AGRICULTURE ▪ HORTICULTURE ▪ FORESTRY ▪ ENVIRONMENT ▪ AMENITY

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Landwards

VISION 2038 *PART FOUR*

ENVIRONMENT

WHAT ROLE FOR AGRICULTURAL ENGINEERS IN COMBATTING CLIMATE CHANGE?

In this issue

IAgrE

TECHNICIAN GRADE

NEW ROUTE INTO IAgrE FAMILY

DAIRY EQUIPMENT TECHNICIAN

The Technician grade of IAgrE Membership is for those who are qualified at a vocational or technical level. They may have completed an apprenticeship or extended diploma. Alternatively they may have gathered technical training at work or participation on an IAgrE approved training programme such as Parlour Safe.

To qualify, you will be working in industry and will have built up experience and career development in the workplace.

You will be keen to be part of the IAgrE family and seeking a cost effective way of getting involved and benefiting from being part of the community of professional engineers.

The IAgrE Technician Grade for Parlour Safe Technicians

If you are registered under the Parlour Safe scheme and have attended training courses at Reaseheath or Hartpury Colleges you are eligible to apply for IAgrE membership and use the letters TIAgrE after your name and on your business card as a way of demonstrating your high standards to your customers and colleagues.

If you have completed the training and assessment at Parlour Safe Category 3 and above you can also apply to become a professionally registered engineer.

This will permit you to use the title of Engineering Technician and join the growing number of engineers who use the letters EngTech as a demonstration of high standards and professionalism.

ACCREDITATION SCHEME

PARLOUR SAFE

To apply and find out more:

Go to the IAgrE website and complete the Application Form iagre.org/technician. With your completed application form, you will also need to provide a current full and detailed CV which describes in detail your working history and experience. We will need copies of academic certificates and details of education/training.

For further information contact Alison membership@iagre.org or 01234 750 876

EDITORIAL: THANK YOU

This issue of *Landwards* marks the end of my tenure as editor. It has been my absolute privilege (and pleasure) to have been at the helm of the Institution's journal for 12 years. Not only has it brought me into close contact with a dedicated and professional group of people, but I've learned such a lot!

Technological advances are changing the way all industries operate. Adoption of new technology can hardly keep up with the plethora of smart solutions entering the market. But much of farming is still a traditional industry, so by definition IAgrE's heritage is also steeped in tradition.

So it is apt that in her editorial this month, our President Jane Rickson focuses on the role of agricultural engineers to alleviate the flooding of homes and farmland in recent times. She rightly observes that our understandable fixation with new technology should not get in the way of maintaining our commitment to more basic essential roles such as soil quality and drainage systems.

Looking back at the first issue I produced in March 2008, it is remarkable how little has changed. We featured an article by Bill Butterworth about the role that ag engineers must play in combatting climate change. And, oh yes, a feature called Mr Motivator marking the 'retirement' of Richard Trevarthen.

There have been highlights too numerous to mention. The industry's presentation in October 2015 to the Royal Academy of Engineering on innovation; the ground-breaking achievement of the Hands Free team, the creation of the Agri-EPI centres, the rise of Harper Adams up the national University rankings, and most particularly the 80th Anniversary celebration when IAgrE returned to its roots at Wrest Park.

Support

Since 2008, I've worked closely with six Presidents and with three CEO's. Chris Whetnall was a terrific mentor in my early days as Editor, and Alastair Taylor and I shared many thoughts and ideas about our vision for the industry as a whole and IAgrE in particular (most of which dare not make the pages of *Landwards*). I wish Ed Hansom every success in the years ahead, this is an exciting time to be an agricultural engineer.

The support from the team at HQ has been nothing short of whole-hearted. Mention must be made of Sylvia, Elizabeth, Marion and most recently Alison for her eagle-eyed proof reading and Sarah for her calm steering of the events and conference, and for being my 'go-between' to the branches and members. Also to the Branches who furnished me with exhaustive and entertaining accounts of their meetings and visits (particularly the Western branch where alcohol and its production was a constant theme).

Finally a special mention of Martin Hebditch who has ensured that the design of *Landwards* has got better and better with each issue. Over the years, he has come up with original ideas and layouts to make *Landwards* as accessible and readable as it is.

I wish Andy Newbold and his colleagues all the very best as they take over *Landwards* from 2020. I am sure he will bring new and fresh ideas that can only be beneficial to the long-term success of the journal.

For me, it will be a break from publishing deadlines that have been central to my life for more than 30 years with *Landwards* and my other industry publications. This does not mean I will be putting down my pen, but will be spending more time with grandchildren, family - and watching cricket. I look forward to meeting up at future IAgrE events – this time unencumbered by notebooks and cameras!

May I wish the whole IAgrE community a very Happy Christmas and Peaceful New Year – and thank you!

Chris Biddle FIAgrE
Editor
chris.biddle@btinternet.com

CHRIS BIDDLE *Editor*
chris.biddle@btinternet.com

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

President **Prof Jane Rickson**
CEnv, FIAgrE

Chief Executive and Secretary
Edward Hansom
CEng MIMechE AMIAgrE

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LANDWARDS PRODUCTION TEAM
EDITOR: Chris Biddle
Tel: 44 (0) 7785 295625
chris.biddle@btinternet.com
DESIGN AND PRODUCTION:
Martin Hebditch
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Award for IAgrE President *Top accolade in Women Leaders Awards*

Professor Jane Rickson, the President of the Institution of Agricultural Engineers (IAgrE) was awarded both the top accolade for Outstanding Achievement and the category award for 'Engineering, Science and Maths' at the annual Women Leaders ceremony at the MK Stadium, Milton Keynes on 11 October.

Professor Rickson, who is Professor of Soil Erosion and Conservation at the University, is also the first female President of IAgrE in its 80-year history.

Professor Rickson was part of the team at Cranfield that was responsible for the University being awarded its fifth Queen's Anniversary Prize, for research and education in large-scale soil and environmental data for the sustainable use of natural resources in the UK and worldwide.

Professor Leon A. Terry, Director of Environment & Agrifood at Cranfield University, said:

"As a leader in her field, Jane is an inspiration to us all with her contribution to soil science and agricultural engineering being rightly recognised across the world. This award is just recognition for Jane's outstanding contribution to science and engineering."

Global Institute for Agri-Tech Economics Official launch at Harper Adams University

The Global Institute for Agri-Tech Economics (GIATE) has been officially launched at Harper Adams University by Vice-Chancellor Dr David Llewellyn. The GIATE is a worldwide network of leading multidisciplinary researchers and stakeholders which brings together experts working on the application, adaptation and adoption of innovative agricultural technology.

At the official launch Dr Llewellyn said: "The best way to predict the future is to create it, and that's what we're doing now at the threshold of the fourth industrial revolution. The Institute is aiming to connect researchers around the globe to focus on the application, adaptation and adoption of innovative agricultural technology in farms and agri-businesses. The research it will undertake will impact policy and enable participating researchers to take a global lead on the discipline as we push forward with the agri-tech agenda."

The GIATE is partially sponsored by the Elizabeth Creak Charitable Trust and is closely aligned to the National Centre for Precision Farming. It is led by the university's Chair of Agri-tech Economics, Professor James Lowenberg-DeBoer, and Chair in Agri-Tech Economic Modelling, Professor Karl Behrendt. Its research will include farm economics, productivity and efficiency in the farming sector, and value chains as well as regulation, policy and governance.

Dr Jordan Shockley, from the University of Kentucky, attended the launch and was excited about the GIATE's potential at a global level, saying: "The Global Institute for Agri-Tech Economics is a really interesting concept that I hope to be a part of. The networking opportunities in terms of exchanging data and getting researchers around the world on the same page with regards to agri-tech economics are really exciting."

Professor Lowenberg-DeBoer said: "We hope the Global Institute will provide a forum for agri-tech economists to work together to share information and methodological challenges, work on joint projects and review each other's papers. Everything you would expect in a solid scientific collaboration."

The launch dinner was part of a two day workshop on agri-tech economics held at Harper Adams, the GIATE's first event, which brought together world leading experts and researchers for lectures and breakout knowledge sharing sessions. The workshop was hosted in partnership with the International Network For Economic Research (INFER).

During the workshop, Dr Andreas Meyer-Aurich from the Leibniz Institute of Agriculture and Bio-economy was enthused by the possibilities the GIATE offered, saying: "In this field we can always work better when we work together so I'm interested to work closer with researchers across different continents through the Global Institute for Agri-Tech Economics."

AEA brochure for Department for International Trade

Promoting UK Agri-Tech Engineering around the world

The Agricultural Engineers Association (AEA) were earlier this year invited by the Government's Department for International Trade (DIT) to compile and publish a brochure showcasing the extent of British manufacturing in the agri-tech sector.

The brochure, ***UK Capability in Agri-Tech Engineering*** was completed and delivered to the DIT in October. It will be used at leading agricultural shows and exhibitions around the world as well placed in UK overseas embassies.

In her foreward, AEA chief executive Ruth Bailey says "We are delighted to have been asked to produce this brochure, showcasing many of the new ideas and innovations from established and new UK companies in support of efficient and timely food production across the globe".

All the companies featured are highly active in the export sector, they include Alvan Blanch, Garford, Greenmech, Househam, Knight, Shelbourne Reynolds and Teagle.

The brochure was compiled, edited, designed and published on behalf of the AEA by *Landwards* editor, Chris Biddle and designer Martin Hebditch.

IN BRIEF

LAMMA'20 has launched a new zone, Farming 4.0 to highlight UK farming's expertise, flair and passion for innovative technology that will help the future of food production.

Precision Agriculture Journal, which is jointly edited by IAgrE fellow, John Stafford and Jess Lowenberg DeBoer (Harper Adams) has attained an Impact factor of 3.36 (up from 2.44 the previous year), placing it at number 4 in peer-reviewed multi-disciplinary agriculture journals.

Norfolk based Council Member, Sam Moulding is embarking on a new venture by starting his own business – Sam Moulding Engineering.

JCB Chairman Lord Bamford has officially opened a new headquarters for JCB Germany, founded in 1965. The company is now operating from a new facility on a 12-acre site in Cologne following one of the biggest investments in JCB's history.

A £250,000 grant from the government will ensure more children in the UK learn about British food, farming and the countryside. The NFU has worked with Learn by Design, a company which delivers STEM workshops, who successfully bid for the funding.

IAgrE has announced that Andy Newbold, of Newmac is to succeed Chris Biddle as Editor of Landwards commencing with the Spring issue 2020. Chris has been publishing the IAgrE professional journal since 2008 and earlier this year announced his intention to retire from the role. Andy, a former IAgrE President publishes a number of specialist farming magazines including Agri Machinery News.

Hands Free Farm Scaled up to a 35-hectare farm

The Hands Free Farm (HFF) has undertaken the drilling of its first crop at the 35 hectare farm site on the Harper Adams University campus. The HFF follows on from the Hands Free Hectare (HFHa) that has been running at the university, in conjunction with Precision Decisions (now a Mag of Ag company), since October 2016. The small team behind the project aimed to be the first in the world to plant, tend and harvest a crop remotely, without operators on the seats or agronomists in the field. They successfully harvested their first crop, 4.5 tonnes of spring barley, in September 2017 and 6 tonnes of winter wheat a year later.

In May of this year, it was announced that the team would be returning for a further three years and scaling-up to a 35-hectare farm. They are to grow winter wheat (which is due to be drilled imminently), winter beans and spring barley, which are planned to be planted in March. New partners have also come on board in the shape of FarmScanAG UK and the Agri-Epi Centre.

Mechatronics Senior Graduate Researcher, Mike Gutteridge said: "Since we announced the farm project, the time has gone very quickly and now drilling is just around the corner. We've had a lot to keep us busy, including getting our second ISEKI tractor that we used on the Connected Autonomous Vehicles (CAV) project up to the correct specifications.

"We've recently taken delivery of a new drill from Simtech. It's great to see their continued support for the HFF following their help with the HFHa. We've installed the variable rate controller and tested it on the original HFHa site so all we need now are the right field conditions."

Senior Agricultural Engineering Lecturer Kit Franklin said: "With the HFHa we had the aim of sparking conversation about the speed automation was happening within agriculture. We achieved that, but along the way, we had many conversations asking us how the technology will work within the field".

"We were working in a perfect hectare, which was flat and fenced off, which is not representative of the fields our farmers are working in every day. They have to tackle telegraph poles, hills, ditches and public footpaths. The fields in our new 35-hectare farm will also provide us with these challenges. But like any farmer we are beholden to the bad weather."

Have to tackle telegraph poles, hills, ditches and public footpaths

Martin Abell from Precision Decisions said: "This is our chance to really test the solutions we develop as a consortium and see what their combined capabilities really are, and where the limitations may be. We've known that individual parts of technology required for automation have existed for some time but we're now seeing autonomous systems coming onto the open market. However, we don't totally understand yet how they will be used in day-to-day life by the farmers". Jonathan Gill, Mechatronics Engineer at Harper Adams said: "This is a three year long project, so we're not going to have all of the answers straight away. We expect teething problems, and it might take us the whole three years to get to a point where the machines can work fully autonomously in the fields without human interaction".

Online drone course

Established to explain new regulations

New regulations published on 21st June by the Civil Aviation Authority (CAA) will require farmers to become more aware of how to deploy drones on their land. However, despite having been published, the EU unmanned aircraft regulations will not come into effect until July 2020. This gives farmers and other operators the opportunity to prepare for the proposed changes to drone use.

Cranfield University is a leader in aerospace research and the use of drones in agriculture. Through the Agrifood Training Partnership (AFTP), Cranfield is offering farmers, agronomists, and anybody likely to use drones in agriculture, the opportunity to learn how drones can be used responsibly and effectively to monitor and manage crops.

Research compiled by Price Waterhouse Coopers estimates 76,233 drones will be used in the UK by 2030. It is further estimated that over a third of these drones (25,732) will be used in agriculture. Farmers already use drones for crop spraying and health assessments. The drones use normal and thermal cameras to deliver a level of insight into field crop health that is not obvious to the eye and reduces the need for farmers to walk fields to understand how well crops are performing.

In addition to being aware of CAA regulations, those who study the course will also learn how drones can be applied in agriculture, how to differentiate between drones, and what software is available for crop monitoring. The course will cover how to interpret the data generated by drones and how this can be used to improve crop and land management. Soil health, crop establishment and disease can all be assessed by evaluating drone data which saves time and discovers crop production issues more quickly.

For more information on the course offered by AFTP through Cranfield University visit https://www.aftp.co.uk/course/drones-crop-production/single_course

Alastair Taylor Retirement

IAgrE held a party on Tuesday 17 September for Alastair Taylor to mark his retirement as Chief Executive on 1 September. The event held at Mitchell Hall, Cranfield University, was attended by over 50 staff, IAgrE members and industry guests. These included Alastair Taylor's predecessor at IAgrE Chris Whetnall and the new IAgrE CEO, Ed Hansom. Amongst the guests were Keith Hawken from Agricultural Engineers Association (AEA), former AEA CEO Roger Lane-Nott and Keith Christian, Director of British Agricultural and Garden Machinery Association (BAGMA).

