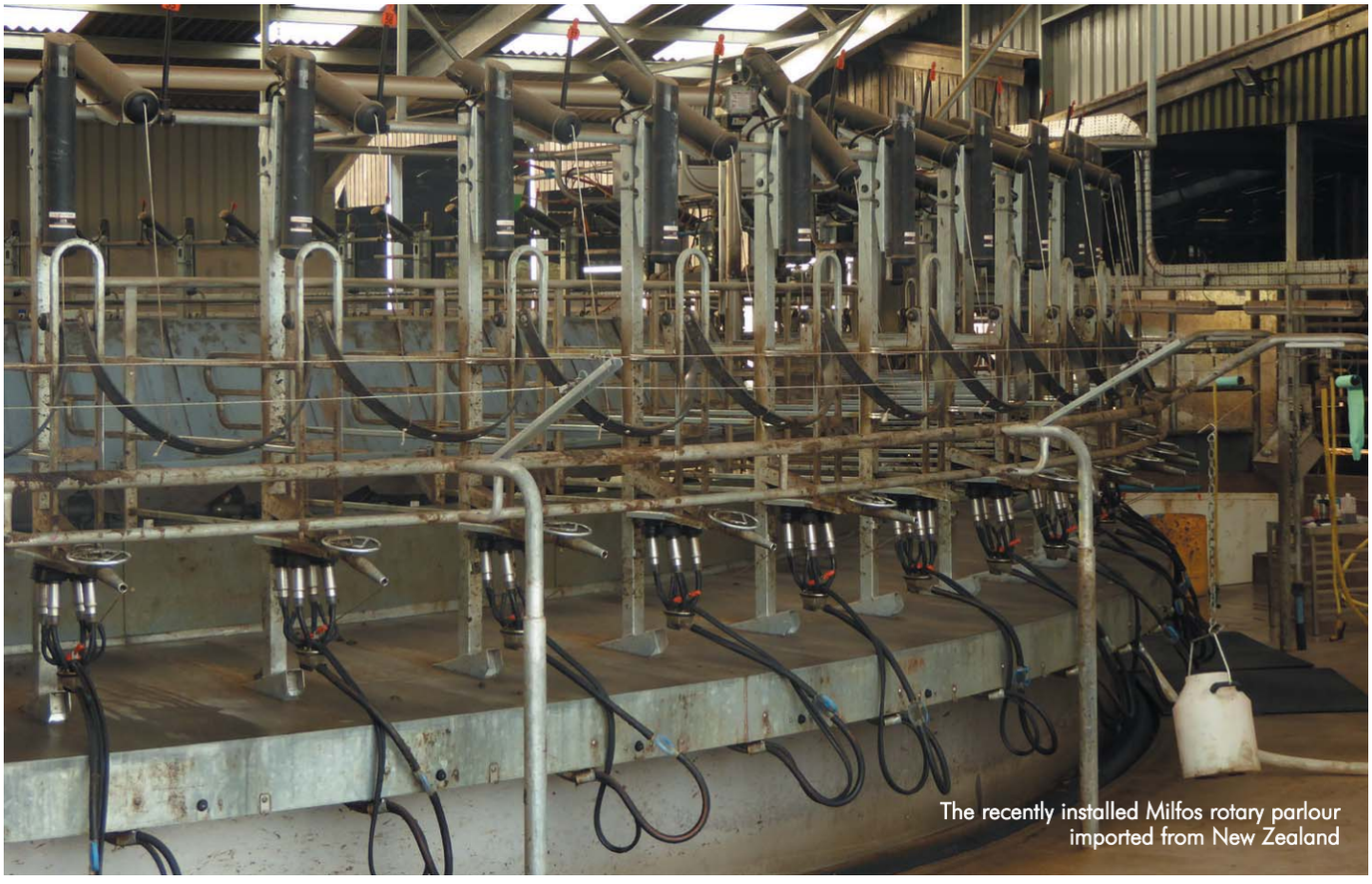
So for Simon Martin, the key to successful dairy management is to prioritise what new developments or advancements are important - and ensure that they are cost-effective.

Despite the present 'yo-yo' price of milk in the world market, partly due to bans of dairy exports to Russia, a slowing of demand from China, and some over-production, farmers need to invest in the future. The spectre of the lifting of European milk quotas in April next year has thrown another 'curve-ball' into the future planning of dairy farmers like Simon Martin.

"25 pence a litre for milk is not going to pay for many robots"

But he remains confident in the long-term future, is willing to invest in new technology, but only if it improves his efficiency and ultimately the bottom-line.

Simon with the Jenquip plate meter which he described as the most important tool on the farm



The recently installed Milfos rotary parlour imported from New Zealand

e-Xtra

Available now on www.iagre.org/publications/e-xtra

Land & Water Management in UK under Climate Change - The Precautionary Principle

Risk reduction and future proofing

by TIM HAVARD EngTech CEnv MIAgrE

This paper is based on my own experiences and observations over the years in the field mostly overseas but also in the UK and the growing number of scientific reports on the matter but notably the latest IPPC report.

I have for many years agreed with those scientists who have been putting forward the concept of global warming in as much that we have been noticing significant changes in weather patterns, particularly an increased storm intensity and short periods of higher local temperatures; not only in the UK but also in West Africa.

The damage to the ozone layer brought home the fact that the activity of mankind could affect the atmosphere. We reduced CFCs and lo and behold the hole in The Ozone Layer started to close. It thus seems wholly plausible that the massive amounts of pollutants notably CO2, but also methane, Ammonia, nitrox, water vapour and a wide range of aerosols that are belching into the atmosphere, significantly more than the amount of CFCs that was discharged, must have an effect somewhere.

Those old enough will remember the London smog caused by coal burning and that it took very little effort to sort that out - stop burning coal.

There is growing reliable evidence that:-

1. The CO2 content in the atmosphere is rising as are other pollutants
2. The general temperature of the atmosphere is increasing
3. The surface water temperature of the sea is increasing
4. The general level of the sea is rising
5. The acidity (pH) of the sea is increasing
6. Storm intensity is on the increase both in terms of wind speed and volume of water (rain) delivered per storm
7. Air temperatures and wind speeds over the northern hemisphere - the main global land mass - are more volatile
8. El Nino events in the largest mass of global water, the Pacific Ocean, increasingly do appear to have an effect on the weather patterns in other parts of the world but certainly the northern hemisphere. There is some evidence that it affects the energy balance of The Jet Stream
9. El Nino events have a major surface water mixing effect due to higher wind speeds that increase wave activity. This transfers warmer surface water down the oceanic profile - a heat sink in its own right - causing mixing which in turn affects deep ocean current activity that relies on temperature and salinity gradients to flow.

From these indicators and some basic physics there is every reason to believe that significantly more incoming solar energy is being trapped within the global atmosphere and oceans- the greenhouse effect - and that this extra energy, as it has to go somewhere, is highly likely to manifest itself in a more turbulent weather pattern. I would suggest that the growing number of flood and storm events in the UK over the past few years are a manifestation of this increased climatic energy - the northern jet stream is certainly more energetic and erratic, and this in turn makes land and water management a much more serious matter than hitherto.

There is a growing need under this climatic uncertainty for a clear coordinated national programme that brings the well being of the land and water in to one focus particularly in the light of the demands of a high and growing population and increasing global political instability.

Mechanisation of smallholder Conservation Agriculture in Zambia

Lessons learnt and future directions

by BRIAN SIMS, FAO Agricultural Mechanization Consultant; JAMES BREEN, Independent Agricultural Consultant and SINA LUCHEN, Regional Agronomist, FAO, Johannesburg, South Africa

SUMMARY

Conservation agriculture (CA) mechanisation options for smallholder farmers include ripping and direct seeding with draught animal and tractor power.

The hand-dug basin conservation farming option is also available for very small land holdings. In supporting CA mechanization, FAO has been promoting a donor-supported, e-voucher system which gives lead farmers the ability to purchase CA services from appropriately trained providers equipped with CA equipment (both draught animal and tractor powered).CA has now taken off in Zambia and the provision of appropriate CA services via commercial contractors has been a vital ingredient of the success.

Involvement of the private sector in the provision of equipment and the extension of loans on a subsidy-free basis is the preferred system for the future.

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**

Activities of the DOUGLAS BOMFORD TRUST

An update

Annual General and General Management Board meetings held in November

At the Annual General Meeting of The Trust held at Cranfield University on 4th November, Professor Mark Kibblewhite, President of The Institution was welcomed as a full trustee and member of The Board.

At the General Management meeting held later the same day, The Board of Trustees:

- **Reviewed the administration and financial position relevant to The Trust;**
- **Agreed to support five applications for funding for a range of research activities;**
- **Reviewed the progress of research projects and other activities that are funded by The Trust.**

Studentships and Prizes

STUDENTSHIPS

Applications for studentships for the 2014/15 academic year are currently being processed.

A total of 17 applications were received from students from Harper Adams University and shortlisted candidates attended interviews at the University held on 19th November.

PRIZES

Very many congratulations go to James Phillips who received The Douglas Bomford Trust Award that is given annually to the best FdSc Agricultural Engineering student at Harper Adams University.

James, 21, from Haverfordwest, Pembrokeshire, spent his industrial placement year working for Claas UK and his final year project investigated how the design of air filters and their maintenance affects the performance of diesel engines.


James Phillips receiving The Douglas Bomford Trust award

James is following in his brother Tom's footsteps - Tom received the same Douglas Bomford Trust prize in 2011 and the family are now very proud to have two prize winning sons. James has now returned to the University for a further year to top up his degree to BSc(Hons).

Engineering scholarships and bursaries supported by The Trust

ROYAL ACADEMY OF ENGINEERING - UNDERGRADUATE RESEARCH BURSARY IN AGRICULTURAL ENGINEERING.

This bursary was awarded by The Royal Academy of Engineering to James Throup who is studying Mechanical Engineering at the University of Bristol.

His research project entitled '*A feasibility study into using nano quadcopters to test the possibility of pollination as well as inspection of plant matter*' involved investigating the flight dynamics of the 'Crazeflie' nano quadcopter near plant material.

The effect of flying the quadcopter close to plants was measured and the interaction between the quadcopter and the plant was studied using Optitrack Motive software and reflective tracking balls (see picture).