Alastair took up his post in 2013, becoming the 15th CEO and Secretary of the Institution since its formation in 1938. Welcoming the guests, IAgrE President Professor Jane Rickson, paid tribute to Alastair's total commitment during his 6-year term. "He has effectively promoted the Institution at every opportunity" she said "and ensured that the voice of this relatively small professional body is regularly heard at the 'top-table' of our profession such as the policy committee of the Royal Academy of Engineering".

In his reply, Alastair paid tribute to the support of the IAgrE Presidents who had supported him during his term, to the committees ("we often had a healthy level of straight-talking but always constructive debate on the way forward"), to the IAgrE head office staff ("I could not have had a more committed and professional support team, and owe them a huge amount of thanks and gratitude") and to his wife Linda ("living in Shropshire, working in Cranfield and with copious travel living much of the time out of suitcase, I look forward to a more normal married life").

Keith Hawken, on behalf of AEA CEO Ruth Bailey, presented Alastair with a glass engraved plaque before being presented with a collection fund from members to buy an electric bike and a specially made cake depicting a signal box on the Severn Valley Railway where Alastair is a volunteer signalman.

WHAT ROLE SHOULD THE IAgrE COMMUNITY PLAY IN MEETING THE CHALLENGES OF CLIMATE CHANGE?

The role of the agricultural engineer in the flooding crisis 2019

President's Musings

IAgrE President
PROFESSOR JANE RICKSON CEnv, FIAgrE

Discussions around climate change abound, as yet more rain falls on communities already badly affected by severe flooding. It seems to me that the agricultural engineering community has a vital role to play in mitigating the effects of these extreme weather conditions, which are predicted to become the 'norm'.

Specifically, soil and water engineers know the importance of soil being in excellent condition to "receive, retain and release" rainfall (the essential 3 'Rs' as my colleague, Dr Rob Simmons calls it). Acting like a natural sponge, well managed soils can absorb rainfall, allowing it to infiltrate to deeper layers.

Soils which have been overworked have little resistance to heavy downpours and can collapse and slake – leading to soil surface sealing, poor infiltration and surface runoff. In turn, this increases the likelihood of flooding further down the catchment. Soils should ideally contain a mixture of pore sizes, from large pores that drain quickly, middle sized pores that can retain and then slowly release water, and small pores which can hold on to water, but that can be extracted by crops (important during drought conditions).

Dick Godwin and Mark Dresser produced a report to the Environment Agency back in 2003*, which showed soil pores to a depth of 50cm held 78 million cubic metres of water for a 1 in 2 year, 5 day rainfall event! Obviously good soil management is key to maintaining well structured, porous soils with high water holding capacity.

MANUFACTURERS ROLE

Other agricultural engineers play a role too: Equipment manufacturers design soil engaging implements that minimise damage to soil structure (so maintaining all those soil pores to allow good infiltration of rainfall), whilst creating a fertile seed bed. Tyre and track manufacturers are focusing on systems that prevent the compaction of soil: often the cause of excess surface runoff and subsequent flooding. Designers and manufacturers of controlled traffic farming equipment also know the importance of avoiding compacting soils. Ironically, wetter winters will further limit the window of opportunity of getting on the land to alleviate soil management problems and other field operations. These agricultural engineering skills and know-how will be increasingly needed in the future. In recent editions of Landwards, we have tried to imagine what the agricultural sector will look like in 2038, when the IAgrE celebrates its Centenary. Projections of future climate change state that "winter precipitation is expected to increase significantly"; "wet winters will become wetter"; and "when it rains in summer, there may be more intense storms". This suggests flooding may affect more areas, more frequently.

Although much attention is placed on innovation and 'high tech' in agriculture at the moment (including the topic of our Annual Conference on 'Big Data' last month), I wonder if we have lost focus on more 'traditional' but equally important agricultural engineering disciplines such as land drainage. Draining fields is not given as much support as in the past….and many drainage schemes from the 1960s – 80s have fallen into disrepair. Could this be a contributory factor to the recent flooding?

* Godwin R J and Dresser M L (2003) Review of Soil Management Techniques for Water Retention and Minimising Diffuse Water Pollution in the River Parrett Catchment. R&D Technical Report P2-261/10/TR, Environment Agency, Bristol

WHAT'S NEW AT AGRITECHNICA 2019

The world's biggest showcase of agricultural machinery and equipment, Agritechnica, was staged in Hannover in November. This year, new technology took centre stage with several manufacturers showing off concept models or advancements in digital technology or AI. Here's a round-up of some of the interesting new developments

JOHN DEERE

Presented load carrying drone

John Deere and Volocopter presented the first large drone adapted for agricultural use.
A demonstrator model of the VoloDrone equipped with a John Deere crop protection sprayer, which is ready for its first field flight, was shown in the Future Technology Zone in Hall 13.
Featuring a potential payload of 200kg, the VoloDrone is able to cover an enormous area, especially under difficult operating conditions.
This first large agricultural drone is the result of a collaboration between John Deere, who bring knowledge of farmers' needs, and the Urban Air Mobility pioneer Volocopter, whose flying taxis form the technological basis of the VoloDrone.
Large drones are becoming increasingly important, not just in the field of logistics but also in passenger transport. At the same time, small drones are already being used in agriculture for stock control and mapping, for example.
The VoloDrone is powered by 18 rotors with an overall diameter of 9.2 m, and features a fully electric drive using exchangeable lithium-ion batteries. One battery charge allows a flight time of up to 30 minutes, and the VoloDrone can be operated remotely or automatically on a pre-programmed route.

CNH

Joins up with DataConnect

CNH Industrial has joined DataConnect, the data interface project recently announced by CLAAS, John Deere and 365Farmnet.
With the addition of CNH Industrial brands Case IH, New Holland Agriculture and STEYR, the cloud-to-cloud solution now includes five major farm equipment brands and their respective telematics platforms.
DataConnect enables the exchange of essential machinery data between the different platforms to allow users to view all of their mixed-brand fleet information within the single platform of their choice.
Previously, viewing such information required duplicating effort by using each manufacturer's separate and corresponding platforms or web portals to view such machine information.
The addition of CNH Industrial means that users of AFS Connect, the telematics platform of Case IH, MyPLM Connect for New Holland and S-Tech for STEYR will have the option of real-time, cloud-to-cloud exchange of data with both the John Deere Operations Centre and CLAAS TELEMATICS or 365FarmNet portals.

MASSEY FERGUSON

Unveils concept tractor

Massey Ferguson revealed its vision of the future when it unveiled its stunning MF NEXT Concept tractor.
Massey Ferguson has chosen its striking livery and styling as a tribute to the 50th Anniversary of the first man on the moon.
"With the MF NEXT Concept tractor, Massey Ferguson presents its dynamic future designs. It is a Concept that embodies Massey Ferguson's DNA and our vision to make tractor technology accessible, easy-to-use and affordable to most farmers around the world," said Thierry Lhotte, Vice-President and Managing Director Massey Ferguson Europe & Middle East.
The tractor is fully and partially autonomous, has on-board integrated technology, integrated sensors and cameras and Augmented Reality windscreen display.

FENDT

Voted tractor of the year

This year's Tractor of the Year (TOTY) was awarded to Fendt for its 942 Vario, landing Fendt the award for the sixth time since its creation back in 1998.
A jury of 25 agricultural machine journalists from 24 countries – Germany has two votes – selected the winner after a lengthy process of analysis and test drives. The award was received by the Fendt engineering team including Peter-Josef Paffen, brand head Fendt EME and chairman of the AGCO/Fendt Management Board.
"This is the best tractor we have ever designed," he said. "The best tractor in our lifetime."
The 942 boasts an optimized six-cylinder engine that delivers maximum power at low revs and the Vario transmission that delivers different torque to the axles. It meets Stage V requirements.

CEO

Reflections on a changing world

LEARNED FRIEND

IAgrE's role to explain new technologies to farmers

Edward Hansom *CEng MIMechE AMIAgrE*

This is now my second article for Landwards and my first since taking up my appointment as your new CEO. When I started on 2nd September we were still enjoying the last few weeks of what had been a very hot Summer. Just over 2 months into the job and it has definitely turned colder, the days are shorter and the nights much, much longer.

The country has also experienced another prolonged period of torrential rain resulting in the serious flooding of the River Don in Sheffield. There is nothing new to the change in the seasons but it does emphasize just how significant the weather is to our industry. Farmers still have to work outside in all of the seasons and their equipment and machinery must be rugged enough to cope with all that Mother Nature can throw at them.

The sheer scale of the event is staggering

AGRITECHNICA

I have just returned from Hannover in Germany where AgriTechnica 2019 is still going on. This event is the largest of its kind in Europe and, arguably, one of the largest in the world.

Agricultural technology manufacturers of all shapes and sizes were there in force displaying their wares to anyone who paused long enough to take an interest. The sheer scale of the event is staggering. I was also taken with just how big some of the vehicles have become. There does, however, seem to be a move now to focus on smaller vehicles for the future, particularly autonomous vehicles and robots. If you believe the experts we are also on the cusp of the 4th industrial revolution which will focus on data being as important to a farmer as the vehicles, big or small, that help cultivate the land. The recent IAgrE annual Conference last month focused on this very topic and the opportunities and challenges that 'Big Data' holds for the industry.

MEMBERS SURVEY

You will be pleased to learn that your Institution also still manages to 'punch above its weight'. In the last couple of months, we have contributed to the answer from the Royal Academy of Engineering (RAE) Engineering Policy Centre in response to DEFRA's consultation on Developing a National Food Strategy. At the Council meeting held at Pershore College there was much debate about how the Institution can position itself as the 'learned friend' to the farmer regarding the pros and cons of the latest technological advancements in agricultural technology.

Build a better prospect for both existing and new members

Over the next few weeks we will be looking at the results of the member survey earlier this year to crystallise a way forward to build a better prospect for both existing and new members.

Thank you very much indeed if you completed this survey, it is only through listening to your voice that we can deliver what you want. I hope to be able to announce some new benefits of membership in 2020.

I would like to finish by wishing you a very Happy Christmas and New Year.

CONFERENCE REPORT

FORESTRY ENGINEERING GROUP SYMPOSIUM

IAgrE's Forestry Engineering Group (FEG for short) has long been known for hosting a conference with great technical content and accessible messages for all who take part. The 2019 FEG Symposium held at Newton Rigg on 26 September was no different.

Andy Newbold reports

CONFERENCE THEME:

New Developments in Timber Extraction

Around 80 delegates met and spent a thoroughly enjoyable day getting up to date with the latest developments.

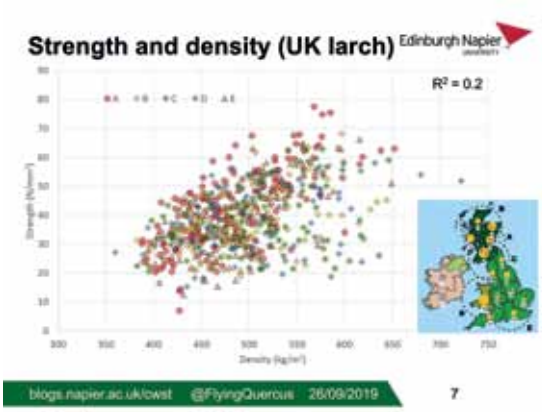
First up, Malcolm Cattermole, the symposiums chair welcomed the delegates, took us through the housekeeping, talked a little about professional membership, FEG and its activities before introducing Ed Hansom, the recently appointed IAgrE chief executive officer. Ed spoke briefly about the importance of standards in professional life and how members can record their CPD to demonstrate that professionalism. This in turn stimulated some interesting discussion.

Dan Ridley-Ellis, Associate Professor of the Centre for Wood Science & Technology, Edinburgh Napier University presented the first paper on **Current and Future Trends with the Timber Industry**.

He said "The biggest barriers to using wood are in our head, to do with how we see it being used. To understand wood as a material the link between wood and trees has to be broken. We think a lot of things can be described by wood density, (useful for paper making and biomass, as a predictor of quantity). Not useful for construction, as it's not a measure of strength, indeed species is not everything.

There is a correlation between density and stiffness, but that's an aggregate of 300 varieties, but within one species there is huge variation across the population. Properties are much more important than species. It's worth remembering that there is more variation in a single tree, than there is between trees in the same stand.

Consider the circular economy as wood is limited and needs to be recycled at the end of its first life in construction. There is a long timeline to production of useful wood from planting, in effect, what is growing now, will be the available timber when its harvested in the future, efficient use of that timber is vital.



What does the future hold?

Well it was planted 30 years ago, so we know what's coming for the foreseeable future. A tree harvested now, was probably planted before the internet, mobile phones and the rise of off-site construction. Foresters are already setting the future of timber in construction (as they are planting it now).

Key points:

- Wood is the material of the future (whatever we do)
- But renewable is not the same as limitless
  – New planting needed (with planning ahead)
  – Availability needs to be an impact assessment parameter
  – Need to be better at "forest fractionating"
  – & use technology to become "less standardised"
  – Make sure new resources don't make us more wasteful
  – Need to stop over specification, greenwashing etc
- We need to align conflicting views about the "purpose" of forests

Gareth Hopkins, Forest Services, Forestry Commission then spoke on behalf of the Forest Industry Safety Accord (FISA) regarding the new draft guidance on **Traction Assist*.**

Traction Assist is a mechanical means of assisting working forestry vehicles on slopes, with several types of units available, either machine mounted, or as a stand-alone powered winch unit.

Traction winches should be used to:

- *reduce the tractional force transmitted by the machine to the ground surface*
- *can be considered for forestry and other tree work applications including harvesting, silvicultural and ground preparation operations.*
- *assist with machine traction by preventing wheel/track slippage and associated ground damage and* ***not as a safety tether***



- *increase traction and are not a support hence the machine must always be able to maintain stability without the traction system i.e. hold its own ground.*

"Once upon a time" Gareth said "If the front wheels were not off the ground, you were not pulling hard enough! The world has changed. Independent traction winches are not just skidders without a cab. Remember, if you have used a traction winch for harvesting and forwarding, then you should use it for all other mechanical activities on that same slope.

It's a traction assist machine, it's not a safety tether to go abseiling with a machine. A machine must be able to hold its own on the slope, then you are on a slope where a traction winch can assist. If the machine can't stand still on that slope, it's not safe for a traction assisted machine"

"A traction assist system is useful for marginal sites, ie those you would not work on in frost or after rain. They are giving more productivity on the marginal sites, as operators feel more secure, use less fuel etc.

A traction assist system can extend working areas of current machinery but are not a means to go onto sites which are unsuitable. The first step to deciding suitable working areas is a risk assessment".

Gareth noted that operators must ensure that if the working machine is anchored to a static machine, make sure that the static machine weighs more than the working machine (or at least exceeds the towing load of the traction winch). This becomes more important if an anchor machine is needed on pulley between the traction assist and the working machine, ie as the cable angle becomes more acute there is more loading on the pulley and what it is anchored to (ie static machine, or tree stumps).

**Please note the guide is in draft until the final ISO standard is agreed & the HSE may still want some tweaks)*

Max Maclaughlin, (Forestry England) spoke on issues relating to **timber extraction from difficult terrain in the Lake District.** He said "Phytophthora Ramorum (a notifiable disease) was identified at Seat Howe in Whinlatter Forest in the Lake District in 2012. Whilst most of the infected trees could be cleared by conventional means, a small number were located on a steep slope directly above the village, allegedly populated entirely by retired solicitors! First the team had to identify a list of site constraints which included:

- slope between 30 and 60^0
- previous history of instability
- historic mine workings, old lead mine shafts
- Crags with loose rock
- Adjacent village
- Overhead services
- Wide variation in tree size
- Very poor HGV access
- Environmental issues (bats, water, close proximity to an osprey nest c 100m)
- High public access and nearby recreational infrastructure (Whinlatter forest, in the Lake District National park)
- Cost.

Then with key personnel, H & M manager, beat forester, civil engineer, recreation manager, land agenda, forest planner, communications officer, and forest services representative:

- Establish objectives and project sequencing
- Compliance with Statutory Plant Health Notice (SPHN)
- Safety of site personnel, forest users and our neighbours is paramount
- No wheels on the ground until ready
- No pressure to be quick
- High safety culture for all
- Use experience of others, hydrology, A86 project, contractors.

There were unexpected hazards including remaining timber brash which was not decomposing and could have set off down the slope had to be bagged and removed.

It cost £60k to remove 24 trees, of which approx. £50k to get the helicopter into the country and the remaining £10k for the actual removal. (**Watch the video of helicopter logging** https://www.youtube.com/watch?v=pbeOZ08iK1w)

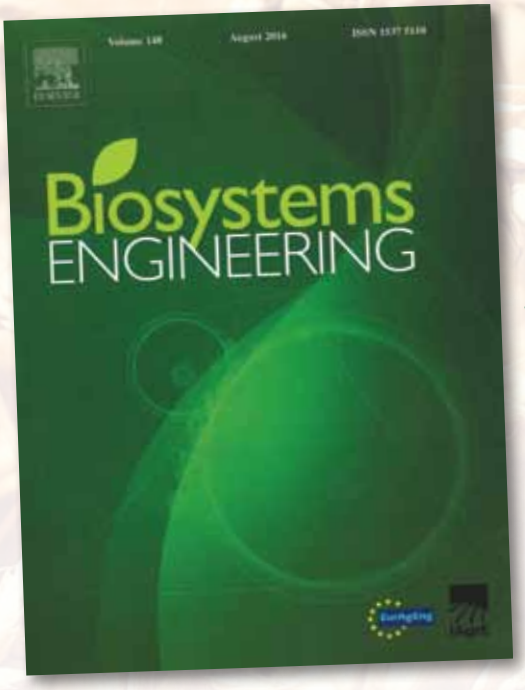
Additionally, there were the following papers:
Graham White, Forestry and Land Scotland. ***Bridges – Timber vs Concrete.***
Jim Hume, convener of the National Mental Health Forum discussed ***'Mental health well-being 'time to talk'.***
Richard DeBoys from Forestry and land Scotland talked about ***Hand Arm Vibration.***
Gillian Clark gave an update from ***FISA Forestry Industry Safety Accord.***
John Gorman (SEPA) and **Julia Garritt** (Scottish Forestry) gave a guidance update on ***Forestry and Water.***

SUMMARY
The take-out message from the FEG Conference for all engineers was to use all available expertise (within and outside the organisation), work with other professionals, do not compromise on the goals for the project and plan, schedule and be realistic.

FORESTRY ENGINEERING GROUP

The Forestry Engineering Group (FEG) is a *Special interest group within the Institution of Agricultural Engineers. It was inaugurated on 15 March 1989 (30 years ago this year) and is a forum for engineers and their associates who work and share an interest in the forest industry to meet and exchange their experience and knowledge - outings, meetings and publishing papers, along with awarding CPD hours.*
For more details
https://iagre.org/feg-main

Biosystems Engineering



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

Biosystems Engineering
Volume 184, August 2019, Pages 181-189

Ammonia emissions and mitigation from a concrete yard used by cattle
William Burchill, Francesca Reville, Tom H. Misselbrook, Christina O'Connell, Gary J. Lanigan
Teagasc, Wexford, Ireland
Rothamsted Research, North Wyke, Devon, UK
Trinity College Dublin, Dublin, Ireland

Livestock excreta deposition on concrete farmyards has been identified as an important source of ammonia (NH_3) emissions from agriculture. The objective of this study was to quantify the effect of urine application rate and four cleaning strategies on NH_3 emissions from excreta deposited on a concrete yard. Ammonia emissions were measured using wind-tunnels for 72 h. Cumulative NH_3 emissions increased linearly with increasing urine N rate and emission factors ranged from 46% to 67% of urine urea-N applied and from 22% to 29% of total N applied. The greatest reduction in cumulative NH_3 emissions was obtained from pressure washing at 1 h which reduced emissions compared to the non-cleaned control by 91%. Pressure washing at 3 h reduced emissions by 80% while scraping after 1 h and 3 h reduced emissions by 78% and 54%, respectively. Farmers should be encouraged to clean their animal handling yards as soon as possible after use in order to maximise reductions in NH_3 emissions from this source.

Biosystems Engineering
Special Issue: Agricultural Machinery Safety
Volume 185, September 2019, Pages 161-173

Evaluation of Crush Protection Devices for agricultural All-Terrain Vehicles
Farzaneh Khorsandia, Paul D. Ayers, Eric J. Fong
University of California, Davis, USA
University of Tennessee, Knoxville, USA

Statistics show that there are a large number of All-Terrain Vehicle (ATV) rollover-related injuries and fatalities in the agriculture sector. Properly designed and installed Crush Protection Devices (CPDs) can potentially decrease the operator injuries in an ATV rollover accident. The CPD of a vehicle protects the operator by increasing the crush protection zone (CPZ) under the overturned vehicle. Several operational and safety evaluation criteria for ATVs equipped with CPDs were developed in this study. Some of criteria were evaluated in previous studies but required further assessment. Previous studies regarding the CPD performance in ATV rollover accidents were reviewed. Also, several factors related to operational and safety criteria for three designs of CPD mounted on 13 ATV models were measured.

Biosystems Engineering
Volume 186, October 2019, Pages 156-167

Fluorescence imaging for rapid monitoring of translocation behaviour of systemic markers in snap beans for automated crop/weed discrimination
Wen-Hao Su, Steven A. Fennimore, David C. Slaughter
University of California, Davis, USA

Investigating the translocation behaviour of fluorescent markers is significant for the effective application of the markers in weed and crop differentiation. Snap bean was used as a model plant to study the systemic movement of Rhodamine B (Rh-B) in specialty crops for weed control. A fluorescence imaging system was developed to monitor the uptake and translocation of Rh-B from dyed snap bean seeds to bean plants. The proposed crop signalling approach based on Rh-B emission was able to classify snap bean plants from different weeds (e.g. burning nettle, groundsel, and barley). The results demonstrate that fluorescence imaging technology is a rapid and effective approach to studying the real-time translocation behaviour of a signalling marker in a crop system. Based on the unique fluorescence property, visualisation of the marker in vivo specialty crops grown from Rh-B treated seeds provides potential for their successful application in early season weed discrimination.

COVER FEATURE: **VISION 2038** *Part Four*

THE ENVIRONMENT

The final part of our year-long feature assessing the likely challenges that will face the agricultural engineering sector in general, and IAgrE in particular, in the year 2038 when the Institution marks its Centenary.

As environmental issues rise to the top of the world's agenda, what role will agricultural engineers play in combatting issues of climate change?

CONTRIBUTORS

Planetary Boundaries and Food Security: Professor Anthony Furness CEng MIAgrE

Evolution not revolution: Alastair Tulloch MIAgrE

Destruction of Amazon Rainforest: Reginald Ward IEng MIAgrE

Climate Change Challenges: Dr Alex Keen AMIAgrE

"We now have an opportunity to demonstrate the critical role of agricultural engineering in overcoming the major global challenges caused by climate change"

Professor Jane Rickson CEnv, FIAgrE, President IAgrE
Landwards Autumn 2019

FORWARD

LAND MUST REMAIN PRODUCTIVE

Limits to the contribution of land to address climate change

Land is already under growing human pressure and climate change is adding to these pressures. At the same time, keeping global warming to well below 2°C can be achieved only by reducing greenhouse gas emissions from all sectors including land and food, the **Intergovernmental Panel on Climate Change (IPCC)** has said in its latest report.

The report titled, *Climate Change and Land, an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* says that better land management can contribute to tackling climate change, but is not the only solution. Reducing greenhouse gas emissions from all sectors is essential if global warming is to be kept to well below 2°C, if not 1.5°C.

In 2015, governments backed the Paris Agreement goal of strengthening the global response to climate change by holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C.

Land must remain productive to maintain food security as the population increases and the negative impacts of climate change on vegetation increase. This means there are limits to the contribution of land to addressing climate change, for instance through the cultivation of energy crops and afforestation. Bioenergy needs to be carefully managed to avoid risks to food security, biodiversity and land degradation. Desirable outcomes will depend on locally appropriate policies and governance systems.

LAND IS A CRITICAL RESOURCE

Climate Change and Land finds that the world is best placed to tackle climate change when there is an overall focus on sustainability.

The report says "Land plays an important role in the climate system. Agriculture, forestry and other types of land use account for 23% of human greenhouse gas emissions. At the same time natural land processes absorb carbon dioxide equivalent to almost a third of carbon dioxide emissions from fossil fuels and industry"

"Land already in use could feed the world in a changing climate and provide biomass for renewable energy, but early, far-reaching action across several areas is required - also for the conservation and restoration of ecosystems and biodiversity."

DESERTIFICATION AND LAND DEGRADATION

When land is degraded, it becomes less productive, restricting what can be grown and reducing the soil's ability to absorb carbon. This exacerbates climate change, while climate change in turn exacerbates land degradation in many different ways.

In a future with more intensive rainfall the risk of soil erosion on croplands increases, and sustainable land management is a way to protect communities from the detrimental impacts of this soil erosion and landslides. However there are limits to what can be done, so in other cases degradation might be irreversible.

Roughly 500 million people live in areas that experience desertification. Drylands and areas that experience desertification are also more vulnerable to climate change and extreme events including drought, heatwaves, and dust storms, with an increasing global population providing further pressure.

FOOD SECURITY

The report highlights that climate change is affecting all four pillars of food security: availability (yield and production), access (prices and ability to obtain food), utilization (nutrition and cooking), and stability (disruptions to availability). It says that about one third of food produced is lost or wasted. Causes of food loss and waste differ substantially between developed and developing countries, as well as between regions. Reducing this loss and waste would reduce greenhouse gas emissions and improve food security.

Risk management can enhance communities' resilience to extreme events, which has an impact on food systems. This can be the result of dietary changes or ensuring a variety of crops to prevent further land degradation and increase resilience to extreme or varying weather.

An overall focus on sustainability coupled with early action offers the best chances to tackle climate change. This would entail low population growth and reduced inequalities, improved nutrition and lower food waste. This could enable a more resilient food system and make more land available for bioenergy, while still protecting forests and natural ecosystems.

LAND AND CLIMATE CHANGE RESPONSES

Policies that are outside the land and energy domains, such as on transport and environment, can also make a critical difference to tackling climate change. Acting early is more cost-effective as it avoids losses. There is real potential here through more sustainable land use, reducing over-consumption and waste of food, eliminating the clearing and burning of forests, preventing over-harvesting of fuelwood, and reducing greenhouse gas emissions, thus helping to address land related climate change issues.

PLANETARY BOUNDARIES AND FOOD SECURITY

The Engineering Imperative

Professor Anthony Furness CEng, MIAgrE, Visiting Professor, Harper Adams University, argues a case for action in agricultural engineering research, development and services.

THE world is faced with two significant sets of issues that are impacting upon our very survival on planet earth. Yet despite the evidence of informed sources, the indications are that they are not receiving the political attention they deserve, or indeed the attentions of representative engineering institutions, particularly in agriculture.

The issues are food security and planetary boundaries, recognising that agriculture is seen to be both a contributor-to, and a victim-of, the problems inherent within them.

This case for action is not a 'knee-jerk' response to these protests, it stems from a much earlier and deeper consideration of food security and planetary systems, within which there is seen an important, **engineering**, imperative that requires immediate and sustained attention.

Moreover, that imperative demands a radical, dynamic and sustainable strategic approach to deriving thematic engineering and technological constructs for solutions, as well as extended design methodology and exemplar solutions, which can be collectively delivered as catalysts for other solution-providers.

PRIMARY CHALLENGES PLANETARY BOUNDARIES:
Attention to the interplay between planetary boundaries, social and political factors is necessary to distinguish environmentally-safe, and socially just, space in which humanity can survive and thrive.

The planetary boundaries include, *climate change, land-system changes, fresh water usage, bio-geochemical flows, biosphere-integrity, ocean acidification, stratospheric ozone depletion, atmospheric aerosol loading and the introduction of novel entities.*

The socio-economic trends include *global and urban population growth, growth in real GDP, foreign direct investment, primary energy use, fertilizer consumption, water usage, paper production, large dam constructions, transportation, telecommunications and international tourism.*

The earth system trends include *rise in atmospheric carbon dioxide, nitrous oxide, methane and coastal nitrogen, loss of stratospheric ozone, rise in surface temperature, ocean acidification, marine fish capture, shrimp aquaculture, tropical forest loss, domesticated land usage and terrestrial biosphere degradation.*

Whilst many of these trends can be seen as climate change, the reality is that climate change is only part, albeit an important part, of the problem and an effective means of articulating the collective measure of criticality. It is the totality of factors that need to be addressed holistically and within a redefined framework, that better distinguishes the problems and provides a more accessible platform for seeking solutions.

By distinguishing **planetary boundaries**, a suitable framework is definable. Nine planetary boundaries have been recognised, each of which can be related to agricultural production. In reality, each constitutes a complex set of factors and can be quantified to specify the 'safe space' for humanity, together with associated limits and rates-of-change that can assist in deriving engineering solutions to the problems they present.

Briefly, the boundaries concerned are:

- **Land-system changes**
- **Freshwater usage**
- **Bio-geochemical flows**

- **Biosphere integrity**
- **Climate change** –
- **Ocean acidification**.
- **Stratospheric ozone depletion**
- **Atmospheric aerosol loading**
- **Introduction of novel entities**

BACKGROUND
Planetary Boundaries is a concept involving Earth system processes which contain environmental boundaries, proposed in 2009 by a group of Earth system and environmental scientists led by Johan Rockström from the Stockholm Resilience Centre and Will Steffen from the Australian National University. The group wanted to define a "safe operating space for humanity" for the international community.

FOOD SECURITY CHALLENGE – This constitutes the unprecedented challenge to accommodating a 50% increase in global food demand by 2050 coupled with appropriate attention to the environment, climate change and resources.

The UK articulation of this challenge, in the form of the 2011 Foresight Report fell short in appreciating the importance of engineering in the approach to the challenge proposed. This was brought into sharper focus through subsequent reports from IAgrE and IMechE.

Despite these reports, and the current government support through its Agri-Tech strategy, there appears to be no cohesive, national **engineering** plans to address this challenge in a practical, incremental manner. The significantly structured and funded Food Security initiative clearly focuses upon science and research but provides only passing consideration to the importance of engineering, even when listing agricultural engineering as a future priority. There is almost a disregard for the importance of engineering in supporting the pursuit of science itself, recognisable in the inevitable role of engineering in exploiting the outcomes of scientific research and its role as a research and innovation discipline in its own right.