The quadcopter close to plant material showing the reflective balls used for tracking movements

ARKWRIGHT ENGINEERING SCHOLARSHIPS


Arkwright Scholars Oliver Rees (left) and Mark Holliday (right) receiving their awards with Paul Miller, Secretary of The DBT

These scholarships are for those starting out on A-Level courses at school and aim at stimulating interest in engineering as a career.

Sponsored students get a financial award and opportunities to be involved with engineering activities via The Arkwright Trust and sponsors. Students are selected by The Arkwright scheme using written examinations and interviews and selected students are then allocated to a sponsor.

The Douglas Bomford Trust is working with two students, Mark Holliday and Oliver Rees both of who have an interest in agricultural engineering.

They were presented with their awards at a prestigious awards ceremony held at The Mermaid Conference facility in London and will be involved with The Douglas Bomford Trust over the two years of their A-level course.

FEC

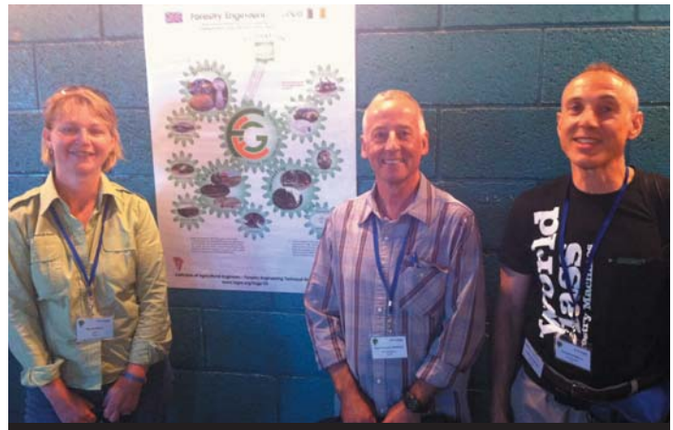
FEC/Formec Conference, Germander, France Sept. 23rd to 26th 2014

Propelling the Forest Value Chain

SUMMARY REPORT

by

JOHN LYONS AMIAgrE,
Past Chairman Forestry Engineering Group
Technical Services Manager, Coillte.
John.lyons@coillte.ie



L-R: Conference organiser Maryse Bigot, with Jean-Francois Gingras (FP Innovations, Canada) former organiser and Rafaelli Spinnelli, CNR, Italy

The 5th International Forest Engineering Conference, which was held in conjunction with the Formec's 47th International Symposium on Forest Mechanisation.

The many-faceted subject matter covered by this conference had drawn 260 delegates from all continents requiring three parallel sessions in order to accommodate the 70 posters and almost 100 presentations that had been submitted.

Mrs Morgan Vuillermoz FCBA chair of organising committee introduced the conference by listing the previous four FEC events in Scotland, Sweden, Canada and South Africa.

The proceedings were grouped into 16 themed areas to allow for reference and search purposes.

The theme areas are as follows;

- **Keynotes and Plenary**
- **Innovation driven developments in harvesters and forwarders**
- **Contractors and durable business**
- **Measuring and tagging logs along the supply chain**
- **Wood Supply Chain management and decision support tools**
- **Ergonomics and man-machine co-developments**
- **Trafficability practices and understanding of forest soil characteristics**
- **Harvesting techniques and working methods for biomass utilisation**
- **From traditional to automated work studies**
- **Logging in steep terrain**
- **Looking for efficient bioenergy supply chains**
- **Forest Roads and Environment**
- **Fuel Quality and moisture content management**
- **Operational uses of remote sensing technologies for logging operation**
- **Workforce training and skills development**

NOTE. It is suggested that the reader browse through these, selecting from them whatever area is of interest. In all cases, the contact information for the presenters is available, (name, organisation and e-mail address) for any follow up that one might wish.

The full proceedings will be available on the FCBA web site; **www.fec2014.fcba.fr**

Also, the Formec web site hosts the proceedings from many recent conferences held on Forest Mechanisation topics. **www.formec.boku.ac.at**

The plenary session focused on the 25 year old International Journal of Forest Engineering, IJFE. that publishes relevant papers, articles that are reviewed by technical experts on a voluntary basis, many of whom were present in the audience. An example of such is the '*COST Model for Calculation of Forest Operations Costs' published this yr, Vol 25, Issue 1*'.

www.tandfonline.com/toc/tife20/current#.VCfU-lftM4k

Also in the plenary session, *The Croatian Journal of Forest Engineering* was highlighted as a further source of peer reviewed publications in Forest Engineering. **www.crojfe.com**

BIOENERGY

Prior to the conference proper there was a session on Bioenergy focusing on the work being done via the INFRES Project.

The objective of this project is to present biomass as a cost efficient and sustainable energy source by supporting innovations and by demonstrating the results of the ongoing work in this area, such as the MAMA harvesting head. **www.infres.eu**

NOTE. Due to the Parallel Session format of the presentations the author was unable to report on them all. Below are outlines of the Keynote address and of the presentations he attended.

COLLABORATIVE LOGISTICS

The keynote address was given by a business consultant from CRET-LOG.

The theme was '*Improving business relationships and supply chain visibility to propel the forest value chain*'. Considering the growing complexity of value chains and of the environment (fierce competition, market dynamics, sourcing uncertainties, regulation and compliance pressures, increased environmental risks), it is acknowledged that local optimisations and isolated efforts

cannot succeed in improving value chains performance and success.

Considering the structural changes of the value chains in most industries, competition has shifted from 'company vs company' to 'supply chain vs supply chain'. Therefore a supply chain management approach is needed to improve operational performance of value chains, as well as their responsiveness, agility, robustness and resilience.

It is thus necessary to switch from a single intra-organisational approach to a more holistic inter-organisational perspective in order to design or redesign logistics innovatively and efficiently. Most research work highlights the need to improve logistics collaboration among supply chain partners, though this is not always easy since it requires openness and the sharing of information. This requires trust, which may take years to build up.

FOCUS ON CONTRACTORS

This focus was recognised as an important and positive development since previous conferences had largely ignored that they are a vital link in the supply chain.

Surveys in various countries have highlighted the lack of understanding in many cases of business practices, lack of communication skills and of their use of capital, and a lack of professionalism. Most of these areas can be improved through better communications, contractor/client relationships and with more development of the 'softer' skills.

OPERATOR TRAINING AND RECRUITMENT

This is becoming an international problem, as there is an ageing workforce and much knowledge and experience being lost.

A permanent solution must be found. Short term fixes are not enough. Leadership in the wood value chain and funding are also issues that require improvements.

An Interesting presentation from Sweden entitled '*Training 3rd Level*' explained how an academic course had been tailored to focus on all aspects of the timber supply chain. The course focused on analysis and planning skills since they were regarded as key to competitiveness. The course offered strategic planning over 3/5 years, tactical planning over a year and day to day operational planning.

HARVESTER / FORWARDER TECHNOLOGICAL DEVELOPMENTS

Increasing productivity via machine technical developments has slowed down significantly from a decade ago and only minor improvements are being gained in this respect.

Some of the more significant developments have been in the engines and emissions area.

> "..a supply chain management approach is needed to improve operational performance of value chains"

WOOD SUPPLY CHAIN AND ENERGY SUPPLY CHAINS

These are hugely variable and much care is needed in interpreting and comparing data from other countries operations.

This is due to the different technologies, cost bases, productivities, tree sizes/species, utilisations of equipment, measurement systems, end product specifications and pricing, H+S and environmental issues. While the technologies can be transferred quite readily, not the same can be said for the whole supply chain.

The challenge is to be aware of developments, trends and technologies in order to select what is appropriate.

LOG MEASUREMENT AND GRADING REQUIREMENTS

This is of particular interest in countries like New Zealand that export 6 million m^3 per annum.

They are required to tag every log being exported so that it can be identified, from stump to mill, through all loading and unloading as well as shipping.

TIMBER HAULAGE

There is an increase in the Gross Vehicle Weights in some countries, e.g. 60T to 76T in Finland, and a derogation in France for up to 48T and 57T. Brazil have benefitted by making lighter trailers.

IUFRO

A representative highlighted the need for Forest Engineering personnel to increase their interaction with other disciplines and increase visibility.

CATASTROPHIC FIRES AND INSECT INFESTATION

The dangers and the effects of these were highlighted as presenting many challenges and opportunities for the forest engineering community.

FUTURE NETWORKING

Networking has been hugely important in the past. Differences in communications will emerge, with podcasts, skype, increased internet work and searches.

Joint projects with Local Government are regarded as very valuable, and may provide some funding sources. Successful case studies will be very important.

SHIFT PRODUCTIVITY

This was not a specific topic of any of the presentations, but frequent references were made to time breakdown elements of operations, many of which omitted one of the greatest factors on productivity i.e. machine utilisation.

Of those presentations attended there was still an emphasis on elemental times.

PROFITABILITY

Requires large tree sizes since small tree sizes often involves the need for subsidies. No change in this.

CONSUMER LOW COST GPS

This was featured for tracking in a couple of presentations.

FIELD VISIT

One field visit site showed both harvester and forwarder working on very steep slopes up to 70%.

Both were tethered to synchronised winches with 500m wire rope on the drums. No ground damage was done. Basic winch costs were about 75k Euros but since the machines had been adapted for both front and rear winch rope attachment their cost was 100k Euros. Production was around 50m^3/day and roadside costs were approximately 40Euros/m^3. Sawlogs were being sold for 80/100Euros to local mills.

Another example of steep slope work was by the use of a large skidder with a remote controlled mechanical winch. The skidder was skidding 60m tall trees uphill to roadside following motor manual felling. Typically, three 16m long sawlog lengths were being produced but pieces from 20cm down were left on forest floor as waste.

NOTE. OBSERVATIONS ON NEW RESEARCHERS

Some previously researched areas are re-emerging again, e.g. comparison of rutting on soft soils with different forwarder configurations.

In some ways this is indicative of older persons whose knowledge and experience is being lost when they retire.

Another point that struck me was that there were presenters who were unable to answer questions about the relevance of their research in a broader context. This is probably due to their being familiar only with their narrow area of research, and having not researched thoroughly previous work done in their field.

The Author would like to acknowledge the Financial contributions from Coillte and the Forestry Engineering Group to facilitate attendance to the Conference.