The need can be seen for a complementary initiative directed at **engineering for food security**; it is engineering in partnership with science, and other disciplines, that will undoubtedly be required to meet the food security challenge. Moreover, it has to be recognised that engineering is the one set of disciplines that facilitates the tangible, **practical** entities that provide solutions and underpin the very development of civilisation.

A starting point for addressing the food security challenge can be seen in the five-step global plan derived by Foley et al. (2011) for doubling production by 2050, with appropriate attention to environmental needs, namely:

- Controlling the agricultural footprint
- Improving the yields of existing farmland
- More effective and efficient use of resources
- Shifting diets away from meat (culture and sustainable protein production)
- Reduction in food wastage.

"Political leadership and the ingenuity of engineers must come together to deliver solutions to the complex global challenge of climate change"

Dr Hayaatun Sillem
CEO Royal Academy of Engineering

THE ROLE OF AGRI-EPI CENTRES AND AGRICULTURAL SUPPORT ORGANISATIONS

It can be seen that the Agri-EPI Centres, and Agricultural Support Organisations, including the agricultural engineering institutions, are in a prominent and a responsible position to help action responses to the problems arising and assist in developing a unique engineering base for tackling the specific agricultural problems involved, given sufficient resources.

While it can be argued that the food security and climate change issues are being tackled elsewhere questions arise as to the engineering aspects relating to:

The extent and nature of the efforts being expended,

- How these efforts relate to the totality of issues involved and the extent to which informed sources of information are being related and combined into decision making,
- The global collaboration involved and required, and,
- The extent to which the **engineering** is explicitly seen in tackling these challenges.

The indications are that both the food and planetary challenges each require immediate and urgent attention and with each dependent upon engineering as the practical facilitator of solutions.

Connectivity and integration are intrinsic features in these developments and the concept of a 'Totally Connected' Farm can be seen to define this opportunity and the capability.

ROLE OF ACADEME

Building upon the successful and well recognised Hands-Free Hectare (HFH) project undertaken by Harper Adams University, the prospect is seen for a **Hands-Free Planetary-Conscious, Totally Connected, Farm Concept**. Using the University 38-Hectare site the prospect is provided for a ground-breaking platform for addressing the agricultural needs in relation to food security and planetary boundaries. Moreover, it also provides a potentially more important prospect for the UK and international reach if it also connects with the Agri-EPI Centre Satellite Farms and exploits the Midlands-based Agri-EPI Centre as the base for a doctoral training centre (DTC).

A DEng in Agricultural Engineering and Planetary Systems, is in the process of being developed by Harper Adams University, requiring both academic and industrial partners to complete the proposal. The potential for providing an explicit, promotable initiative directed at strengthening the engineering base for tackling the boundary issues and food security is clear. It would also provide a foundation for progression to, and extension of, chartered engineering (CEng) and chartered environmentalist (CEnv) status.

All too often, with initiatives directed at food security and the environment, the emphasis is on what science can offer and while this is important the *engineering imperative* is not sufficiently well recognised and supported. Yet it is the engineering imperative that provides the practical solutions, even for the scientific research.

In recognising the roles of the recently introduced Centres for Engineering, Precision and Innovation, the Centres can be seen to be in a very strong position to influence the approach to tackling these challenges, particularly if that approach develops and adopts a disciplined innovative melding of engineering and environmental capabilities and methodologies.

By exploiting the Agri-EPI Centre potential for addressing agricultural engineering needs at the leading edge, and by partnering with Harper Adams University, the National Centre for Precision Farming (NCPF - hosted through Harper Adams University), and industry, in tackling these challenges, scope can be seen for defining a concerted action programme that covers a range of supporting actions. These actions may be partitioned into two prominent, but linked initiatives: include:

1. **Centres' Initiatives**, including monitoring, awareness, service support initiatives and leadership in articulating and promoting the engineering approaches to tackling these challenges within agricultural sector, and,
2. **Industry-facing Academic and Institutional Initiative,** in developing and delivering an innovatively-structured support initiatives that:

- Strengthen the agricultural engineering and professional support base with respect to the challenges identified.
- Provides a doctoral training programme that spans advanced research and design methods, and the embodiment of international and political scaling factors, applied to the advancement of agricultural and associated engineering disciplines and the thematic attention to the challenges of food security and planetary boundaries.

BUSINESS ENGAGEMENT

Businesses, of course, are at the very core of tackling the food security and planetary challenges. Farming and other agricultural businesses are, like most businesses generally, geared to making profit and ensuring a good return on investment. Equating this need with the demands on farmers and other industry stakeholders, to meet the food production requirements, while faced with rising competition and the growing impact of technological change is exacting and can be frustrating in their own right.

The opportunities for all manner of business development can be seen and the initiative being proposed here will assist in both identifying and bringing those opportunities to UK businesses, and with the prospect too of identifying new products, new businesses, services support and associated benefits of job creation and economic development.

With the food security and planetary boundaries challenges being relevant to all agricultural activity, the market for supporting solutions constitutes the totality of agricultural businesses, for which the total income from farming within the UK is estimated at £4.698billion (May 2019, down by 3.1% on the previous year figure of £4.85billion (December, 2018 figure).

In 2018, the total income from farming fell by £929 million to £4,697 million, a 17% decrease on 2017. The main contributors to this decrease were reported to be the rise in animal feed (+£509 million), goods and services (+£358million), fertiliser (+£116 million), energy and labour costs (+£110 million each).

The UK farming industry comprises more than 200,000 arable farm businesses, with an average size of around 57 ha. However, some 41,000 farms (approximately 14% of the total) are larger than 100 ha, account for over 65% of the agricultural area. In Scotland, the average farm size is over 100 ha, while in England it is around 50ha and for Wales and Northern Ireland, sizes are smaller at around 40 ha. Farms ranked by size of land usage would constitute a favourable stage in determining targeting strategy.

PRIORITY FUNDING

An urgent and very significant, multi-million pound (an estimated £10-15million), investment is required to tackle these issues and establish a sustainable applied research and development base. Unlike a conventional government funded call for solutions, this will be a request for government and industry funding that emphasises this catalytic focus for:

- Identifying and promoting solutions
- Initiating a network of solution providers
- Initiating a network of accredited (CEnv and CEng) advisors
- Facilitating a sustainable applied research base for identifying and addressing on-going needs for agricultural engineering support
- Promoting inventive innovation and the engineering imperative.

The need can be seen for priority funding to cover the requirements for engineering in tackling both collective needs in relation to both challenges and a more specific funding directed at the agricultural-specific needs. Associated funding calls should also be accompanied by actions to create greater engineering presence with respect to the challenges identified, including:

- Appointment of a Government Advisor specifically on Engineering.
- Concerted action of raising public perception of engineering.
- Concerted action on supporting initiatives to raise the understanding of engineering and its pivotal importance in tackling the challenges posed by Planetary boundaries and Food security.
- Engineering Design support tools for accommodating Planetary boundaries and Food security issues.
- Acknowledgement and support for **engineering consultancy** directed at food security and planetary boundary issues – setting up an accredited (CEnv) consultancy support network.
- DEng research development initiative, potentially in collaboration with Harper Adams University and Doctoral Training Centres (DTCs).
- A Planetary Boundaries quality label to indicate attention to food security and planetary boundary needs.
- Initiatives geared to developing and promoting engineering skills that encompass the needs to consider Planetary boundaries and Food security issues.
- Initiatives geared to strengthening the educational and research interfaces between science and engineering with respect to Planetary boundaries and Food security issues.
- Specific investment in complementing the Agri-EPI centres provisions to facilitate engineering-specific initiatives geared to tackling the Planetary Boundaries and Food

Security challenges.
- A funding call agenda that embraces the needs of the Planetary Boundaries and Food Security challenges and combines the requirements for enterprise and innovation in applications and problem solving to generate new products and market opportunities.

It would be an easy option for the engineering profession to side-step these challenges with the assertion that the government request for priorities is directed at a more immediate, parochial, commercial view of digital for example. In doing so it would, in my opinion, be abrogating a professional and moral responsibility, and opportunity, to take a lead in tackling these important issues, particularly with respect to agriculture and associated disciplines.

The initiative has the capability to:
- Rapidly and beneficially impact upon the industry products, processes and services with respect to food security environmentally-conscious developments.
- Readily inform on climate-protection developments.
- Assist in giving UK businesses a competitive advantage in respect of both UK and international trade.
- Identify and promote new job opportunities and new businesses. including attention to job losses due to automation.
- Stimulate research and development.
- Strengthening the lead for the UK agricultural engineering industry.
- Advisory support for government with respect to policy and funding for agriculture.

Anthony Furness writes:
If you have an interest in supporting and developing this initiative, please contact me at anthony.furness@btconnect.com
Please note that the views expressed above do not necessarily reflect the views of Harper Adams University or other Institutions.

EVOLUTION NOT REVOLUTION

A sceptical market, operating under commercial pressures

by **Alastair Tulloch** MIAgrE ***After Sales Manager CLAAS UK***

Agricultural engineers certainly have a lot to offer, but it is suggested there is a need to work closely with all aspects of the agricultural market we serve in considering developments.

It could be argued that there is a need for more scrutiny and analysis of the commercial realities. Some developments could well expect an increase in the cost of agricultural production. The only way the market can accept that, is if 'farm gate' commodity prices rise.

That tends to lead to food price increases, which will be resisted. Governments will tend to focus on environmental issues for any agricultural support rather than for food production, all of which challenges the commercial viability of innovations which might be more expensive based on an all- inclusive cost per hour or hectare.

There will be enthusiasts who have far reaching visions of robotics, autonomous equipment in large volumes, vertical farming and other interesting ideas, all operated remotely. It is good that these are being researched and evaluated and those involved should be actively encouraged. We may need to curb our enthusiasm a little in consideration of the speed of acceptance by a slightly sceptical market, which is operating under considerable commercial pressure.

Developments of any kind tend to be more evolutionary than revolutionary, so it is suggested that this is the most logical and effective path to follow. Precision farming for example is now well established and has huge potential in its development to improve agricultural efficiency. This applies to all areas of agriculture including livestock which tends to get less publicity.

HARVESTING FRUIT AND VEGETABLES

In practical terms, there is an obvious demand for more mechanical and semi-automated harvesting methods for fruit and vegetables, given the shortage of manual labour and the associated cost.

In crop production, the pressures to reduce or even eliminate chemicals will bring about a change in agricultural management to respect the environment and the demand for the precision targeting of weeds, pests and fungal disease.

It should be considered however, that such equipment needs to cover large areas in a tight time frame, often made more acute by weather changes. One of the many considerations therefore, must be how quickly they can cover every 100 hectares, compared to a 12 meter sprayer, or fertiliser distributer which is used today.

The other aspect which is often overlooked is the true cost of distributing sophisticated equipment and the cost of product support. These are often thought of as 'unwanted' costs, but they are very real and much more expensive than many give them credit for. They all come into the costs the market is expected to cover, as does the obvious need for a high calibre of operator to effectively control more sophisticated products. These commercial realities need careful consideration by agricultural engineers, otherwise, the best ideas could become a commercial failure.

These aspects should not dampen our resolve, however, because we have to believe that common sense will eventually prevail in agriculture, not least because we will need more food rather than less, to feed a growing population.

On the back of this, agricultural engineers have a lot of opportunities and an exciting future, because all problems are there to be solved. In doing so, however, we should remember what has been learned through experience and look at the wider picture, so as to make best use of all resources at each stage.

OPINION

DESTRUCTION OF THE AMAZON RAINFOREST

A resource vital to the health of all beings is being systematically destroyed.
by **Reginald Ward** IEng MIAgrE

The Amazon is an important area on the planet as it helps to control the climate. The most important is that it is a high-pressure zone and provides a block for winds. The vast forest of mainly hardwood trees, many over 60 metres tall, take in vast amounts of impure water to pass it out high in the sky as pure water vapour, thus creating high pressure. Winds will only move from high pressure areas to lower pressure zones. They cannot blow from high pressure to high pressure.

The Sun does this, its energy causes differences in pressure and then wind occurs. The earth's atmosphere is the refrigeration gas and works in the same way our domestic appliances work, moving gas to cool and produce ice.

Pressure drops over hot arid terrain but at an area of cloud and rain there will be a high and wind will flow from there to the low. The planet is cooled or warmed according to the difference. Our atmosphere is as important to us as water in rivers and oceans vital to all the living organisms that use the saturated water atmosphere.

We breathe in nitrogen and extract the oxygen from it to live, while fish take in water through their gills to extract oxygen to live. When the atmosphere is altered it alters the air breathed in by land based beings and also the water based organisms. We do not breathe in dry air it always contains humidity.

OXYGEN

The role of the Amazon rain forest has many aspects, it is vital to the health of all beings on this earth but it is being systematically destroyed. Hardwood has a huge market and land is wanted for cattle grazing and agricultural production. This is taking place now at an ever-increasing pace. The end of it will be the complete destruction of this rain forest.

Once the pressure system is altered then winds will alter or move in new directions and large areas like the Matto Grosso of Brazil will turn into desert. The rain forest has been eroded for many decades, there have been protests but the destruction continues. Trees have been systematically felled since colonialism and when the railways were developed tons and tons of hardwood was used to fire the steam engines, these forests are now gone for ever.

The whole existence and well-being of all living things on the planet is dependent on steps taken by individuals who are interested in populism. Governments should not be able to destroy areas which affect the well-being of other countries. Without the rain forest large areas of neighbour countries will be affected, it could cause drastic climate change and affect rainfall and crop production over large areas.

Oxygen is needed by almost all the living beings on the planet even plants and trees, all internal combustion engines heating and a lot of energy production uses oxygen, even materials become oxidised, fire too will use vast amounts.

When oxygen is low all types of disease will set in, we kill the rain forests to kill ourselves.

The planet is now facing even more dramatic climate changes but the greed for a bit of easy money is putting our well-being at risk we, can only observe what is going on, get upset but we are powerless, we know it is wrong, we do not benefit from the destruction of the Amazon, we must just sit and watch and when the rain doesn't fall and disease runs rife, all we will be able to do is sigh and say, I told you so. Life on the planet for human kind only became possible after many thousands of million years of plant life which slowly formed the atmospheric conditions so that complex animal life could emerge, it is incomprehensible that there exist beings that are destroying those that gave us and continue to give us life because without them there is no life.

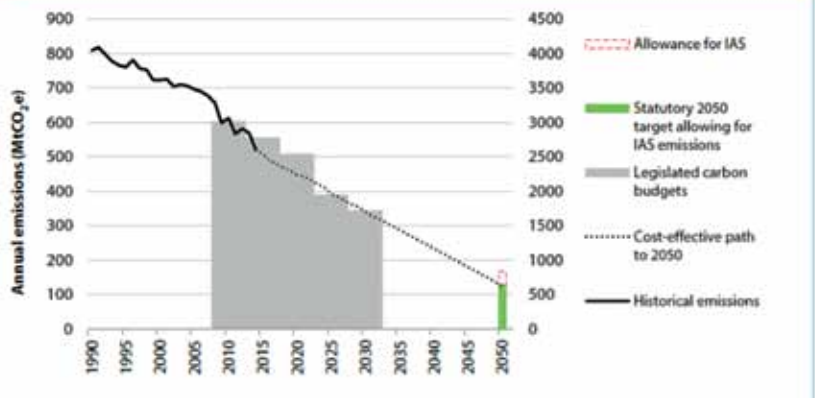
CLIMATE CHANGE CHALLENGES

by **Dr Alex Keen** AMIAgrE

Recommendations for agriculture still appear limited and unambitious.

Concerns and action from governments over reducing and correcting the effects of climate change are gaining importance and support from citizens in most countries. Legislation for net zero carbon emissions by 2050 is being enacted and is gaining support, and, in some countries, there is already pressure to reduce the deadline and move to net carbon capture — cities like Manchester in the UK are already setting more demanding targets than the national government and the UK National Farmers Union is promoting a net zero carbon emissions target of 2030.

Figure 1.2. The UK's existing long-term emissions target (set in 2008) has guided the setting of earlier targets and actions to deliver them



Source: Adapted from CCC (2015) *Fifth Carbon Budget Advice*. Based on DECC (2015) *Final UK greenhouse gas emissions national statistics: 1990-2013*; CCC analysis.
Notes: This chart is from the CCC's 2015 fifth carbon budget report. GHG emissions shown are the actual emissions, while carbon budgets represent the emissions under the net carbon account; IAS stands for International Aviation and Shipping, which are included in the 2050 target but not the carbon budgets.

Large parts of the solutions that have been proposed to manage and reverse climate change, and its effects, include the move to electric powered vehicles and renewable energy, afforestation and reforestation, agricultural greening, and the increase of photosynthesis from agricultural and other land.

As soil is the main terrain we deal with, its long-term sustainability and that of the vehicles that we use is a prime concern, colleagues at the International Society for Terrain-Vehicle Systems (ISTVS) have a record of investigating aspects of the environmental impact of how we use vehicles, including soil erosion and flora, and the development of electric vehicles, their performance, and drivelines.

The move to having only new electric vehicles, already within two decades in some countries, should be focusing our attention on electric vehicles, their technology, support, and control systems.

In the wider context, there is an opportunity for IAgrE to set up a workshop for those interested in discussing the issue by

- Identifying those interested,
- Their interest areas,
- What they can contribute,

- What we do and don't know
- Establish an action plan.

THE ISSUES

The Climate Change Report, May 2019, (published by the Climate Change Committee (CCC) May 2019) appears to be the main source of information for UK Government.

Although the recommendations include some reforestation, biomass production and carbon capture and storage (CCS) they do not plot a route to zero net carbon emissions from agriculture by 2050. Agriculture looks to be a relatively small contribution to emissions compared to industry, power, buildings and transport but although reductions in agricultural emissions over the last 25 years are small, they are not insignificant.

The notion of farmers producing renewable energy as an alternative enterprise and substitute for high emission enterprises such as beef and sheep has not been properly explored in the report.

A second flaw, maybe more important, is similar to the one looked at by Kenneth Mellanby in the early 70s. Then, as now, we import around 40% to 50% of our food and in the early 70s there was a concern that the UK population would reach 100m by the year 2000.

Would our agriculture be able to cope with the impending demands for food without further large increases in imported food?

Mellanby included some of the current issues of concern, including diet, but found that a population of up to 100m could be maintained from UK food production.

The CCC recommendations do not appear to include a specific target for agriculture of net zero emission or net zero food imports. Changes in diet, land use, cropping methods, soil management, avoidance of agrichemicals, renewable energy farming, changes in population and so on, need some thorough evaluation.

The CCC reports do not analyse the world behaviour of the carbon cycle and therefore do not identify from these areas for greatest potential recovery of atmospheric carbon.

The largest identifiable area for improved recovery of atmospheric carbon is the difference between the carbon exchange in plant photosynthesis and respiration – around 61 Gt C. Around a 12% increase in this difference would appear to have a highly significant effect in offsetting burning fossil fuels.

The recommendations for agriculture still appear somewhat limited and unambitious, particularly in the context of the UN FAO report about the loss of biodiversity in nature and agriculture and also within the context of the pressures to reduce the target time for net-zero carbon emissions to 2030.

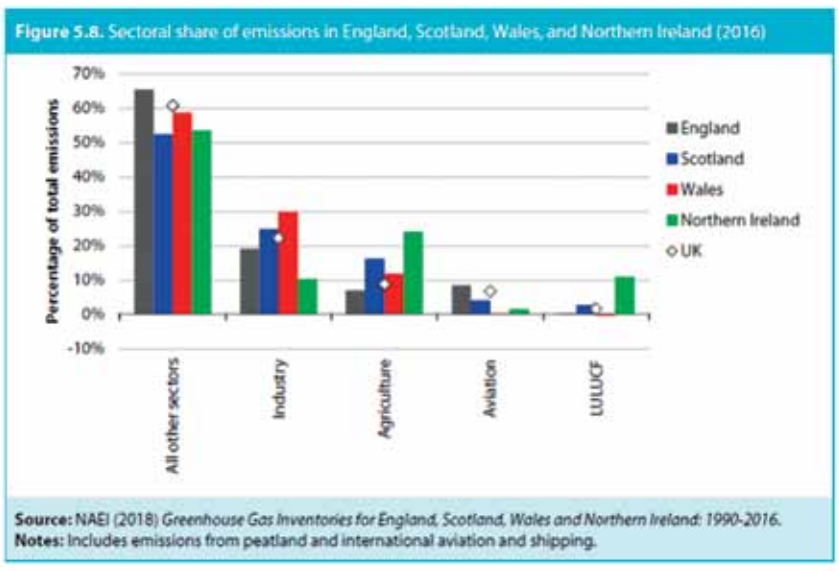
Sir David King (Centre for Climate Repair (CCR) at Cambridge University) has said that a net-zero emissions target within 10 years would be preferred. It was unlikely to be met but should be achieved as rapidly as possible accompanied by action to take CO2 out of the atmosphere with a target of reducing CO2 from 410 ppm to 350 ppm, or less.

SOLUTIONS?

There seems to be a lot of questions relevant to agriculture and agriculture engineering that have not been fully addressed in the CCC reports. As ever there are more questions than answers. Such as:

- How to reduce C emissions in agriculture to zero through diet, crop production, ag engineering, mechanisation, and soil management? There isn't a persuasive holistic quantitative model showing change, cause and effect.
- How can soil C be conserved and what is the sequestration potential?
- The forestry target from the CCC report. What is the potential for forestry amelioration of flood risk? The CCC reports did not deal with sea rise?
- The effect of diet changes on land use and C emissions – what are the main scenarios?
- The potential for renewable energy (wind, solar, biomass, algae) for farmers as alternative enterprises to food or to enhance their business?
- The effect of changes on biodiversity: should their be clear biodiversity targets as well as a net zero C emissions target?
- What are the benefits of changes in the use of spring sown cereal crops, overwinter legume cover crops, strip cropping, inter-row cropping, CTF and other reduced compaction practice, and precision transplanting cereals (as in the SRI in rice)?
- Non-ag recommendations also apply to ag: transport, energy, buildings, etc. It is not clear how these were taken into account for agriculture.
- What is the potential contribution of precision farming, precision mechanization operations, to reduce the use of high energy chemicals that threaten bio-diversity, particularly to pollinating insects such as bees.
- What proportion of ag land is required to generate renewable energy for net zero C emission farms?
- What areas of UK farming land can utilise increased photosynthesis in sequestrating C and at what annual level?

Further to my suggestion for IAgrE to set up a workshop for those interested in discussing the issues, it may also be useful to consider how we co-ordinate with relevant institutions at home and abroad (including EurAgEng, ASABE, etc.).



NOTES

Alex Keen has started a section on the **ISTVS** Resource Initiative website www.istvs.org/resourceinitiative called '**Environment, Climate Change and Terramechanics** https://tinyurl.com/yxkhbee9
Committee for Climate Change report www.theccc.org.uk
Centre for Climate Repair at Cambridge University www.climaterepair.uk

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PERSPECTIVES

IAgrE

CLIMATE CHANGE

CROPS TO SHIFT NORTH AND WEST?

The items featured in Perspectives were reviewed in the October/ November issues of the Food and Farming Futures Newsletters www.foodandfarmingfutures.co.uk

Unchecked climate change could drive Britain's crop growing north and west, leaving the east and south east unable to support crop growing, new research suggests.

At present, most of Great Britain's arable (crop growing) farming is in the east and south east, with livestock pasture and other uses more common further north and west.

The new study, led by the University of Exeter, looks at the effects of the 5C warming predicted by 2100 if the world's carbon emissions continue to rise at the current rate (a scenario known as RCP 8.5).

As well as being significantly warmer, Britain would have a predicted 140mm less rainfall per growing season (April to September) with more acute drying than this in the south east.

"Britain is relatively cool and damp, so a warmer and drier growing season is generally expected to increase arable production," said Dr Paul Ritchie, of the University of Exeter.

"However, our research suggests that, by 2100, unmitigated climate change would see a decline in arable farming in the east and south east.

"Crops could still be grown with the aid of irrigation, but this would involve either storing large quantities of winter rainfall or transporting water from wetter parts of the country.

"The amount of water required would be vast, representing a major challenge for UK agriculture."

Part of the impact of warmer, drier conditions could be offset by higher levels of carbon dioxide in the atmosphere, because this allows plants to use water more efficiently.

"Our findings suggest that unmitigated climate change would change the way we use our land in Britain," said Professor Tim Lenton, director of Exeter's Global Systems Institute.

"In this scenario summer droughts mean that without significant irrigation, large regions of the east and south east of England would become less productive land. Meanwhile livestock farmers further west and north may be able to switch to more profitable arable farming."

Journal Reference:
Paul D L Ritchie, Anna B Harper, Greg S Smith, Ron Kahana, Elizabeth J Kendon, Huw Lewis, Carlo Fezzi, Solmaria Halleck-Vega, Chris A Boulton, Ian J Bateman, Timothy M Lenton. **Large changes in Great Britain's vegetation and agricultural land-use predicted under unmitigated climate change**. *Environmental Research Letters*, 2019; 14 (11): 114012 DOI: 10.1088/1748-9326/ab492b

Science Daily

ENVIRONMENT

Roadmap to make the land sector carbon neutral by 2040

Land is critical to human livelihoods and wellbeing, while actions related to land use also play an important role in the climate system. IIASA researchers contributed to the development of a new roadmap outlining actions on deforestation, restoration, and carbon cuts that could lead to the land sector becoming carbon neutral by 2040 and a net carbon sink by 2050. (International Institute for Applied Systems Analysis)

A study published in Nature Climate Change, unveils a land sector roadmap laying out critical actions on forests, farming, and food systems the world should take to veer away from spiking global temperatures.

The study is the most comprehensive exploration of the contribution of land to the 1.5°C target to date, and the first of its kind to offer a point-by-point identification of specific land use actions, their related geographies, and implementation pathways to reduce land use emissions by 50% per decade between 2020 and 2050. The actions outlined will also contribute to climate adaptation and the achievement of the UN Sustainable Development Goals (SDGs).

IIASA researchers took the lead on the technical aspects of the study, which employed integrated assessment models, and assessed 24 land management practices that offer the most mitigation potential along with other social and environmental benefits. The international team of researchers mapped out priority actions countries could take to zero out emissions from the land sector by 2040 to limit global temperatures from spiking beyond 1.5°C.

The six priority actions outlined in the study include reducing deforestation, peatland drainage and burning, and mangrove conversion by 70% by 2030; restoring forests, drained peatlands, and coastal mangroves; improving forest management and agroforestry; enhancing soil carbon sequestration in agriculture across all agricultural countries; reducing consumer food waste in developed and emerging countries; and shifting one in five people to primarily plant-based diets by 2030.

The analysis indicates that sustainable land management through these actions could contribute 30% of the mitigation needed to achieve the goal of keeping temperatures below 1.5°C as set out in the Paris Agreement.

PRIORITIES

This is on top of the 30% of carbon emissions that land already sequesters naturally. The authors however note that the window of opportunity is getting smaller and the longer we delay action, the lower our chances will be to achieve the Paris Agreement goals, and the higher the burden we put on our natural and food systems.

"The roadmap foresees a phased approach where first actions to avoid emissions are prioritized. This means concentrating on avoiding deforestation in hotspot geographies such as Brazil and Indonesia. More high-tech options on carbon removal from the atmosphere need to be tested and piloted today. However, large scale deployment is not expected to happen within the next decade given current realities of the international climate policy regime," explains IIASA Ecosystems Services and Management (ESM) Program researcher Michael Obersteiner, one of the study authors.

According to study lead author Stephanie Roe, an alumna of the IIASA Young Scientists Summer Program (YSSP) and an environmental scientist at the University of Virginia, keeping the planet under 2°C will require us to halve emissions every decade, and also remove a huge amount of CO2 already in the atmosphere.

"Restoring forests, peatlands, wetlands and agricultural soils is immediately viable, proven at scale, and provides many other benefits compared to other climate solutions. However, we will also need to develop and pilot additional negative emissions technologies—like direct air capture and low-impact bioenergy with carbon capture and storage (BECCS)—to sustainably remove more carbon from the atmosphere in the future. Otherwise, we will rely more and more on our natural systems. The land can and already does a lot, but it can't do it all. Research and investment in negative emissions technologies today will be critical for assisting in their sustainable deployment in the future," she says.

If countries were to implement the roadmap, the land sector could become carbon neutral by 2040 and a net carbon sink by 2050. The land sector currently emits about 11 GtCO2e per year (about 25% of global emissions). With this roadmap, it will be a net carbon sink of about 3 GtCO2e per year by 2050. Together, these actions would mitigate 15 GtCO2e per year – about 50% from reducing emissions and 50% from additional carbon uptake by land. While the authors emphasize that countries worldwide can contribute to better land management, they conclude that actions in the US, the EU, Canada, China, Russia, Australia, Argentina, India, Brazil, and other tropical countries are particularly important due to their large mitigation potentials.

"This study does a great job in reconciling global climate stabilization pathways with bottom-up mitigation potential assessments to develop an actionable roadmap for the land use sector to become carbon neutral by 2040," concludes co-author Stefan Frank, who is also a researcher in the IIASA ESM Program.

Going beyond similar climate roadmaps focused strictly on climate benefits, the study identifies actions that deliver wins beyond greenhouse gas emissions cuts and removals, while building on and updating the IPCC land report, which argued that forest destruction, bad farming practices and unsustainable diets, in addition to fossil fuels, must be tackled together to avoid climate chaos. Several of the authors who worked on developing the roadmap were IPCC land report contributors.

Reference
Roe S, Streck C, Obersteiner M, Frank S, Griscom B, Drouet L, Fricko O, Gusti M, et.al. (2019). Contribution of the land sector to a 1.5 °C world. Nature Climate Change DOI: 10.1038/s41558-019-0591-9 (paywall)

ARABLE

Talking tilth – Championing change

OPINION PIECE FROM TOM-ALLEN STEVENS in CPM Magazine

An interesting debate has gathered momentum on Twitter over arable farming's effect on climate change. The discussion revolved around no till, which is always good click bait for arable farming's Twitterati. It posed the question of whether NFU members would accept that its target of Net Zero emissions by 2040 would result in the inevitable end of ploughing.

Of course it's absurd to suggest that, whatever a government's desire to reduce emissions, it would command the requisition of all ploughs and anyone who deigned to put metal to soil would be turfed off the land (although with the current lunacy that's consumed Westminster, anything's possible).

It does raise the very serious question, however, of just how much carbon we release through tillage, that's lost to the atmosphere, and more importantly what we can do to reduce or even reverse this loss. The fact is, we don't know. It can't currently be accurately measured.