Fullwood's camel milking unit

Council members learn about innovative, advanced milking technology at Fullwoods

Fullwood, a company at the forefront of milking technology for over 70 years was the venue for the IAgrE October council meeting.

Chief Executive David O'Hare and Technical Director John Baines, were on hand to talk about the company's history and developing product range that has contributed to the company's position at the forefront of modern milking technology.

The group, who embrace CAD design and rapid prototyping techniques, has come a long way from the company Matthew Fullwood founded in London in 1785. It began by importing annatto seed for dyeing leather and foodstuffs such as cheese. The business prospered and the product range was extended to include rennet, also used in cheese production.

A major development in 1918 was the decision to move the rennet production to a new site in Ellesmere, Shropshire and links with dairy farming increased during the 1920's as more dairy farmers abandoned hand milking and installed new, modern equipment to meet stringent hygiene standards and help them cope with expanding herds.

The company's first milking machines were manufactured at Ellesmere in the 1940s. It became a holding company after the acquisition of the Packo group of companies and Fullwood Limited became the trading company.

In the 1960s the company started manufacturing milk cooling tanks, and in the 1970s they diversified into the manufacture of processing equipment for liquid foodstuffs.

In 1994 Fullwood took over the Belgium Packo company adding its cooling products to the milking machine business.

From small beginnings the company has grown to become a forward thinking, international manufacturer supplying a range of innovative products world-wide with a turnover of 100 million Euros.

"We are continually improving and developing our products to make sure we stay at the forefront of modern milking technology," said David O'Hare.

"We were at the beginning of robotic milking with the first generation Merlin robot introduced in 1996. Since then we have improved and upgraded Merlin in line with feedback from our customers and dealers and by incorporating advances in technology."

Six generations of Merlins have been developed and all six of these generations will happily work together on one farm, with one computer and are installed on many farms throughout the world.

The Merlin robot allows cows to be milked 24 hours a day, 7 days a week at a time they choose. The advantages for the farmer are no more early morning milking and more flexibility to concentrate on other important farming tasks. The animals can enter the unit when they feel most comfortable and as every cow has different milking times these are staggered throughout the day and night so the need to stand for long periods in collecting yards has disappeared.

An integral part of Merlin is Fullwood's Crystal herd management software, which is also available for conventional parlours.

Crystal works by identifying animals that do not conform to selected criteria such as yield, conductivity, body weight or activity so that they can receive the necessary attention from a vet.

Fullwood's sister company is the Belgium company Packo and together they have developed a range of cooling tanks specifically for robotic milking. Its ice bank tanks ensure rapid and intensive cooling without freezing the milk and allows the use of off-peak electricity.

"It's still a family business and its continued success is because we keep close contact with our customers and value our key asset, our employees," David added.

Technical Director, John Baines said,

"We are very proud of the length of service of our employees. It takes about 25 years to lose your new boy status here," he joked.

The rate of farms in the UK investing in robotic milking equipment is developing fast due to the ever increasing demands on dairy farmers to improve efficiency, reduce labour costs and a desire for a more relaxed lifestyle..

But manufacturing milking machines is not just for cows. Sheep, goats, buffalo and camels are also catered for and milking products remains the biggest of Fullwood Packo's three divisions, accounting for half of the group's turnover.

In 2006 the company designed and installed the world's first mechanised camel facility for Al Ain Dairy Company in Dubai, one of the largest dairy producers in the United Arab Emirates. At this farm, 1000 camels are milked twice a day. Before the installation 2,500 camels were being milked by hand.

Amazingly, the company produces one million litres of camel milk a year and with the demand for it in the UAE reaching around four million litres a year, it suggests camel milk will be the next super food - but it's not cheap as its retail value is 6 to 8 times more expensive than cow's milk.

The unit which was commissioned in 2011 consists of a pair of double 12 herringbone parlours which are equipped with camel stalls and milking clusters. All associated equipment including the plant's milk cooling system is housed in cellars below the facility to protect milk and equipment from the intense heat and dust storms that dominate the region.

Before touring the facility, IAgrE members were encouraged to ask questions.

John Baines was asked if he considered himself an engineer or a scientist. John said he considered real engineering to be about much more.

"It's about having the skills to understand the customer and bring it all together. My degree is in agriculture with an animal bias and I have worked with engineers throughout my career so I would probably call myself a bio-systems engineer. Sadly, the word 'engineer' doesn't have the same kudos in the UK as it has in the rest of the world. We are not good at selling the agricultural engineering sector.

"I think agricultural engineering is the crossroads of all engineering - it's a multi-disciplinary industry to be involved in. Once you get people in and you hold on to them, it's just as though the light switch comes on and people recognise what an interesting and worthwhile career it can be."

> "...I think agricultural engineering is the crossroads of all engineering - it's a multi-disciplined industry to be involved in"

The IAgrE Council group at Fullwoods

Professional Registration: The steps to success

by JOHN GITTINS, BEng (Hons), MSc, CEng, MIAgrE

John Gittins grew up on a family run dairy farm near Oswestry in Shropshire. From an early age Lego captured his interest and combined with his love of inventing this made him pursue a career in engineering. He attended Harper Adams University to study a BEng (Hons) in Agricultural Engineering which included an industrial placement year. John was very pleased to win the Johnson New Holland trophy for his major project to design a telescopic and rotational dipper arm for a Lewis Equipment backhoe loader.

After graduating John decided to take an MSc in Agricultural Engineering. On completion he took employment at Turfmech Machinery as a Design and Development Engineer working on the newly acquired Allett cylinder mower range.

As his career progressed he moved up to Chief Engineer then Engineering Manager and has recently become Engineering and Quality Manager. He now manages the new product introduction team following a stage gate process model that he conceptualised and has continuously improved over the past 4 years. This process ensures they listen to their customers and only invest time and money in worthy projects. John provides technical support for production and aftersales, which became increasingly important after Turfmech made a large acquisition in 2011 of both the petrol and electric cylinder lawnmower ranges from Bosch Lawn and Garden Equipment in Stowmarket. This made the Allett mower brand a significant name in British manufacturing.

The intention of this article is to clearly set out the steps needed to complete professional registration and encourage readers to take suitable steps to record and plan their own professional development.

There are 3 levels of professional registration; Chartered Engineer (CEng), Incorporated Engineer (IEng) and Engineering Technician (EngTech). Each in their own right has a set of competence and commitment criteria which need to be met.

Figure 1 below summarises the 6 steps to becoming professionally qualified, all 3 levels of professional registration require you to follow the same basic path.

ACADEMIC STUDY

Loosely, CEng requires academic study to a Masters level (MEng, MSc or MBA), IEng requires a Bachelors degree (BEng or BSc) and to reach the EngTech grade a National Diploma (ND) is needed.

Figure 2 summarises the academic routes to achieve the desired professional grade.

Professional grade	Academic qualification & Time →				
CEng	MEng				
	BEng/BSc			MSc/MBA	
IEng	BEng/BSc				
EngTech	ND				

Figure 2: Academic study requirements for professional registration grades

For a more complete list of qualifications and their equivalents you can visit: **www.iagre.org/registration/profqualseng**

All courses must be accredited by the Engineering Council (EngC) who licence the IAgrE to award professional engineering qualifications. To check if your course is accredited visit: **www.engc.org.uk/education--skills/accreditation/accredited-course-search**

DECIDING WHICH GRADE TO APPLY FOR

The previous section outlined the academic qualifications recommended for each professional grade. However, it is ultimately your competence and commitment to professional standards which are assessed rather than the qualifications you have gained. With the correct experience someone with a BSc or HND (Higher National Diploma) can become a Chartered Engineer. Figure 2 should act as a guide to help you choose the most appropriate level to aim for and select the right competence and commitment criteria to use.

If you are in any doubt which grade you are applicable for you may fill in the registration form on the IAgrE website leaving section 2 blank. The IAgrE can then best advise you which grade you are most applicable for.

The form can be found at: **www.iagre.org/sites/iagre.org/files/docs/appform.pdf** and some useful guidance on filling it in is available at: **www.iagre.org/membership/guidance**

RECORD EVIDENCE

It is highly recommended that you download a copy of the Competence and Commitment Standard for the grade of professional membership you are seeking. These guides are available from: **www.engc.org.uk/professional-registration/standards/uk-spec**. The guides list the competences that must be met for each grade and give useful examples of the activities which you may use as evidence.

Table 1 summarises the competences required for all professional qualification levels.

When recording your competences the IAgrE online tool is very useful, its use has been covered in a previous *Landwards* article from the Summer 2014 edition on pg20-21. It is important to choose a method of recording your competences that suits you. Some candidates choose a series of quarterly reports listing events in chronological order. Others like myself choose a project based approach. *Table 2* gives a useful format for recording evidence using this method.

In the project based approach at the completion of a significant project the most fitting competences are allocated, a summary is produced and some form of hard evidence is kept as proof. The hard evidence may be in the form of; design

Category	Roles and Responsibilities	Competence
A	Knowledge and Understanding	A1/A2
B	Application to Practice	B1/B2/B3
C	Leadership / Management / Supervision	C1/C2/C3/C4
D	Interpersonal Skills	D1/D2/D3
E	Professional Conduct	E1/E2/E3/E4/E5

Table 1: Summary of competences.
Category A-D covers the competences and category E covers the commitments that the EngC standard requires for each grade. There are 17 competences in total.

studies, data sets, calculations, drawings, defect investigations, project plans, artifacts, photographs or computer programmes.

Here are some abstracts from my own evidence to act as an example of what you may like to include in each projects summary:

- *"Here, I learnt to lead by example. Driving for efficiency and sharing my knowledge of lean techniques helped other members in my team develop and ultimately achieve our common goal. I gained valuable project management experience and now continue to look for further efficiency improvements."*
- *"The main benefit of a structured problem solving approach is that it helps share information and drives the solution of problems, therefore improving quality. I have used the problem solving model many times when reporting on the solution of warranty issues to the Aftersales Manager, Sales Director and MD. A structured problem solving approach gives the Sales team and MD confidence in the products quality and that serious and deliberate actions are being taken to make improvements."*
- *"When the model was implemented, as project manager I placed myself with different team members, both people orientated and action orientated roles. Here I could give leadership and develop my understanding of the potential problems. I learnt to utilise my analytical and discipline skills to help move the project through the activity stages using a combined collaborative approach. I was able to offer technical support to the Sales team and gain a better first hand understanding of the customer's needs."*

REVIEW AND PLAN

By this point to recap you have decided; which level of professional registration to aim towards, become familiar with the competence and commitment criteria and have recorded and summarised several projects or work activities with some hard evidence as proof.