Until we have reliable metrics for the impact arable farming has on the soil carbon exchange, we will always be vulnerable to criticism, perhaps even legislation, that may restrict what we regard as best practice to optimise production. If you consider the vitriolic abuse hurled at beef and lamb producers, based on a shocking level of misinformation, it's only a matter of time before climate extremists train their venom on what they may see as abusers of the soil.

What's inspired about the NFU initiative, however, is that it proactively challenges such a stand. It recognises farming's vital role in sequestering carbon, just as much as it acknowledges that we should and can reduce our net emissions.

This begs the question "how?", and that's where the CPM reader comes in. If there's anyone in the country who will have the foresight and progressive thinking to show the way forward, it will be you. So we're setting out to find the Climate Change Champions – those farmers with their eye set firmly on the future; those with a level of measure, not just on their cost per tonne, but its carbon cost too; and most of all, those with inspirational ideas that will take UK Farming towards its goal of Net Zero over the next 20 years.

We'd like you to step forward and play your part in helping a climate-friendly, more productive and future-proof agriculture take shape. For its part, CPM will push to give our Climate Champions the profile they deserve. This is also a partnership approach, that involves the entire industry. We already have a number of commercial partners who have come on board. We're grateful to them for the support they've pledged for this worthy cause, and we're expecting that number to grow.

And there's no better time than 2020 for this initiative. At the end of next year, the world's attention will be focused on Glasgow which is set to host the 26th session of the Conference of the Parties (COP 26). This is a major UN gathering, expected to draw representatives from 200 nations as they determine the next steps in the global quest to slow global warming.

Such an eminent gathering has never come to the UK before. I think we should aim to have our Climate Change Champions take part, perhaps even share the stage with the likes of Greta Thunberg, and show the world that it's not criticism farming deserves, but praise for its inspirational leadership.

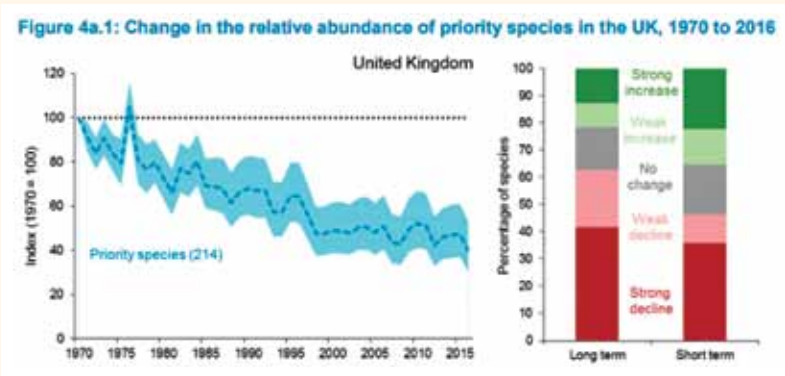
But first we need to identify those champions. So please, if you feel this is you, step forward. If you know someone who deserves this mantle, encourage them to do so.

THE TRUE STATE OF NATURE?

A word to the wise for Mr Packham, who yet again has accused farmers of "drenching the countryside in toxins" following the release of the State of Nature report. This noted a "significant decline" of 13% in terrestrial and freshwater species since 1970.

Here's the actual chart from the Joint Nature Conservation Committee that advises UK Government. Note the decline, which coincides with a doubling in productivity, seems to have levelled off, since environmental schemes were introduced in the late 1990s.

Perhaps if Society was to show a shred of support for these efforts, instead of constantly levelling criticisms, we could both reverse the decline and further boost productivity.



Tom Allen-Stevens has a 170ha arable farm in Oxon, but doesn't own a plough

SMART FARMING

Identifying winners and losers

Responsible innovation that considers the wider impacts on society is key to smart farming, according to academics at the University of East Anglia (UEA).

Agriculture is undergoing a technology revolution supported by policy-makers around the world. While smart technologies will play an important role in achieving improved productivity and greater eco-efficiency, critics have suggested that consideration of the social impacts is being side-lined.

In a new journal article Dr David Rose and Dr Jason Chilvers, from UEA's School of Environmental Sciences, argue that the concept of responsible innovation should underpin the so-called fourth agricultural revolution, ensuring that innovations also provide social benefits and address potentially negative side-effects.

Each of the previous revolutions was radical at the time -- the first representing a transition from hunting and gathering to settled agriculture, the second relating to the British Agricultural Revolution in the 18th century, and the third to post-war productivity increases associated with mechanisation and the Green Revolution in the developing world.

The current 'agri-tech' developments come at a time when the UK government has provided £90 million of public money to transform food production in order to be at the forefront of global advanced sustainable agriculture. Many other countries are also prioritising smart agri-tech.

This, combined with private investment from organisations including IBM, Barclays, and Microsoft, means that 'Agriculture 4.0' is underway, with technologies such as Artificial Intelligence (AI) and robotics increasingly being used in farming.

Dr Rose, a lecturer in human geography, said: "All of these emergent technologies have uses in farming and may provide many benefits. For example, robotics could plug potential lost labour post-Brexit in industries such as fruit picking, while robotics and AI could enable better chemical application, saving farmers money and protecting the environment. They could also attract new, younger farmers to an ageing industry."

Writing in Frontiers in Sustainable Food Systems, Dr Rose and Dr Chilvers warn though that agri-tech could also have side-effects, bringing potential environmental, ethical, and social costs.

"In light of controversial agri-tech precedents, it is beyond doubt that smart farming is going to cause similar controversy. Robotics and AI could cause job losses or change the nature of farming in ways that are undesirable to some farmers. Others might be left behind by technological advancement, while wider society might not like how food is being produced," said Dr Rose.

"We therefore encourage policy-makers, funders, technology companies and researchers to consider the views of both farming communities and wider society. We advocate that this new agricultural tech revolution, particularly the areas funded by public money, should be responsible, considering the winners, but particularly the potential losers of change.

Dr Rose added: "This means better ways, both formal and informal, to include farmers and the public in decision-making, as well as advisors and other key stakeholders sharing their views.

Wider society should be able to change the direction of travel, and ask whether we want to go there. They should be able to question and contest whether benefits to productivity should supersede social, ethical, or environmental concerns, and be able to convince innovators to change design processes.

"Responsible innovation frameworks should be tested in practice to see if they can make tech more responsible. More responsible tech saves controversy, such as that surrounding genetic modification, ensures farmers and the public are behind it, and can help to deliver on the policy objectives."

Reference:
David Christian Rose, Jason Chilvers. **Agriculture 4.0: Broadening Responsible Innovation in an Era of Smart Farming**. *Frontiers in Sustainable Food Systems*, 2018; 2 DOI: 10.3389/fsufs.2018.00087

2019 IAgrE LANDWARDS CONFERENCE

IAgrE's Conference theme of the growing importance and influence of Big Data on agriculture attracted a large number of delegates to the East of England Arena, Peterborough on 30 October.

Chris Biddle reports

WILL BIG DATA BECOME THE NEW FARM TRACTOR?

That was the question posed by IAgrE President, Jane Rickson at the opening of the 2019 Conference attended by almost 100 delegates.

Big Data, rather like the Internet of Things, is an embracing and convenient label to describe a diversity of number-crunching information sources. You perhaps have to ask when data grows into Big Data?

"A definition of big data is that it has become too large, messy, rapid, and diverse to handle with traditional relational database management systems and statistical software programmes" said Jane Rickson. For centuries, tasks and processes have been monitored. The adage '*If you can't measure it, you can't manage it*' has long been true across industry.

Today, it is becoming easier and easier to gather data. That's never the problem. The challenge is how it is used? What is relevant? In a farming analogy, how to sort the wheat from the chaff. There is a real danger that we experience information-overload, with the result that farmers and others get so confused that they shun new technology. And it is not going to get easier. As one speaker explained there is currently a zettabyte of digital information available in the world, equal to 1,000,000,000,000,000,000,000 bytes – a figure that is going to grow 6 times every three years.

Both Jane Rickson and opening speaker Benjamin Turner spoke about us embarking on a 4th Age (or Revolution) in farming and across industry. First, Mechanisation, second Mass Production, third Automation and fourth the Digital Age. Each Age will have had issues of adoption by a traditionally cautious population, and it was acknowledged by many of the conference speakers that the future is evolution rather revolution.

Of course the use of sophisticated digital information systems is all around us, but we rarely notice or appreciate it. Energy companies use it to monitor use and predict power requirements. Smart data is central to keeping air traffic, roads and railways operational and food companies use it to predict demand and cost savings. Simon Pearson touched on the work that his organisation LIAT (Lincoln Institute of Agri-Food Technology) is doing with Tesco to monitor the power usage of chilled cabinets to obtain maximum energy savings.

Two key themes ran through in the Conference. One was that the adoption of smart digital technology had to be presented to potential users in simple and straightforward terms. Most farmers are traditionalists, most a small or medium size operations without an IT department – and they need the operational costs, practical application and benefits set out clearly in a language they can understand. The second theme concerned ownership of the data. Should it be shared with others? How safe is it from third-parties?

Big Data was an ambitious theme for the IAgrE Conference that touched many areas of farming and food production, and covering a subject that is largely 'in the ether'. Unlike a new tractor, you cannot 'kick the tyres' of Big Data, however its successful adoption is essential if the farming sector is to meet the external and unpredictable factors inherent in food production.

‘BE AMBITIOUS’
Beware of big data disillusionment

Benjamin Turner is the Chief Operating Officer of Agrimetrics, one of the four AgriTech Centres. A chemical engineer by training and Chartered Engineer, he came to the farming sector via a number of senior roles in FMCG, professional services, media and hospitality. He has seen other industries transformed by the use of Big Data and believes that agriculture must grasp the opportunity to become data-driven in the coming years.

He started by reminding delegates about the incredibly short timeframe since digital information came on stream. “It all really started in 1999, just 20 years ago when we stored information on floppy discs and used a dial-up connection to access the internet. And remember that Google was only formed a year earlier”

He warned that progress could be hampered by what he described as ‘Big Data Disillusionment. “There are issues that the amount of data produced only serves to confuse and also that we lack the ambition to push forward fast enough into a new digital age. It could be argued that Big Data is the new oil” he said. “Look what has been achieved in the past 10 years, and try and imagine the achievable progress over the next decade. He quoted Bill Gates “Most people overestimate what they can do in one year, and underestimate what they can do in 10”.

He said that many engineers ‘needed to go back to school’ in the future as society changes. “Over the next 10 years we will likely see the destruction of 40% of jobs as we know them, but the digital age will create many new roles. We will also live in an age where three-quarters of the world’s population will have mobile phones”.

1999

Keep it Simple
Tackling resistance to precision farming

A practical view of Big Data was presented by **Oliver Wood**, Precision Technology Manager for Omnia Precision Agronomy. “It’s not the amount of data that’s important, but what organisations do with it” he said. “Farmers have an abundance of data around them, whether that is being generated from their machinery, paid for services like soil mapping, or the wealth of knowledge that is in their own heads”

“The majority of farmers are not convinced about precision farming” he said “we need a new approach to connect data with management and agronomy so that it is easy to understand and implement”

“Powerful and sophisticated data can now provide very accurate information through mapping of the clay content of a field. But when the farmer gets that information, it is often presented as a mottled, multi-coloured mosaic. There is no way that a farmer can practically deal with it”

“What farmers (and agronomists) want is for all the data to be in one place so that it can be analysed and acted upon”.

Oliver Wood then explained Omnia’s Connect - a cost effective solution that has been designed to simplify precision farming. An iPad app not only allows farmers to seamlessly and instantly send variable application maps created in Omnia to the field, but also controls the spreader, sprayer or drill as well. “Connect is compatible with a wide range of machinery including Amazone, KRM, Kuhn, Vaderstad, Horsch and more, but we need more manufacturers to come on-board.”

DATA SECURITY

Who owns it, will farmers share?

A far-reaching insight into the adoption of new digital technology was provided by **Dr Joachim Stiegemann, Product Manager of CLAAS** along with colleague **Edward Miller from CLASS UK**.

Dr Stiegemann said that the game-changer for farmers was the introduction of GPS and referenced Pokemon Go as being the trigger to todays precision farming.

"But also the power of digital technology means that we can create a 'digital twin' of a combine to simulate operational data as a basis for improvements and new features. This not only means that operational, servicing and maintenance decisions can be made, but it greatly reduces the need for costly and time-consumer mock-ups"

"Today's farmers are faced with a myriad of questions about scheduling, time management, machine reliability, location of equipment, soil conditions – and the weather. I do believe that farmers will soon have access to really accurate local weather forecasting, which after all underpins their whole operation"

"Step by step we are leaving the analog/linear data setup, but that in itself provides more challenges such as ownership of data."Will they be prepared to share it. Where should it be stored? How should it be stored? How will it be processed?"

"Only a farmer can make those decisions, and as manufacturers we have to be very respectful of their individual rights. It is their data after all".

Small farms

New digital technology shouldn't be just for big farms

Farm491 is a space for innovators to grow their businesses by applying technology to growing environments. It provides high-spec facilities created to foster entrepreneurship, ideas generation, and collaboration – and it includes 491 hectares of farmland for research and testing. It has start up space on-site at the Royal Agricultural University's main campus in Cirencester and at the farm-based workshops at Harnhill: affordable and flexible working environments where agri-tech innovators can run and grow their businesses.

The UK is predominately made up of small farms, said **Luke Halsey, Head of Farm491**, but it is sometimes difficult to quantify what makes a small farm? "My favourite description is ***A Large Farm is one twice the size of mine!*** In reality we are talking about relatively small acreage, value driven, family owned and low-income operations".

"We also have to look at the economics. In 1970 total farm income was £7bn, a figured that dropped to £2.7bn in 2006. Against that, treated areas of farmland in the UK increased by 63% from 1990 to 2016".

"The major change is that food sales have increasingly been channelled through huge retail chains who have become the gatekeepers to the consumer, controlling shelf space as well as the consumers' perception of quality and acceptable product standards"

"That means increasing reliance of data driven farming, and if new technology only works for big farms, then we are in danger of losing the small farms and the heritage that comes with it"

"To put it in a global perspective, around 2 million people or more than 26% of the world population derive their livelihood from agriculture – and 75% of agriculture is in small farming operations. So Big Data has to be applicable to all"

"My view is that we need big data cloud-based processing to minimise the need for hardware on farms. We need real-time solutions for low connectivity areas. We should use unorthodox data points to drive better performance within farms or access to finance, And finally we need to enable a shorter supply chain between small farm and big food service providers".

PANEL SESSION:

LEFT: Pictured (l to r): Benjamin Turner, Luke Halsey, Filippo Fassimo, Oliver Wood, Joaachim Stiegemann, Edward Miller, Anthony Furness

WILL BIG DATA BE AS REVOLUTIONARY AS FARM MECHANISATION?

Following the morning session, a panel of speakers fielded questions from the audience. The lively discussion, chaired by Andy Newbold, ranged from the adoption of blockchain technology, threats to data security from the Chinese and whether machinery purchase would be replaced by asset ownership. However, by far the most debated topic was the ownership of data which the panel universally agreed should remain with the farmer and that manufacturers have a responsibility to ensure that customer/supplier integrity is paramount.

AFTERNOON PARALLEL WORKSHOPS

The afternoon programme was devoted to a series of presentations devoted to **Emerging Research and Policy Themes** and **On-Farm Developments.** The speakers were:

- **Nick Starkey, Royal Academy of Engineering** who outlined the role of the RAE in developing research and policy themes around emerging technologies which rely on the collection of Big Data in areas such as autonomous vehicles, drone technologies and data ethics.

- **Ron Corstanje, Cranfield University** spoke on the

DIGITAL SERVICE JOURNEY

Providing quick, predictive and proactive maintenance

"The timeliness and efficiency of food production is directly linked to the reliability and performance of the machinery and equipment" said **Fillippo Fassino, the Director of CNH Industrial Customer Contact Centre.** The company operates in the agricultural market with New Holland, Steyr and Case IH brands, in construction equipment and in commercial vehicles with its Iveco brand. "Each of these segments is reliant on our ability to provide quick diagnosis, and predictive and proactive maintenance regimes"

To bring together easy-to-use digital technologies, New Holland has launched a new aftermarket precision farming brand, AgXtend. Initially, five innovative solutions will be available through AgXtend, all of which can be fully integrated into New Holland Agriculture's existing precision farming platforms.

CropXplorer is a highly advanced biomass sensor which uses exclusive features and algorithms to determine fertilization rate based on crop needs.

SoilXplorer allows users to discover the full potential of their soils using a contactless sensor to measure soil conductivity at four different depths.

The new **crop NIR sensor** can be mounted on all types of equipment: forage harvesters, combines, balers and tankers, allows farmers to determine yield moisture as well as crop constituents.

Xpower is the electro-herbicide that allows farmers to replace chemicals with electricity for weeding and pre-harvest desiccation of crops, and the package is completed by the new **FarmXtend App**, a smart weather application working with a complete set of connected sensors.

role of the UK Government Digital Champion and developments in agri-informatics. He said that his research is policy relevant as to which statistical techniques are developed and considered for soil quality health monitoring, the resilience of natural systems and the development of infrastructure in urban ecology.

- **Rob Simmons, Cranfield University** talked about the development of a Soil Management Information System for Horticulture, and that the Climate Corporation and Gamaya already offer data-driven agricultural insights that take soil type, seed suitability and local weather patterns into account.

- **Arthur Soames**, Hummingbird Technologies covered developments in the use of Artificial Intelligence, imagery and data analytics from satellite, drone, plane and robot technology to provide farmers with high-resolution maps of their crops at intervals during the growing season.

- **Mark Rutter, Harper Adams University** gave an entertaining presentation on how data can be collected from sensors attached to the neck, ear, feet and rumen of the animal to monitor, as well from 3-D cameras mounted in pens. He also looked beyond the farm gate to a time when consumers could be provided with an app which would access detailed information about the providence of meat and fish they were buying. "However, the livestock industry is still way behind the arable sector in technology, and we have to do better to convert and explain the data to managements".

- **Simon Pearson, Lincoln Institute of Agri-Food Technology (LIAT**) outlined the various projects being undertaken on behalf of the agri-food sector including robotic systems, energy control and food safety measures. He also covered the development and application of greenhouse spectral filters and LED lighting systems and showed a video of the developments in robotic fruit picking based on trials with a strawberry harvesting robot.

IOT AND AGRICULTURE

Poorly defined and not reaching its potential

Anthony Furness, Visiting Professor at Harper Adams University said that the agricultural industry is now presented with an opportunity to take the lead in defining an IOT structure. He said "Despite 20 years of technological progress, White Papers, government reports and some 8 billion objects being connected to the internet, the Internet of Things still remains a nebulous, poorly defined structure which is far from reaching its potential"

"The IOT concept has morphed into specific areas such as the Internet of People, Industrial Internet of Things, Internet of Agri-Things and Internet of Food Things which has sought to provide greater definition of IOT capability".

"Unfortunately there appears to be a general lack of collective motivation to take IOT concepts and meld them into operational infrastructures that can meet global needs and challenges".

"IOT must be applied if we are to meet the challenges of meeting the needs of a growing world population through enhanced precision farming, attention to food security and an understanding of planetary boundaries*.

**The importance of planetary boundaries is examined by Tony Furness on page 14.*

WANT TO KNOW MORE?

Powerpoint presentations from all the speakers at the 2019 IAgrE Landwards Conference are available under the Events and Awards section of the IAgrE website.
A recording of the main presentations at the Conference is in the process of being edited and will be available to members. Watch for information.

BEHIND THE SCENES

The IAgrE Council *by Chris Biddle*

Reflections on October's Council meeting at Pershore College

IT would be wrong to describe the IAgrE Council as a talking shop, but more aptly as a 'think-tank'.

Apart from a small dose of formal matters such as Apologies, Minutes of Last Meeting and a CEO's brief report, the main rump of the meeting is traditionally taken up with healthy and hearty discussion on the world of Agri-Tech and IAgrE's role in it.

The October meeting was the first opportunity for the Institution's new Chief Executive, Ed Hansom, to address Council and he was able to report on IAgrE's involvement on the National Food Strategy alongside the Royal Academy of Engineering. He also talked about the timescale for the IAgrE app due to be launched next year, reported on the change of editorship of ***Landwards*** and offered congratulations to IAgrE President Jane Rickson on being awarded the top accolade at the recent Womens Leaders Award ceremony in Milton Keynes.

Strictly speaking, the group's full title is the Advisory Council. It has a much looser remit than the Executive Committee which oversees and controls the corporate governance of the Institution. IAgrE, a company limited by guarantee and a charity, is regulated both by Company Law and by the Charities Commission. The Trustees form the Executive Committee, normally comprising around 12 officers and co-opted members and is responsible for financial and legal matters and acts on recommendations and reports from specialist committees such as Professional Development, Membership, Publications and so on.

By contrast, the Council can comprise of almost 40 members drawn from officers and representatives of all the committees as well as representatives of the Branches.

Council meetings move around the country and are staged at locations of particular relevance to IAgrE. Recent venues include the Agri-EPI centre hub at Harper Adams University, the National Fluid Power Centre at Worksop and in October at Pershore College (part of the Warwickshire Colleges Group) where the Council members were shown the teaching facilities including the vertical farm unit at the College's Agri-Tech Centre (*see page 26*). This format gives an opportunity for both a formal meeting as well as an educational tour, all counting towards members CPD records.

IAgrE'S ROLE

Each Council meeting considers a central theme. At Pershore, the question was asked ***"How should IAgrE formulate and promote its position on Agri-Tech issues?"***. The bottom line to the question was exploring ways in which IAgrE's informed voice could be heard, and heeded, in all the relevant quarters – and whether there were risks involved in taking a stance on particular issues.

The free-wheeling discussion lasted more than an hour with informed views from experienced Council members such as Mark Moore of AGCO who has plenty of miles under his belt travelling the world and connecting with Government bodies such as the Department for International Trade. But the joy of the meeting was hearing from the younger voices. Those who are passionate about their world in the future. For there is excellent representation on Council by the likes of Dr Alex Cooke now overseeing environmental matters at Severn Trent Water, Harper Adams University students, Amy Boothby and Sam Scales, Sam Moulding currently workshop manager at Gs and Cranfield PHD student Alex Ansell, a former Pershore student.

Many of these enthusiastically joined the debate which ranged from disquiet about the effectiveness of the Agri-Tech Centres and what influence IAgrE could bring to bear on ensuring that they were fully utilised; to problems of adoption by farmers of new technology particularly in the field of precision farming and whether IAgrE had an education role; through to creating an effective programme of communication via the specialist press on agri-tech, environmental and food production issues.

There was also some criticism of money being granted to technology companies with no specific aim in sight. "It is often a case of a solution looking for a problem" said one Council member.

The general feeling was that IAgrE should pick and choose the most appropriate response to 'hot topics' but that as a professional institution, it had to remain cautious and even-handed rather than go for easily misinterpreted headlines or sound-bites. All of which is excellent feedback to the Executive and Committees and goes a long way to making sure that the widest possible variety of voices are heard within the IAgrE community.

DOUGLAS BOMFORD TRUST

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
@BomfordTrust Secretary: Alan Plom
Administrator: Elizabeth Stephens

Douglas Bomford Trust Secretary Alan Plom reflects on the range of events attended by Trustees and the part that recipients of sponsorship from the Trust over the years are now playing.

KEEPING UP APPEARANCES

The Trust has been represented at a wide range of events over the past few months by Trustees and the Secretary, but it is always rewarding to see many recipients of support from the Trust over the years playing an important part in meetings too. These have included:

At the end of July, our Chair **Nick August** and Trustee **Paul Miller** attended the **AHDB**'s Open Day held at Sonning Farm, **Reading University**, for a demonstration of their robot sprayer. **Nikolaos Koukiasas** described his research (co-funded by DBT) on the biological interface between systems to apply single droplets of herbicides to weeds. He recently successfully completed his PhD for his part in this project.

Harper Adams University Graduation and Prize Giving Day was held on 20th September, when Trustee **Paul Miller** presented the DBT Award for the Best Foundation Science Degree in Agricultural Engineering to **James Paton**. James worked on developing an autonomous harvester and we hope he will find his way into the industry.

Several ex-DBT scholars were also 'on parade' at HAU, either receiving prizes or presenting them. Not least multiple recipient **Alex Skittery** (MEng Agricultural Engineering at HAU in 2014), who presented the JCB Trophy. Now a Project Manager at JCB Research, Alex has clearly enjoyed his latest assignment - developing JCB's Land Speed Record tractor. Achieving over 103mph, this was featured recently on Channel 4, driven by the inimitable bike racer and speed-freak Guy Martin.

In the afternoon, some of 'our' students also received their degrees, including ***Dr* Anthony Millington**, who was awarded his Doctorate for his research on 'X-ray tomography to investigate soil properties' - the second of HAU's ongoing series of (DBT co-funded) 'Tillage and Traction' projects.

Two visits to the East of England Showground followed. Firstly for the (part DBT-sponsored) **IAgrE Landwards Conference** on *Big Data* which we expect will lead to some smart applications for funding. A week later it was back to Peterborough for the **Agri-Food Charities Partnership (AFCP)** AGM and Annual Forum, jointly organised with the East of England Agricultural Society. The theme of *'Education - the essential farming and food chain input'*. Both of these events attracted a number of DBT-sponsored researchers who appreciated the discussions and useful networking.

On 30th October it was down to London for the **Arkwright Engineering Scholarships** Awards Ceremony, held at the prestigious Institution of Engineering and Technology (IET), and where I met our two new DBT-funded A-level students and their proud parents. We will sponsor their membership of IAgrE [as with all students on relevant courses], provide a mentor and aim to find opportunities for them to experience various aspects of the industry, which we hope will encourage them to seek further education and a career in agricultural engineering.

ABOVE: Alan Plom with Arkwright Scholars Jack Titcombe and Finnley Frost.

Finding opportunities for our young entrants to experience the industry was **Paul Miller's** objective when he spoke to the **AEA's Outdoor Powered Equipment Council** (OPEC) recently too. This followed our previous presentations to the AEA's Education and Training Committee and Farm Equipment Council.

MEET A TRUSTEE: DR MARK MOORE

Mark has been a Trustee since 2013 and is now our Vice Chair. He brings valuable industry and international perspectives, having worked for AGCO (and originally, Massey Ferguson) for over 3 decades. Currently AGCO's Business Process & Agricultural Development Manager for Africa and the Middle East, his various roles have taken him to many other parts of the world too, including North & South America, Eastern Europe, Asia, Australia and New Zealand.

He has worked in marketing, led on technical training (throughout the world), product development and research - developing advanced technology as well as sustainable systems, working with innovative farmers, external companies and research institutions on a global basis, funded by industry and government.

Mark was involved in early research on precision farming and completed his PhD (sponsored by MF) in Agricultural & Bio-Systems Engineering at Cranfield in 1998, building on his BSc (Hons) in Agricultural Technology & Management (Silsoe 1990) and Agricultural Engineering HND (Rycotewood 1987). His academic background, wide range of industry experiences and a business ethic make him well-suited to assess requests for funding and mentoring research students.

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

Council visit to new Agri-Tech Research Centre at Pershore

Resource for industry and students to come together to work on projects

The IAgrE Council had an opportunity to visit the new Agri-Tech Research Centre at Pershore College following their meeting on 17 October.
The Centre has been built using the site of the College's former library with support of a grant of £500,000 from Worcestershire Local Enterprise Partnership.
The £500,000 investment from Worcestershire LEP, through the Government's Growth Deal, now enables Pershore College (part of the Warwickshire Colleges Group) to provide a groundbreaking initiative within the Agri-tech STEM (Science, Technology, Engineering and Maths) sector.
Officially opened in July 2019 when IAgrE CEO Alastair Taylor gave the keynote speech, the centre addresses current and pressing skills shortages in agriculture and horticulture that act as a barrier to innovation and growth for this important sector in Worcestershire.
A new applications laboratory and live field-based experimentation and demonstration facility enables the college, local horticultural businesses and students to work together on industry challenges involving the application of innovative technologies.
The dedicated agri-tech applications laboratory houses a research and teaching laboratory, an outdoor vertical farm system and an indoor fully-automated hydroponics chamber using robotic and computer based technologies that will be used to educate and train students and employers on modern applications of agri-tech and provide a centre for simulation of application.
Showing IAgrE members around the Centre, Professor Roy Kennedy said "We now have state-of-the-art equipment and facilities needed for our students to become the skilled workforce of the future".
"Importantly, Pershore's agri-tech centre will also be a resource for industry, where businesses can come and be trained in innovative technologies and work with students on projects to help develop solutions to the many challenges facing the agriculture and horticulture sector".
"Pershore College has a rich heritage and this investment means that we will continue to be at the forefront of land-based education and training in the region."
The new STEM-focused facility will also enable the college to develop and deliver a programme of support for schools to raise awareness of agriculture and horticulture as high-tech, highly-skilled industries, again encouraging more new entrants to the industry in the longer term".

EAST ANGLIA BRANCH

Visit to CLAAS UK, SAXHAM
24 September 2019
Report by David Seccombe CEng, MIAgrE

23 members and guests attended the re-birth of the East Anglia Branch of IAgrE.

We were warmly welcomed by our hosts CLAAS UK, Saxham and before the start of the meeting I had to drag members away from a long pictorial time line stretching nearly 50m. The timeline, compiled by Alastair Tulloch for Helmut Claas, shows how the Saxham site, MANNS, and the CLAAS farming equipment have developed since the first imported harvester arrived at Saxham in 1947.

We assembled in the Academy building and were seated next to the new CLAAS AXION 960 Terra Trac (after the meeting many excited members were seen climbing over the new tractor) – a brief IAgrE meeting was held and there was a unanimous decision that the East Anglia Branch should recommence.

We have agreed a Chair and have an active committee to take the Branch forward. Hopefully a phoenix from the ashes.

Brian Wain, Customer Services Manager, introduced CLAAS UK as a family oriented business which invests in people to take the business forward. Brian explained that CLAAS starts with the customer, listening to their requirements and then endeavouring to provide a product to suit their specific needs, from the right equipment through to a comprehensive sales and services package.

CLAAS routinely reviews its business model and takes account of factors such as total farming income, current trends in equipment purchase and market trends. To date, CLAAS is a financially solid business that has the capacity to invest an annual 8% increase into research and development.