You will now need to review the evidence you have collected periodically. If you have regular appraisals this is a good time to hold the review. It will help you plan what to focus your development on for the next period.

It is advisable to collect equal amounts of evidence for each competence to make sure development is uniform and well balanced in all skill areas. It may be helpful to summarise the evidence and competences gained in a contents table, like the one in shown in *Table 3*.

The projects in *Table 3* reveal that the B3 competence is missing. As an objective in your work appraisal or an action point in your continuous professional development (CPD) plan you could make a note to try and cover this point by the next review.

ORGANISE AND SUBMIT EVIDENCE

To gain a professional qualification you must submit your evidence to the Membership Committee for review. Over the years you have been gathering and recording evidence it is likely that you will have a large number of projects. It is advised to select a small, but significant number of projects or work activities which are good examples of how you have met each competence. Each project must have some tangible evidence to prove your involvement. I'd recommend that around 15 projects should be sufficient. It is advised that the selected projects have a common theme acting as a spine linking them together.

The theme I used was new product introduction. Evidence ranged from a large company acquisition to design studies on hand-arm vibration to the conceptualisation of a product introduction process model.

Competence	Project title	Competence description	Summary
B1 B2 C2	Quality improvement project	**B1** Identify potential projects and opportunities. **B2** Conduct appropriate research, and undertake design and development of engineering solutions. **C1** Plan for effective project implementation.	Give a brief description of the project background and your role. Focus on lessons learnt and the benefits you gained. Remember you are trying to show how you grew professionally, so demonstrate how you tackled problems and what new skills you had to acquire to do so.

Table 2: Project based evidence recording

Table 3: Competence contents table

Project title or Report date	Competence criteria					
	A1	A2	B1	B2	B3	C1
Quality improvement project			●	●		●
Lean manufacturing training	●	●				

Evidence should be organised in a folder and in a sensible order. Organising the evidence by competence is useful, for example the project you are using to demonstrate competence A1 should come first, followed by A2 and so on. Make good use of dividers and the contents page as shown in Table 3 is useful to quickly reference a project and the competences it demonstrates. It is a good idea to include an executive summary like the example in Table 2 for each of the selected projects. Aim to make 4 copies of the evidence you will submit. If you are submitting your evidence electronically make sure you have made full use of hyperlinks in pdf or Word documents to help the reader locate your evidence.

Remember to include your CPD action plan in your evidence. If you have held regular reviews as recommended, your action plan will be the notes from each review. An action plan should reflect upon past work, evaluate future needs and include action points that can be ticked off.

To submit your evidence fill in the registration form mentioned in the previous section 'deciding which grade to apply for' and send it off with 1 copy of your evidence and the fee.

PROFESSIONAL REVIEW INTERVIEW

Your submitted evidence and application form go to the Membership Committee for review. It is important to note that this committee meet every 2 months. If your application is successful you will be invited to a professional review interview (PRI).

Bring with you to the interview a copy of your CV, CPD action plan and 3 copies of your evidence so that it can be referred during the discussion.

Usually there will be 2 assessors who will ask you questions concerning your submitted evidence to determine if you have achieved the level of competence for the professional qualification you are applying for. At the start of the interview you will be briefly asked to talk about your current job role and give some background information on your company, this is why your CV will be useful. All being well you will satisfy the criteria and successfully achieve a professional qualification.

Education & Training has 'serious issues'

Needs to be urgently addressed

Dear Chris
I would like to comment on the Landwards Special Issue, Education and Training : *Leading figures from E&T give their views on the issues to be addressed to meet future industry demand* :

Before I start, first of all I don't know what brief was given to these leading figures, and maybe it was an attempt to give a different beat to the drum. Having said that hardly any of the serious issues which need to be addressed were mentioned.

The issues facing the E&T of our industry are the same now as in previous years, and I feel we have serious issues that urgently need to be addressed.

In no particular order they are :

1) **The problem of recruiting young and up to date staff due to the very poor pay scales in FE**
2) **Lack of time for FE staff for a) quality preparation, and b) updating**
3) **Lack of funding, which means many Colleges are struggling to update their resources. (I recently had a long chat with the son of an ex student of mine. He said he enjoyed time spent at the College, but most of his work was on MF 135s!)**
4) **The worrying trend of minimum hours for full time courses**
5) **A small industry such as ours has three examination bodies offering qualifications to the LBSE sector. All three offer Levels 2 & 3 and each is of a different standard. How confusing is that for industry?**
6) **The level of the 3 Rs of school leavers is also still a worry**

Maybe we should look at 'regional colleges' for our industry, with the chance that manufacturers would be more prepared to support them.

Chris, I won't go on, but in closing I would like to see more support from the IAgrE for the young qualified technicians. They are the back bone of the IAgrE and our industry. We need to check out their views as to what they expect from the IAgrE.

Sorry if this is the same beat to the drum but we need to look very seriously at the road ahead. It is all very well talking up the new Trailblazer Apprenticeship, but unless we start considering the ground root problems very little will be achieved.

Richard Trevarthen
IEng MIAgrE

> "..unless we start considering ground root problems very little will be achieved"

If you would like to respond to any articles which have been featured in *Landwards* please write to the Editor at : *chris.biddle@btinternet.com*
Or the IAgrE Communications Officer, Marion King on *pressroom@iagre.org*

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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FORESTRY ENGINEERING GROUP

ANNUAL SYMPOSIUM

Wildlife, Water & Weather - An Environmental Minefield
4th September - Newton Rigg - Penrith

This year's Forestry Engineering Group Annual Symposium ranged across several subjects.

First up was **Dr Mark Webb of Peak Ecology** who picked out the main elements of wildlife law and how they can impact on engineering in forests. Animals such as otters, dormice, water voles and goshawks can all be seen as constraints to carrying out forest operations, but a combination of collecting information on what's there, forward planning and ensuring the machine operators are aware of the appropriate measures for dealing with wildlife, will reduce the impact on operations and cost.

Much the same goes for dealing with diffuse pollution from forestry which was explained very well by **John Gorman from SEPA** in Dumfries and Galloway.

After a quarter of a century of Forest & Water Guidelines, much of the siltation and pollution coming off forest sites stems from poor practice such as blocked culverts and drainage directly into watercourses. Clearing and maintenance of old drains is vital to protecting forest roads but the refreshed drainage systems need to meet new guidelines, breaking the pathway between the source of erosion and the streams. Using vegetation as a soakaway and natural filter together with engineering solutions such as sumps and sleeping policeman all help take the sediment and the energy out of the water.

The closing of old drains in Galloway catchments, along with the restructuring of forests, is reducing the acidification of the salmon spawning streams and limiting the extremes of water flow. The widespread use of rock crushers to prepare roadstone can also lead to pollution from dissolved metals, particularly from sulphite-rich rocks. Runoff from quarries and stocks of roadstone should be contained and treated.

The next talk by **Dr Deborah Hemming from the Met Office** was a fascinating insight into the complexity of climate modelling which now incorporates the impacts of vegetation and land use change and in turn can project changes to vegetation cover and productivity arising from global warming.

Short term forecasting has improved considerably with the accuracy of 3 day pressure forecasts now as good as the one day forecast from 1988. Fire and flooding severity forecasts are available as are daily pollen counts for a wide range of tree species - data looking for creative applications!

FEG Symposium speakers - *photo supplied by Malcolm Cattermole*

After lunch we continued on the theme of water management with **Tim Harvard** pressing the lessons of his long career on the importance of catchment management; slowing water runoff from the upper reaches of the catchment through land management and engineering.

Tim called for this to be a far greater focus of land use planning and land management incentives. With a changing climate and continuing pressure on resources we need to maximise soil moisture retention capacity and the value of water, particularly for supplementary irrigation in the lowlands.

Back to forest roads again with **Alan Drake** and the roadscanner van. In the old days (says Alan) when there were permanent forest road maintenance teams, there were always people around who knew the material beneath our forest roads.

Nowadays we need more reliance on technology. Alan's new improved van hosts high and low frequency ground penetrating radar (and associated gizmos) coupled to video recording and GPS tracking, providing a multi-media display on the state of the subgrade. A degree of interpretation is required to pick out the most likely boundaries of the different materials but the system can provide a linear map showing how much roadstone would be required to upgrade the road and where to put it. At around £400/km the roadscanner will more than pay for itself by saving stone and money as well as the environmental impacts arising from quarrying and construction.

Richard Smalley, who has a long history of forest machine design and production, presented a combined harvester for coppice and forest residue.

This neat piece of appropriate technology built on a tried and tested track system, has a wide grapple and circular saw coupled with a rotary fed billeter. Rather than creating chips, the billeter cross cuts, bends and cracks lengths of stem dropping them directly into a log bag ready for wood burning stoves or larger biomass boilers. The short log lengths and fracturing, aid air drying.

The many and various possibilities offered by new technologies was the subject of **Clive Blacker**'s presentation. Clive of Precision Decisions led us through the existing mapping uses of global positioning systems, satellite imagery, LIDAR (Light Detecting and Ranging) and drones or UAVs (unmanned aerial vehicles).

There can be challenges to using these in forestry - often to do with mountainous terrain and dense canopies, but these are being overcome. There are also crop measuring technologies involving 3D laser scanning in forests. The huge potential comes from linking these technologies with the information coming out of harvesting heads and lorry telematics and by overlaying land records and survey data. The challenge for us all is to get our heads around this technology and start to use the data we already collect to improve land management and operational efficiency.

The most enlightening presentation of the day was from **Dr Sarah Peers of NEF: The Innovation Institute** who is also a trustee of the Women's Engineering Society.

The Forestry Engineering Group is only too well aware of the preponderance of wise old men that attend these symposiums and the need for both forestry and engineering to reach out to younger people and to women. While Britain has been a world leader in equal opportunities legislation it is still at the bottom of the European league in terms of women in professional engineering.

Dr Peers presented rather challenging statistics demonstrating the problem and said we need to be proactive in increasing diversity in our professions and 'opening up the club' to women.

Both forestry and engineering include an array of jobs and types of work that can appeal across the range of young people's interests, be it hi-tech systems, wildlife, environmental management, civil and mechanical engineering, production forestry and timber design. We need to demonstrate this and invite young people of both genders to get involved by providing information, encouragement, apprenticeships and job opportunities.

The Forestry Engineering Group is a part of IAgrE and it holds an annual symposium each September at Newton Rigg Campus in Penrith. It is not expensive and open to anyone with an interest. Next year please come along!

Roland Stiven

BRANCH REPORTS

SOUTH EAST MIDLANDS BRANCH

MACHINERY DEVELOPMENTS IN AGRICULTURAL CONTRACTING - CROP PROTECTION

Local farm contractor, Matt Redman (Matt Redman Agriculture) won the 'Farm Sprayer Operator of the Year' in 2014 and is a regular contributor to *Farmers Weekly*, so was well-placed to provide an interesting perspective on agricultural contracting, recent developments in technology and machinery, and how changes in legislation impact on farming.

He did not disappoint. His illuminating presentation revealed the vision, dedication and business acumen needed to develop a successful business and win the Sprayer Operator of the Year accolade. All the more impressive given that he is only 26 years old and was the first person to win it on his first attempt in 10 years.

It was reported that the judges of the national competition were particularly impressed with his "*efficient and safe operation, including a self-built induction hopper with two extra rinse nozzles and a system to ensure tough-to-spot nozzle blockages behind the tank are picked up at the nearest opportunity*".

Matt described how his experience of working on a progressive arable farm was an eye-opener and instilled in him a keen interest in the developing technology, eg use of telematics to optimise field operations and improve efficiency during cereal harvesting. As a consequence, his own activities quickly expanded beyond his family's arable farm. He set up his contracting business in 2012 and it continues to grow.

Although he admitted it was a steep learning curve, this quick expansion has been possible because he has experimented and progressively improved his tractors and sprayers, adopting new technology and the most advanced features to improve the speed and accuracy of his spraying operations. These include GPS steering; tyre

Matt Redman (kneeling) with the other Sprayer Operator of the Year finalists

selection; auto rate controls, the best nozzles combined with boom height adjustment (to minimise drift and over/under application); boom section controls and 'twin lines' (to enable instant changing of nozzles from the cab and to provide variability and quick turn-around), etc. All underpinned by the inevitable GPS mapping of soil zones/types, enabling variable rate seeding - and more accurate invoices!

As Matt put it, these features have "enabled him to become an operator not just a driver". He also claimed it has reduced his own stress - although the downside to us mere-mortals is that he now has up to 5 screens to observe in his cab and there is no room for any more - in terms of space, if not information to assimilate?

He has also started using a comprehensive and powerful Farm Records system, although he admits he still needs to work out how to maximise the information from this new tool - when he gets 5 minutes to learn how!

Always looking at the next opportunity to meet the growing needs of his customers, he continues to develop his own ideas to upgrade his equipment, eg a mobile induction hopper to enable multiple chemicals to be mixed quickly and safely - vital now that filling the tank has become the critical time-limiter.

Matt admitted that he was addicted to buying new kit and when asked what Big Boy's Toy would be on his Christmas Wish List, he replied that he needed to design and build a new Avadex applicator to increase his capacity, match wider tramline sizes and cope with the significant increase in demand.

Matt has clearly got the enthusiasm, vision and commitment to enter the next stage in his successful venture. So, it was good to see a local boy doing well.

We wish him good fortune and look forward to having him back to speak to us again in the future.

Alan Plom MIAgrE

EAST MIDLANDS BRANCH

WINTER 2014 / SPRING 2015 PROGRAMME

The East Midlands branch Winter 2014 / Spring 2015 programme of events got off to a flying start on Tuesday October 14th with a superb visit to Amazone Ltd, at Harwich, Doncaster. As well as looking at the latest Amazone equipment, the visit included a brilliant presentation by Branch Manager Simon Brown which gave us a fascinating insight to future developments.

Our next meeting was on Tuesday Nov 11th. We met at Riseholme College to listen to Peter Leech give an illustrated talk on his '*42 years of John Deere and Life after Deere*'. This was not only a fascinating talk on his own wonderful career but of course included a lot of interesting Deere history. Altogether a very entertaining presentation.

Our plan is for the East Midlands Branch to meet every 2nd Tuesday of the month but our next meeting is planned to break away from this new policy.

In lieu of a December meeting, the meeting on Wednesday 28 November (after this issue of *Landwards* has gone to press) will be the IET/EMESP 28th Annual Joint Institutions Prestige Lecture. This year it is entitled '*British Motor Sport: Engineering the Future*' and we hope to report on a successful event in the next issue.

We revert back to our meeting on the 2nd Tuesday in the month in 2015, with meetings taking place on 13 January, 10 February and 10 March. We look forward to seeing you there.

Richard Trevarthen IEng MIAgrE
Chairman, IAgrE East Midlands Branch

WESTERN BRANCH

42 YEARS OF JOHN DEERE AND LIFE AFTER DEERE - PETER LEECH

Wiltshire College Lackham was the venue for a recent meeting of the IAgrE Western Branch where Peter Leech IEng HonFIAgrE was the guest speaker, delivering a presentation to some 30 members and guests present entitled '*42 Years of John Deere and Life After Deere*'.

Peter began by detailing his early years as a farmer's son studying for an OND in Agricultural Engineering. Upon completion of his studies he saw a job advertisement in 1971 for Service Trainee at John Deere Ltd which was then a relative new company having been formed in 1966. He applied for this job and was successful at interview and thus began a 42 year association with the company.

Peter's talk had many photographs from his career of various John Deere products, people and locations which delighted the audience, many of which had been employed by John Deere dealerships in the area. From his beginning as a Service Trainee, Peter soon moved to the position of Area Manager where he was responsible for supporting 18 dealers with technical assistance. In 1977, Peter moved to Mannheim where he became Senior Service Engineer, responsible for the technical support of Mannheim built tractors for John Deere importers in the Americas, UK, Australia and South Africa. In 1980, Peter returned to the UK and became Division Service Manager, the role ultimately evolved into Manager Customer Support, in which Peter's portfolio encompassed responsibility for John Deere's service, parts and training in the UK and Republic of Ireland.

During his time with John Deere Ltd, Peter saw many milestones. The ones of particular importance were the development and launch of the AgTech apprenticeship scheme in 1992; being involved in the design and build of the offices and training centre of John Deere Ltd at Langar which were opened by Princess Anne in 1996 and the introduction of the LTA Scheme in 2007.

Peter also explained that his involvement with various industry committees especially the IAgrE which culminated in his term as President from 2010 to 2012, he actively encouraged members and guests to become more involved stating that he had proven the maxim "the more you put in the more you get out".


John Deere 955 Combine circa 1977

In 2010, Peter took a new role within Deere & Co, becoming Manager Training Delivery for Region 2. Which is an area encompassing UK, Europe, Russia and the CIS countries as well as North Africa and the Middle East, and Peter was responsible for 11 training centres across this region, delivering some 300,000 hours of training per year to 25,000 dealer employees.

Peter took early retirement in 2013 and started his 'Life After Deere'. He focused on developing a consultancy business offering his experience with customer and product support as well as training to the agricultural engineering industry. He also explained his involvement with his wife's business Serious Cookware and how he has invested time and money into property and classic cars. He has also written and continues to write a series of articles for Classic Tractor magazine.

By way of entertainment and to satisfy a long standing desire Peter also drove a grain cart during the 2014 wheat harvest on a local 5500 acre estate. Needless to say he was driving the latest John Deere 6210R with Direct Drive transmission pulling a 16 ton Bailey trailer.

Nick Handy CEng MIAgrE

NORTHERN IRELAND BRANCH

SOCIAL EVENING 2014 AT SS NOMADIC

Northern Ireland branch members and their guests met during the summer to enjoy a conducted tour of the SS Nomadic.

This historic ship, the last remaining White Star Line ship in the world, is a mini-Titanic having been built at the same time at the Belfast Harland and Wolff shipyard back in 1911 to the same design and with the same luxurious interior finish. It had an interesting long service history of over 57 years unlike its larger sister ship which was tragically lost after just 13 days.

The Titanic was 4 times longer and more than 36 times heavier than the Nomadic. The latter had a vital role, with its shallow draft, as a tender to transfer passengers from Cherbourg harbour out to the Titanic and other large transatlantic liners.

During both World Wars it was used as a troop ship but during peace time continued in its passenger transfer role until 1968. From 1977 until 1997 it was moored on the Seine, near the Eiffel Tower in Paris, as a floating restaurant.

When this role ceased, and it lay redundant in Le Havre, its most likely next move was to the scrap yard. But a band of enthusiastic marine heritage volunteers in Belfast were watching and started a campaign to save it. Fortunately, the Department of Social Development for Northern Ireland saw its potential and purchased the ship at auction in 2006.

It was towed back to Belfast, 95 years after leaving, and fund raising began to restore it as a tourist attraction. At this stage it had lost its 2 upper decks, funnel and most of its fittings. With the generous help of several other sponsors including the European Union's Peace III programme, the Department of Social Development, the Heritage Lottery Fund grants programme, The Northern Ireland Tourist Board, Belfast Harbour Commissioners as well as other local public and private organisations restoration became a reality.


Northern Ireland Branch group on Nomadic with Titanic exhibition building in the background

The initial contract to restore the hull and fittings was awarded to it original builder, Harland and Wolff who still had access to some of the original design drawings. The detailed finishing restoration work, completed in 2013, also involved other contractors and included the re-opening of the historic Hamilton dry dock in Belfast's Titanic Quarter. It is now the ship's permanent home where it sits fully restored to its original glory to welcome visitors.

The guided tour was excellent, not only for its engineering aspects, but also all the personal stories around the ship's fascinating maritime and social history. Previous famous passengers included Marie Curie, Charlie Chaplin, Richard Burton, Elizabeth Taylor and many others.

More details of the exhibition and its history may be viewed on *www.nomadic-belfast.com* and other websites .

Terence Chambers MIAgrE

SOUTH EAST MIDLANDS BRANCH

'AUTO-GUIDANCE' by Will Mumford of AS Communications Ltd

This meeting was held jointly with the local IMechE Automobile Division centre as the rapid development in autonomous vehicles design and now trials on the open road, with Government approval, was an excellent opportunity to show what has been happening in the big wide world of agriculture over the years as well as reminding agricultural engineers what is being done now and possible future developments.

Will Mumford is ideally placed to give a very practical coverage of this topic; he is still involved with the 600 acre family farm and with his electronics training he started, 25 years ago, being involved in CB radio and other communication systems for farmers. Steadily his interests widened and he was approached by Trimble to be one of their two UK distributors. This has given him a good inroad into their developments and he now sells Dickey-John and AgCam as well as the Trimble owned FarmWorks farm management package.

Will covered the basics of how GNSS (Global Navigation Satellite Systems) and especially the US supported GPS (Global Positioning System), works, but how, and why, did it enter agriculture?

It came from the days of crop spraying when it became less H&S correct to have a man with a flag in the field guiding the aircraft so the Trimble Flightbar was developed. This led to the similar Trimble Lightbar which was able to be used in agriculture. Trimble had been looking into using that technology for auto-guidance and produced their first auto-guided vehicle in 1998 and quickly moved onto a system with pre-programmed patterns for farmers.


Trimble auto-guided vehicle in 1998

Displays and systems have developed and today's offerings include bolt-on devices to turn the steering wheel, systems which neatly fit under the steering wheel and, of course, the fully integrated system which connects directly into the tractor's hydraulic steering valve. Steering angle feedback comes from a sensor mounted, robustly, by the king pin and the position sensor accounts for roll pitch and yaw. Not only does this improve position correction but, on a combine, can correct the yield monitor for where the grain is on the conveyor flights. The mass-produced solid state gyroscopes, as used in the Segway, have greatly helped improve performance and reduce costs.

OK so the tractor position is known, and this is often good enough, but especially when doing down-the-row operations it is important to ensure that the implement is also correctly positioned, down to +/- 2cms. Will ran through the implement steering systems, whether, like the TrueGuide, they move the tractor so that the tractor is guided off-course so that the implement is in the correct position e.g. when drilling combinable crops, or, as in the TrueTracker, where the implement is steered in some form so that both tractor and implement are correctly positioned.

Will went through other developments beyond steering covering controllers for sprayers giving application rate control and section control on booms, boom height control, and touched on the ISOBUS to allow universal displays, including ruggedized tablets. The Greenseeker shows the potential to either map offline nitrogen requirements for a growing crop, or used on-line it can automatically vary the application of N.

Land levelling, although not a common UK requirement, has led to being able to get a detailed topographical map of the field. This gives the potential of anticipating changes in surface and moving the sprayer boom earlier for improved boom height positioning.

Of course this information can be fed back to the office, via telematics, to view on the Connected Farm and know what machine is where, doing what and how fast!

Trimble have also been developing their own drone, the UX5, it is a delta-wing that uses a launching ramp to give it a greater time in the air, as power to launch it is saved, and also keeps the operator safely away from the 'pusher' prop. At 75 meter altitude it has a 2.4cm per pixel resolution, a 45 minute flight which is enough to cover 100Ha, and with ground truthing the image gives +/- 4cm in x, y, and z directions. It does require 7 days of training, including 2 with the CAA, to get Basic National UAS certificate for small unmanned aircraft.

Will covered the hand-held GreenSeeker pointing out that a small marked out area, hand dosed with adequate N, could then be used by the GreenSeeker to give recommendations for N applications across the field as a whole. Will argued that this is a very cost effective method, a few hundred pounds for the device is easily able to save several thousand pounds worth of fertiliser; but that it is difficult to get farmers to accept it.


Trimble UX5 Unmanned Arial System about to launch

In considering the future Will is expecting wide-span vehicles, such as the Asa-Lift (see SEM Branch report, *Landwards Summer 2014 p26)* to become more popular as its wide track provides a very stable, practically non-rolling, base to give even greater precision in chemical application. Over the next 5-10 years we can expect that improved GPS performance and accuracy and software control will enable fully automated Headland Turns, seamless bi directional data transfer, remote assistance from dealers and others so long as the mobile phone/broadband or other infrastructure is improved and increased incorporation of modified consumer products such as the IPad and Android devices (Android is already used in the latest Trimble display unit). Generally there will be improvements to sensors, vehicle mountings, Unmanned Arial Systems (UAS / drones) and satellite coverage and accuracy such as the EC's planned, but delayed, Galileo satellite network.

In 10-20 years hence we could expect a fully autonomous UAS on every farm (depending on legislation), spraying technology using ultra-fast image recognition and pinpoint application, on-the-go analyses of nutrients and correction, increased use of self-propelled single activity machines and fully autonomous vehicles of all sizes.

Will even looked at the long term future and pointed out that there has been some discussion by NASA of a lunar-based mining operation in 2114!

For those that missed this presentation, or its recent repeat at Wrekin Branch,then there is an earlier presentation by Will Mumford, from the IAgrE 2011 'Smart Sensors' seminar, on the IAgrE's website under [Resources] [IAgrE Conference and Event Archive].

Dave Tinker CEng CEnv FIAgrE

WEST MIDLANDS BRANCH

DESIGNING MACHINERY FOR SAFE USE

Andrew Turner of the HSE talked us though some of the important points in the matter of designing machinery for safe use. He started by showing with statistics how, with the exception of fishing, agriculture was the most dangerous occupation in terms of fatalities per 100,000 in the industry. Although non fatal reportable injuries were important it was difficult to get accurate figures, for instance it was suspected that in the self-employed sector the under-reporting could be as high as 85%. If you are incapacitated through an injury you just 'disappear' as you are not working. He concentrated of looking at the fatalities over the last 20 or so years, as those fatalities are accurately known. In the construction industry the fatality rate has greatly reduced but agriculture is still in the region of 40 deaths per year,

Andrew looked at the broad picture and did emphasise that accidents when the operator was in the operating position were very low, most occurred when the operator left the operating position. Leaving us with the question as to why so many accidents happened when the tractor handbrake had not been applied!

The meeting was a good discussion and helped us understand the importance of bringing safety into design so that the easiest way to operate a machine was also the safest way and that any unsafe operations were made difficult! He also left us with the challenging question that as there are numerically so few people, so widely spread out working in agriculture and that they are so often on their own why are there so many accidents caused by people being run over or crushed by machines!

The meeting was hosted by Greenmech in Alcester (*www.greenmech.co.uk)* and after the formal presentation was completed we were offered an opportunity to see their production facilities and the comprehensive range of chippers and shredders from the one narrow enough to pass through a 760mm wide doorway up to large tractor mounted models. They are particularly proud of their laser profiling machine that has revolutionised the design, construction and fabrication of their models and also their powered coating plant which ensured that their equipment remained smart and bright for a long time.

John Fox looking as some of the laser cut steel plate. James Wallace is to his right

At the meeting one of our members, James Wallace, was proudly showing us his sixty years membership certificate and inviting us to name those on a photograph of a branch meeting visit to Fort Dunlop in September 1962; two of that party were present at this meeting! The two were John Fox and himself.

William Waddilove IEng CEnv FIAgrE

WREKIN BRANCH

PETALS . . . AND POTATOES

Unlikely as it may seem it is possible to get a group of engineers to turn out to consider petal production. Members visiting Shropshire Petals, based a little south of Newport in Shropshire had a fascinating evening considering production and marketing of flower petals for confetti and other decorative purposes. Driving down the A41 in the summer will show the flower fields before the business signs.

The farm now has 60 ha of flower production from seed annually. Species selection and varietal choice are key to providing a range of petal colours and shapes, the business working alongside breeders to identify niche products, even now searching for green petals. No dyes allowed!

Recent erection of a large dual purpose store supplementing an earlier store allows drying of the petals as well as potato storage, more of the latter later. The petals are hand picked, a harvester has been considered even designed and prototyped but hands are better and available.

The petals are placed in small plastic trays, stacked a few layers high on pallets and then plastic wrapped around each pallet leaving the bottom and top open. The pallets are placed over the ventilated floor of the store and heated air at low humidity is passed vertically through the pallets. Here the science comes into play obtaining energy from heat pumps indicated around a 1:4 ratio to lift the air to 550C and lower the humidity to 15% RH. Thus the whole store, based on pre cast concrete panels with tapered main duct and lateral ducts is kept at this condition for several weeks in the summer.

Once dry the petals are stored prior to despatch, this aspect being mainly based around internet sales. An attractive web site highlights visual and sensory benefits as well as stressing a natural degradable product increasingly demanded by wedding and celebration venues. Package presentation, interactive calculation of petal volumes needed per event are the details offered to the customer who may be anywhere in Europe. One fact which surprised everyone was that the annual petal production total was just 1.5 tonnes! That level being extreme from the other store use - Potatoes.

The Jubb family also operate an arable farming business with a large enterprise growing processing potatoes. Potato agronomy practice was indicated as routine however the handling and storage developments seen were ground breaking and inspiring. Harvesting 7-8 ha daily has meant an increase to pre storage grading, a new sophisticated grader with 50-60 tonne/hour capacity was seen linked to extendable and traversing store loading conveyors offering gentle and efficient store loading. The two stores have double usage, allowng storage of both flowers and potatoes at different times of the year. The most recent store offers refrigeration to combat high spring temperatures. Here pressure of flowers / potatoes overlap is high as well as the fact as the building structure needs to cool down! Whilst the flowers occupy perhaps less than 1 m high on pallets the potatoes are stored 6m deep, a depth probably thought impossible 15-20 years ago. This depth provides challenges for ensuring nil compressibility of the lower layers due to moisture loss. Thus temperature and humidity control are key to controlling potato weight loss necessitating uniform air distribution. Inverter electrical drives provide excellent control of fan speed and thus air quantity for flowers and potatoes. Members also heard that the whole new store build had been managed by one provider to ensure that the benefits of all engineering design e.g. tapering ducts, humidity and temperature modification, controls etc were not lost by various suppliers equipment not interacting with others.


A range of petals in the despatch facility

Practical store management involving the use of ambient air, recirculation within store, refrigeration use, software systems provided and personal experience were discussed. This rounded the visit off, one which was full of surprises both visually and technically, a real broad spectrum mix typically reflecting IAgrE membership interests.

Bill Basford FIAgrE

NORTHERN IRELAND BRANCH

GETTING THE BEST FROM FERTILISER SPREADERS

The guest speaker at the IAgrE, Northern Ireland Branch's meeting in Cookstown was Dermot Forristal (Principal Research Officer from the Teagasc Research Centre, Oakpark,Carlow) who is well known for his work across a range of farm mechanisation and crops research topics.

His talk subject was '*Fertiliser Spreading - Getting the mechanics right*' and dealt with the basics in getting the best performance from a wide range of spreader types. He also described the progression of spreader design and performance test methods.

Attention to spread pattern, the overall effect of overlap and accurate bout width are all vital factors to achieve good spreading results. The end of the spreading season is a good time to review the past season's performance and plan any servicing repairs or new machine purchase in advance of the next year.

Range of spreader types

The relatively simple and previously popular single disc designs and reciprocating pendulum (wagtail) types were used on relatively narrow bout widths up to 12 metres. Now the main agricultural market emphasis for new spreaders has moved to twin-disc designs, some capable of working up to 54 metre bout widths.

Pneumatic spreaders, which meter fertiliser into an air stream to outlets across a full width boom, are still available but comparatively expensive. They have the advantage of their spread pattern being less sensitive to the effects of windy conditions and variable fertiliser quality. Their sharp cut-off pattern is still an attractive feature for plot work at experimental farms. Twin-disc spreaders, when properly set, are capable of good results across a wide range of conditions and recent technical innovation has further improved their performance and versatility. GPS type guidance systems are also very effective in guiding the driver to maintain accurate bout width with all types of spreader.

Fertiliser type and quality

Different fertilisers have different physical properties which affect how far or evenly they can be spread. The ideal fertiliser should have granules of similar size, smooth shape and density. They should be strong enough to avoid breaking up during spreading as fragments and dust will not spread as evenly as whole granules.

Different fertilisers have different particle densities and lighter products like urea will not throw as far as heavier granules. This is why the main spreader manufacturers have been testing a range of fertiliser types to provide guidance to customers on how their machines should be set up to get the best results. Basic sieve kits are also available for farmers to check particle size distribution and batch weights for the fertiliser they are using.

Spreader testing

Independent testing is available and the main European spreader manufacturers have set up their own test hall facilities to test and develop their designs and to optimise spread patterns for the range of available fertiliser types. This indoor method is more accurate than the traditional method of setting out a row of collection trays in open field conditions.

The most basic method involves the spreader being set level at the correct height and spreading when travelling over the row of trays on the floor. The most recent facilities have collection trays with electronic weighing and the spreader is powered on a turning and lifting frame. In others the row of collection cells may sweep across on a radial beam. Specialist facilities provide a wider range of test conditions and speed up the process. The measured spread pattern data is used to show the effect of available adjustments and guide the development of features such as automatic on / off control. Charts are prepared to guide customers on how to get the best results from their spreader for specific fertilisers.

What the figures mean

Deviation from the ideal spread performance is analysed statistically and expressed as the 'coefficient of variation' or CV. In general a CV of 15% or less in the field is considered to be acceptable although 10% or less would be desirable. CVs greater than this are detrimental to crop yield or quality. If visible striping shows up in the crop the CV is likely to be 30% or more.

When spreaders are tested indoors in perfect conditions much better CV values would be expected with 5% or less not uncommon. CV values will drop off in the field particularly where wide bout widths are used.

Given the substantial expenditure on fertiliser, the yield penalty from inaccurate spreading will be much greater than the costs of operating and maintaining an efficient spreader.

The twin disc spreaders group

Although, at first glance, most twin disc spreaders may look similar there are several different designs using various methods to alter bout widths and spread patterns. These include using different disc or vane designs, altering disc rotation speed and changing the fertiliser drop position into the discs. Bout width can also be changed by tilting the machine forward or by altering its height above the crop.

Some have inward rotating discs giving strong overlapping patterns for which settings are generally less critical . The down side is that this type is less suitable for shutting off part of the working width. Others throw outwards from the centre and are capable of good accuracy at wide bout widths but need careful setting to maintain performance. Many of the top specification spreaders now use sensors, cameras or radar to monitor the spread pattern and guide automatic adjustments to assist this process.

The importance of calibration

Advance checking of how much the spreader will apply is vital because fertiliser flow rate out of the hopper can vary between fertiliser types, batches and moisture content. Calibration is the process of measuring the flow rate and relating it to tractor forward speed and bout width to predict the actual amount applied per hectare.

On some spreaders this can be measured quickly by stopping or removing the discs and weighing the amount flowing from the hopper in a given time. Trial and error can be an expensive option. The story was told of someone who started with last year's setting to spread 40ha over 5 separate fields only to discover at the finish of field 1 that it had got 20% too much! So the flow rate got cut back but field 2 received 15% less than intended. An increase for field 3 applied 5% too much before a slight cut back got it right for fields 4 and 5. In this case although the overall average application rate for the 40 ha was correct 40% of the area got the wrong amount.

New technology

The latest spreaders are now available with on-board weigh cells to monitor the rate at which the hopper empties. On a suitable tractor, this can be linked to forward speed measurement and will continuously check and display the application rate. Flow rate can be altered automatically, on the move, to maintain even application rate even if forward speed changes.

This feature can also be used, in conjunction with GPS field mapping systems, to alter the application rate on the move. Automatic control of feed on/off at headlands is now a common option.

Discussion period

The presentation created a lot of interest and an in-depth discussion followed including the following topics-

- Previous published test station results within Europe
- Bulk fertiliser spreading services by merchants
- Driving patterns for overlap in the field
- The effect of altering drop position on a spreader disc
- The merits of hydraulic or electric drive

The chairman thanked Mr Forristal for providing such an informative and enjoyable presentation

Terence Chambers MIAgrE

MEMBERS MEMORIES

James Wallace, AIAgrE 60 years membership

James, better known as 'Jimmy', Wallace was brought up on a farm near Ochiltree in Ayrshire and today the farm is still run by the Wallace family.

After leaving school, Jimmy started work with an engineering company in Ayr before progressing to the nearby Massey Harris factory in Kilmarnock, which was well known for manufacturing combine harvesters. Jimmy joined IAgrE in 1954 whilst working at Massey Harris as an Engineering Draughtsman.

At that time, the combine harvesters being imported were designed for the Canadian prairies and were not suitable for UK conditions. Jimmy did much of the work on designing a header which was better suited for UK use and he became somewhat of an expert in this field. In an interview with *Tractor & Machinery* magazine in August 2014 Jimmy said, "We would get drawings over from Canada which we had to interpret. The materials would be North American, so our metallurgist would have to look up the specification and find a UK equivalent. In one case he wrote 'English Material'. Of course the Scots were up in arms because it was actually coming from the steel mill at Hamilton. So the drawings were amended to 'British Material' and sent back to Canada. But the Canadians wouldn't have that because they were 'British Canadians', so the drawings were amended to 'UK Material' and everyone was happy!"

Following the closure of the Kilmarnock plant, Jimmy was transferred to Massey Ferguson at Banner Lane in Coventry, where he continued to make a major contribution to agricultural engineering.

After retirement, Jimmy put his expertise to good use by working for the ATB as a specialist instructor on combine harvesters. He also became a tour guide at the Banner Lane factory where he met and enthused to many parties of student visitors. He said of this in a January 2004 interview with *Classic Tractor* magazine, "It was interesting showing people around, especially children from the cities, because you felt like you were teaching them something."

Jimmy also continued to be involved with IAgrE in a big way. At branch level he suggested topics, sourced speakers and arranged visits. He was also very active in the Imagineering Scheme and and promoted agricultural engineering at the Royal Show at Stoneleigh.

Throughout the years Jimmy has always contacted and assisted the IAgrE Chairman and Secretary in a very pro-active manner. He was a Committee member in the 1970s and possibly before that - but that is as far back as the records go!

David Mitchell, MIAgrE 50 years membership

Straight away this dates myself having just received the Institution's 50 years Long Service Certificate. Like many members I have had a long and varied life though not all involved in agriculture.

My humble beginnings started as a city boy born and bred of a family working in human medicine. Initial aspirations were to be a veterinary surgeon but this was not to be.

Before having a driving licence I was working part-time for a gentleman farmer driving his Fergie TE 20. This set me on a track to be accepted into the agricultural industry starting YMCA's BBBF (British Boys for British Farms) scheme in East Grinstead, followed 2 years later at Lackham School of Agriculture for 2 years, cumulating in the Institution's entrance examination at Writtle. Passing the exam, it was another 2 years before admission due to not having an O level GCE English. To all those who find it a struggle, persevere with your wishes and you will get there.

David Mitchell last December in Tunisia ridging potatoes with a horse

It was a long road for me, practical farming experience in Sussex, Essex, Oxfordshire, Warwickshire, Herefordshire and Wiltshire. One job I will never forget is being the lone person in a field of sugar beet with just a billhook to lift them and cut the foliage off and put into heaps ready for loading by hand onto a trailer. After 4 weeks of this I was due for a change of duties.

From Lackham I went as a student to Massey Ferguson, Stoneleigh, July 1962, after 6 weeks I was on the payroll at the MF School of Farm Mechanisation. All together spending 24 and three quarter years with MF. 18 years at Stoneleigh which became ITDC (International Training and Development Centre) and 6 and half years in Scotland as an Area Manager.

This employment period saw me serving as a committee member and past Chair of West Midlands Branch, serving on Council and a committee member of Scottish Branch. Also registered as an IEng, since relinquished.

MF Stoneleigh highlights include extensive worldwide travel running training courses. Often away for 6 to 8 weeks at a time. No mobile phones then or ITD (International Trunk Dialling), everything had to be done via an operator and telegrams. How our lives have changed. One of the largest jobs was a World Bank project to build and install 600 PKD tractors in Uttar Pradesh, India, with the assistance of the local dealerships.

My days with MF ended as one of 4,000 people who were made redundant on the same day,

Friday 13 March 1987. A sad ending after a fruitful career. Why did this come about? It can be seen in many companies and organisations who have diversified into areas beyond their core business, getting into financial difficulties and having to drop these non-core activities. Also, sadly reflected in the UK manufacturing industry at the time, production was being transferred to France where labour laws prevented employers making staff redundant. Now, as the final result, MF Banner Lane factory and UK headquarters office block has been razed to the ground and replaced with a housing estate.

Like the present climate where employment can be difficult, after 6 months trying to gain employment, I started my own business, following the educational theme producing visual aids. Along with this I undertook part-time tutoring at a local FE college and at a local estate agent on property rentals. After 25 years being self employed and having major heart surgery, 17 years ago, I finally retired.

Like many grandparents I have looked after the grandchildren, but now all are at school or beyond, so full retirement has started. Today's preference is to go on many *SKI*ng holidays (Spending the Kids Inheritance).

No longer taking an active part in my branch, it is time to retire from the Institution as well.

Membership changes

Admissions

A warm welcome to the following new members:

Member

Davies H A L (Gwynedd)
Davies S (Monmouthshire)
Mitchell-Rowlands G (Suffolk)
Pullan F D (Shropshire)

Associate

Davies H A L (Gwynedd)
Davies S (Monmouthshire)
Mitchell-Rowlands G (Suffolk)
Pullan F D (Shropshire)

Student

Brooksby Melton College

Broadbent C
Chapman J
Grundy D
Johnson M
Jordan H
Lammin M
Lloyd T J
Mansfield T J
McEvoy P
Morley-Lamb M
Pacey J
Perkins J
Phillips A J
Pointing S
Roberts G
Rudolph J
Smith R
Stickels E
West S
White B A

Coleg Sir Gar

Davies A G
Davies J
Evans M
Evans W
Griffiths J A
Havard D
Harvey M
Hirst J
Lamport S
Mathias M
Mattey P J
Phillips S I
Price G
Richards F
Thomas R
Watson M

Cranfield University

Unagwu B O

Dundee University

Ng Z

Moulton College

Maziwisa T

Queens University Belfast

Hamilton W S J
McMullan T
Palmer W

Long service certificates

Name	*Grade*	*Date of anniversay*
60 years		
Robert Derek Sydney **Barber**	FIAgrE	9/11/14
John Malcolm **Boydell**	IEng MIAgrE	9/11/14
50 years		
George Lironi **Taylor-Hunt**	IEng MIAgrE	12/11/14
35 years		
Alistair James **Walshaw**	AMIAgrE	8/10/14
Kimon Peter **Christodoulides**	AIAgrE	2/12/14
Ian James **Yule**	CEng FIAgrE	5/12/14
Brian Lindsay **Roger**	IEng MIAgrE	6/12/14
Timothy James **Marshall**	FIAgrE	12/12/14
Neil **Munford**	AMIAgrE	12/12/14
Peter Allan **Roberts**	IEng MIAgrE	12/12/14
25 years		
Christopher John **Chisholm**	CEng FIAgrE	5/10/14
Rupert John **Lunnon**	AMIAgrE	30/10/14
Anthony N. **Haywood Smith**	CEng MIAgrE	31/10/14
Anthony **Pain**	AMIAgrE	1/11/14
Peter Mark **Stearne**	CEng MIAgrE	1/11/14
Paul **Martin**	AMIAgrE	1/11/14
Hipolito **Ortiz-Laurel**	AMIAgrE	17/11/14
David Francis **Perry**	AMIAgrE	27/11/14
Geoffrey Alan **Walker**	CEng MIAgrE	27/11/14
David John **Perry**	MIAgrE	18/12/14
Michael **Whiting**	MIAgrE	19/12/14

Readmission

Member

Jagun L A (Nigeria)
Olorunfemi A I (Nigeria)

Transfers

Fellow

Butler Ellis M C (Bedfordshire)

Member

James S M (Pembrokeshire)

Associate

Carpenter I (Bedfordshire)

Deaths

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

Mr Elwyn John James (AIAgrE) (Hampshire) - a member since 1979

Mr Donald Bowler (AMIAgrE) (Bedfordshire) - a member since 1972

Engineering Council

Congratulations to the following members who have qualified as Chartered Engineer and Engineering Technician entitling them to use the designatory letters CEng and EngTech after their names.

Registrations

CEng
Ascough G W (Gloucestershire)

EngTech
James S M (Pembrokeshire)

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

South East Midlands Branch
Monday 12 January 2015, 19.30
RUBBER BELTS FOR AGRICULTURAL AND RELATED APPLICATIONS
Speaker: Richard Hunt, Eurotrack Ltd
Venue: Maulden Church Hall, Maulden, Beds MK45 2AU
Eurotrack is the authorised European distributor of rubber tracks from Camoplast and supply to all the major manufacturers including CaseIH, John Deere and AGCO and Claas Challengers. Richard will, amongst other things, outline the differences between positive and friction drive systems and the importance of operator performance in terms of track life and reliability.
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
Web: www.eurotrackltd.com/

Wrekin Branch
Monday 12 January 2015, 7pm for 7.30pm
DEVELOPMENTS IN FORESTRY MECHANISATION - TBC
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

East Midlands Branch
Tuesday 13 January 2015
VISIT TO VEGETABLE HARVESTING SYSTEMS - TBC
Venue: Vegetable Harvesting Systems, Spalding Lincs
This visit is to be confirmed. Full details to follow.
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.vhsharvesting.co.uk

West Midlands Branch
Tuesday 13 January 2015, 19.15
GLOBAL FOOD - WASTE NOT, WANT NOT
Speaker: David Williams
Venue: Friends Meeting House, Maidenhead Road, Stratford-upon-Avon, Warwickshire CV37 6XT
David is a Branch Member and has previously given a presentation on "Grain Storage in the Ukraine". David intends to enlighten us on how food can be used more efficiently.
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: michaelcsheldon@yahoo.com

Northern Ireland Branch
Wednesday 21 January 2015
ADVANCES IN WELDING TECHNOLOGY
Speaker: Alistair Booth
Venue: South West College (Dungannon)
For further information contact Branch Secretary Ian Duff.
Tel: 028 8673 6977 Email: duffi@iagre.biz

South East Midlands Branch
Monday 9 February 2015, 19.30
BRANCH AGM AND STUDENT MEETING
Venue: Maulden Church Hall, Maulden, Beds MK45 2AU
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

East Midlands Branch
Tuesday 10 February 2015, 7pm
VISIT TO HOUSEHAM SPRAYERS LTD
Venue: Household Sprayers Ltd, The New Forge, Main Road, Leadenham, Lincoln LN5 0PE
Factory Tour and Talks on self propelled crop sprayer technology.
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.househamsprayers.co.uk/en/

West Midlands Branch
Tuesday 10 February 2015, 19.15
RURAL ELECTRIFICATION PROJECT IN UGANDA - TBC
Speaker: Dr Colin Oram, Warwick University
Venue: Stoneleigh Village Hall, Stoneleigh, Nr Kenilworth, Warwickshire CV8 3DB
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: michaelcsheldon@yahoo.com
www2.warwick.ac.uk/services/ldc/tandl/excellence/people/oram

Wrekin Branch
Monday 16 February 2015
VISIT TO SINCLAIR HORTICULTURE, ELLESMERE PORT - TBC
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

Northern Ireland Branch
February 2015 - tbc
THE JCB STORY - TBC
Speaker: tbc
Venue: CAFRE Greenmount College
For further information contact Branch Secretary Ian Duff.
Tel: 028 8673 6977 Email: duffi@iagre.biz

Western Branch
Wednesday 4 March 2015, time tbc
BRANCH AGM AND TALK (TBC)
Venue: Royal Agricultural University, Cirencester, Gloucestershire GL7 6JS
More details to follow.
For more details contact the Branch Secretary: Glen Craig
Tel: 07985 756001 Email: glencraig@btinternet.com
Web2: http://www.rau.ac.uk/the-rau

South East Midlands Branch
Monday 9 March 2015, 19.30
THE CHALLENGE OF AGRICULTURAL ENERGY EFFICIENCY
Speaker: Jon Swain, Farm Energy Centre
Venue: Maulden Church Hall, Maulden, Beds MK45 2AU
Jon will discuss how the current agricultural situation presents unique and interesting challenges to reducing energy consumption, especially considering the rise of renewable energy subsidies. He will present several of the latest initiatives and energy saving technologies that FEC are involved in and talk about how reducing consumption and using renewable energy better should be the mantra for the future.
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
Web: www.fecservices.co.uk/

East Midlands Branch
Tuesday 10 March 2015
VISIT TO BRUSH ELECTRICAL MACHINES LTD
Venue: Brush Electrical Machines Ltd, Falcon Works, Nottingham Road, Loughborough, Leics LE11 1EX
Brush Electrical Machines Ltd are the worlds largest manufacturer of Turbo Generators. Located next to Loughborough main line railway station. Please notify either the Branch Chairman, Richard Trevarthen (richard.trevarthen@gmail.com) or Branch Secretary, Paul Skinner, if you are planning to attend as Brush require numbers beforehand.
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.brush.eu/en/1/Home

West Midlands Branch
Tuesday 10 March 2015 19.00
BRANCH AGM AND PRESIDENTIAL ADDRESS
Venue: Friends Meeting House, Maidenhead Road, Stratford-upon-Avon, Warwickshire CV37 6XT
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: michaelcsheldon@yahoo.com

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: TBA
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
March 2015 - tbc
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

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 12 May 2015 - TBC
SUMMER VISIT TO MARTON MUSEUM OF COUNTRY BYGONES - TBC
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: michaelcsheldon@yahoo.com
Web: www.martonvillage.com/index.php/museum

IAgrE
Wednesday 20 May 2015
LANDWARDS 2015: TOO MUCH OR TOO LITTLE WATER? ENGINEERING INNOVATION FOR AGRICULTURAL WATER MANAGEMENT IN A CHANGING CLIMATE
Venue: Newcastle University
Tel: 01234 750876 Email: conferences@iagre.org

Other Events:

Tuesday 6 - Thursday 8 January 2015
OXFORD FARMING CONFERENCE
Venue: Oxford Univerfsity Examination Schools, Oxford, UK
Web: www.ofc.org.uk/

21-22 January 2015
LAMMA SHOW
Venue: East of England Showground, Peterborough, UK
Web: www.lammashow.com/

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

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: coming soon, check website
www.iagre.org