Dr Robert Fillingham, Technical Manager for Tractors, then presented his vision for the future of engineering in agriculture.

The industry is working towards a total solution for the farmer using data to improve output and maximise farming income. While there will be enabling technologies (such as GPRS, Wi-Fi and Bluetooth) to support sophisticated applications and algorithms, Robert highlighted that data analysis will be a cornerstone for future improvements and advances in agricultural engineering. Use of data analysis systems will support greater efficiency for machinery processes (such as automated optimisation and increased connectivity from the cab to the office), reduced operational costs (including reduced downtime and ownership costs) as well as reducing environmental impact (including reduced soil compaction and reduced CO_2 emissions). Linking to continuous monitoring of machines during operational conditions will ensure the optimal use of equipment.

Robert explained that CLAAS are working towards a future where there will be a seamless partnership between CLAAS and the farmer. CLAAS could remotely review predictive maintenance where there is real time monitoring of operational performance and the condition of equipment, as well as proactively advising the operator when maintenance is required to reduce the likelihood of long downtime. If a fault occurs then it will be possible to either quickly send the right mechanic with the right part, or to remotely diagnose and advise the operator how to get back to operation.

It is evident that using real-time data using field measurements, on board environment sensors through to remote monitoring of performance is the future to drive efficiency in agricultural engineering.

WREKIN BRANCH

Henry Thorpe EngTech TIAgrE writes:

"Once again, this year I have been fortunate enough to be chosen to be one of the judges for the IAgrE Innovation awards at the LAMMA show, held for the first time at the NEC in Birmingham. I think that although the cost of the venue was extremely high and some of the major manufacturers pulled out, the location was good and the indoor show gave a good representation of a forward looking and progressive UK agricultural sector.

This year for the first time the judging was split up over two days, one before the show and a day presenting awards at the show, as well as judging the overall first prize. I was lucky enough to be heavily involved in both days and I thoroughly enjoyed my time at both events. As a student it was interesting to attend and judge the submitted entries prior to the show and again very exciting to be officially presenting a number of awards at the show in January.

I feel that it's been a fantastic opportunity which has been offered to me by IAgrE and in particular the Wrekin branch.

I would like to thank all those people who made the junior judging positions possible. I would also like to encourage anyone who is offered the chance in the future to judge at this event to do so. It's a fantastic opportunity to meet people who you would otherwise not come into contact with within the industry, and also spend time on stands and looking at businesses which you otherwise wouldn't come into contact with either. I have personally gained a lot from my experience as a judge"

Henry Thorpe is the winner of the 2019 John Deere Trophy

TALK: PRECISION FARMING SOLUTIONS
Speaker: Jim Wilson, Soil Essentials
15 October 2019
Report by Terence Chambers

The first event in the autumn technical meetings featured a presentation on the subject of Informed Farming Solutions. This was given by Mr Jim Wilson, Managing Director of Soil Essentials, who provide a range of agronomy technical services to farming enterprises both for the UK and world markets.
Mr Wilson is an established arable farmer, with extensive experience in both cereals and potato production, based in Scotland near Brechin, Angus. His company employs a team of agronomists and other specialist scientific technical staff to deliver precision farming services to other farmers. These range through soil sampling, in-field monitoring , aerial crop surveillance, the assembly and interpretation of digital field maps and other precision data to guide optimum husbandry practices for current and future crop years.
Soil Essentials is also the Northern UK dealership for the Trimble range of ISObus compatible auto-guidance and control systems for tractors and field machinery. These provide, in response to digital field maps, accurate and repeatable bout-width steering in the field as well as automatic on the move control of on/off and application rate on sprayers / spreaders. The Trimble range also includes on-board harvest yield recording / mapping equipment which links through Bluetooth and Wi-Fi to send the information directly back to the farm office.

Soil Solutions also provides **KORE**, its own cloud based on-line precision software platform, to observe and guide arable field production systems. It utilises the physical measurements from soil sampling and yield mapping along with aerial drone and satellite surveillance images to assess crop condition and growth stage.
Large amounts of data are collected, stored and analysed within the mathematical model. The UK's Met Office weather forecasting system data can be interfaced to provide early warning of conditions which favour crop disease development .
Soil health assessments are based on soil sampling include pH, nutrient status and soil structure. The digital field maps assembled from the collected data now facilitate accurate cost-saving automatic variable rate application of lime, fertiliser and crop protection products. The latest satellite surveillance system technology can now assess soil moisture content down to 100mm below the surface as a guide for irrigation decisions.
Satellite information technology and its accessibility is steadily evolving. In Europe the Sentinel 2 system provides freely available surveillance, 10m pixel size, from 2 satellites launched by the European Space Agency. As well as measuring crop canopy cover other aspects of field plant health can also now be assessed through the aerial pictures.
Use of drone technology Drones for aerial surveillance are now inexpensive and well equipped. One example is the DJ1 Photon 4 complete with its RTK receiver and high-resolution colour camera. It can be programmed to routinely fly over the selected fields with a typical 70% overlap flight pattern. Viewing the target image from several angles enables the software analysis to measure (by triangulation) tree and some crop heights. The KORE system analysis has adequate in-built capacity to process all of the assembled data.
Potato crop yield prediction
An example of how far practical application of the technology has progressed is Soil Essentials' development and provision of their **Tuberzone** husbandry management and yield prediction system for potato crops. It was first developed with one specific seed crop variety but can now deal with 50 potato varieties. It has been developed from the results of a large number of sample digs at various growth stages. The size and yield data is integrated with the updated drone taken field crop images. This has been refined, over several growth years, into a tuber size and yield prediction model. Whilst total yield prediction is important for any commercial crop, the value of a seed potato crop is also very sensitive to tuber size distribution. This means that growers must halt crop growth, by desiccation of the haulm, as soon as most of the tubers reach the required size. Until now, this has involved a lot of sample hand digs across the field area as the basis for the grower's decision to burn off. Growing conditions vary across fields and if the whole field is burnt off at the same time some areas may lose out on yield of the target size tubers. The work around Tuberzone is supported by field machinery manufacturers, potato product processors and the James Hutton Institute in Scotland.

BELOW: Jim Wilson with Peter Frost

WEST MIDLANDS BRANCH

WEST MIDLANDS BRANCH
TALK: THE LANCHESTER ARCHIVE
Speaker Paul Henderson
Wednesday 25 September 2019
Report by William Waddilove IEng, CEnv, FIAgrE

It is always interesting to listen to someone who has real enthusiasm about their work and interest and listening to Paul Henderson was no exception. He is infatuated by the work of Frederick Lanchester (1868 to 1946). He has been described as Britain's Leonardo Da Vinci with over 400 patent applications to his name. FWL was a creative and imaginative engineering inventor and developer. Although his main interests were automotive and aeronautical he did apply his mind to some aspects of engine design for tractors. His redesigned cylinder head gave an extra 5hp. His time spanned from the time when the car was being developed from a wooden vehicle 'without a horse up front' to a purpose designed motor vehicle.

He was concerned about the subject of harmonic and dynamic balance. His first car engine had two connecting rods, linked to two contra rotating flywheels with a connecting gear. The front one, with a cooling fan, rotating in the opposite direction to the rear one. This removed rotational imbalance. When Daimler cars had crank shaft breakages he designed a dynamic balancer – pretty much like we use today.
On the aeronautic front he studied and wrote books on surface friction and aerofoil designs. His text books are still being studied today.
His slipstream driven hydraulic emergency pump concept is still fitted on aeroplanes. It was originally designed for a gun turret on the Lancaster bomber. A similar feature was used in a real emergency on Concorde! Like many original innovators he was just outside mainstream and acceptance circles and he struggled for full recognition. Intrigued? Go to the website http://www.lanchesterinteractive.org/ where his notebooks and drawings are available to study and you can also virtually visit the archive in Coventry University library (or even just go there in person).

ABOVE: Laser cut model of first car built by Frederick Lanchester

EAST MIDLANDS BRANCH

Visit to SHARMAN'S AGRICULTURAL
8 October 2019
Report by Charles Szabo AIAgrE

On Tuesday, 8th October, some 24 members and guests enjoyed an excellent visit to Sharman's Agricultural Ltd, Gonerby Moor, Grantham.
Sharman's are a long-established Agricultural engineering family business. Two brothers moved down from their Scottish base in the early 1980's and purchased a Ford car and Ford agricultural dealership in Melton Mowbray. Over the next ten years the Barclay Brothers purchased three more dealerships and now have five depots in total, covering Lincolnshire, Leicestershire, Nottinghamshire and Northamptonshire.
In 1990 the company acquired the John Deere franchise at their Grantham depot and consequently the other depots followed suit. Today they have an annual turnover of approximately £38 million which is made up of 50% new and 50% used equipment. Their absorption rate is 80%. They employ 96 people in total and have a very low staff turnover.
The company is constantly investing in their depots and most recently have completed a very large new combine shed, workshop and administration block at their Grantham depot with the stores and shop being moved into the refurbished workshop area.
The staff at Sharman's are split into teams. The Sales Team have 30% of their staff on "the road" all the time and 70% back in the depots doing the pricing, ordering, PDI's, chasing, delivering and all related paperwork to the sale. In the last ten years they have sold 3000 tractors (new and used) which is 30% of the market share in their area.

The company also sells a diverse range of equipment as franchised dealers, most notably JCB agricultural equipment (where the product does not clash with John Deere equipment). In the workshops throughout all branches they employ 36 technicians of which 10 are apprentices. They boast £63,000 worth of special tools and equipment and in 2018 they undertook 9852 hrs of service training. The parts department pride themselves on excellent delivery times aided by the fact that John Deere Langer is only 30 minutes up the road from their Grantham base and JCB's worldwide parts is also very near for emergency cover.
We would like to thank Sally-Anne Hazard, Marketing Director and family member, for her time and the proud way she introduced her staff who eloquently spoke about their part in the enterprise. Thank you everybody for showing us around the Grantham Depot, for the excellent refreshments and making the evening informative and enjoyable.

VISIT: MAUD HEATH VINEYARD
6 September 2019
Report by Mike Whiting MIAgrE

The Western Branch maintained its "enthusiasm" for all aspects of the alcoholic beverage industry with a visit to Maud Heath vineyard based at Bremhill near Calne in Wiltshire.
The Bateman family put on evening visits to their vineyard, throughout the summer, and we were fortunate enough to catch the last one for the 2019 season.
Any brand needs a striking name, and the reference to "Maud Heath" referred to the local lady resident from the 1400's who was concerned about people from Bremhill and surrounding areas, accessing markets with their agricultural produce, in nearby Chippenham.
With the scene set on the name, our host Dominic, introduced us to the vineyards, with the "cook's tour" of successful wine production.
The west facing slope with its green sand, clay loam soil, provides the strong foundations for the anticipated 40 year lifespan of the vines. A microclimate is developed which ensures the frost "rolls" down the hill, reducing the potential for damage of the vulnerable primary buds in spring, just after bud burst. As we stood on the Wiltshire hills in the early evening September sunlight, the location is ideal for soaking up the natural rays from above.
As for the statistics, the vineyard was established in 2006 where 2000 vines were planted by hand. Further vines were planted in 2008, 2011 and 2014, bringing the total of 9,000 vines. The planting density of 1,500 vines per acre, equates to a total of 6 acres established under vine. An additional 34 acres of suitable, arable land is available for future expansion.
Top quality clones, and grafts are used, with the grapes having a parentage of 50% French, and 50% German heritage, coming from the best nurseries.
Dominic studied his craft in New Zealand, whilst spending six months with a well-established winery, exposing him to the challenges of the art form of Viticulture.
Dominic educated us how a good wine progresses from the humble grape to the final bottled product, by referring to the science of cultivating and harvesting grapes. Harvesting time is paramount as once removed from the vine, the grapes chemical composition is effectively set to influence the wines quality from thereon.
Five different varieties of grapes are grown, Chardonnay, Pinot Noir, Pinot Meunier, Bacchus and Rondo, which produce five different styles of wines.
In an era where robotic harvesting techniques are in active development, Maud Heath still applies the traditional manual process, by harvesting the grapes by hand, bunch by the bunch.
A simple trading contract of offering wine in return for free labour, is enough to have friends and associates picking 18,000kg's of grapes during a season.
The Bateman family send their harvested grapes to Litmus Wines, contract wine making services, based in Dorking, Surrey, and last year 2018, was their ninth harvest on record.
The grapes are crushed, fermented, and stored in temperature controlled, stainless steel vats, in order to develop for a period of time, before they are ready for bottling. Although the Pinot Noir, and Rondo grape varieties, are both matured in French oak barrels for 5 months, which produces a top quality, International award-winning red wine.
We all have our preferences for wine, although it's the recommendations by the industry experts which have enabled Maud Heath to contract supply into premium outlets such as Waitrose. The well-respected, highly acclaimed, wine writer from the Daily Mail, Matthew Jukes, describes the 2017 Tytherton Red, as the following "This is without doubt the most successful red blend that I have ever tasted from within our shores". This wine delivered a bronze medal for Maud Heath from the judging panel of the 2019 Decanter World Wine Awards.
It's not all joy and merriment; vineyards bring their trials and tribulations in abundance. For starters Dominic reminded us before he can sell bottled wine from Maud Heath, a duty tax payment is due to the UK Government, accurately calculated from the Litmus wines, production figures.
The group welcomed the opportunity to sample some of the excellent wines presented by Dominic, Mike and Liz, which easily tempted us to purchase further supplies at a discounted rate.

EVENTS AND BRANCH MEETINGS

IAgrE EVENTS

Tuesday 5 March 2020 10.30am-2.30pm
IAgrE Technical Visit: Severn Trent Water
Hosted by: Dr Alex Cooke CEnv MIAgrE
Stoke Bardolph, Nottinghamshire

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

BRANCH EVENTS 2020

EAST ANGLIA BRANCH

Contact: David Seccombe
07766 206208
No events listed yet for 2020

EAST MIDLANDS BRANCH

Contact: Richard Trevarthen
01509 215109
richard.trevarthen@gmail.com
Tuesday 14 January 2020 7pm for 7.30pm
Technical Meeting: Demolition! Talk by A R Demolition, Nuneaton
Quorn Lodge Hotel, 46 Asfordby Road, Melton Mowbray
Tuesday 11 February 2020 7pm for 7.30pm
Visit: Household Sprayers Ltd
Roughton Moor, Woodhall Spa, Lincoln
Tuesday 10 March 2020 7pm for 7.30pm
Technical Meeting: Heico-Lock Fasteners
Talk by Matt Jordan and Paul Windsor from Heico-Lock
Quorn Lodge Hotel, 46 Asfordby Road, Melton Mowbray

NORTHERN IRELAND BRANCH

Contact: Ian Duff
028 8673 6977
duffi@iagre.biz
Wednesday 19 February 2020 8.00pm
Visit: Northway Mushrooms Compost Facility
Speakers: Elaine Shaw and Tom McDonnell
Assemble at Quinn's Corner prior to visit to Northway

SOUTH EAST MIDLANDS BRANCH

Contact: John Stafford
01525 402229
john.stafford@silsoe-solutions.co.uk
Monday 15 January 2020
Technical Talk: Hands Free Hectare: Lessons learnt
Speaker: Kit Franklin
Venue TBC
Monday 3 February 2020
AGM and Student Presentations
Venue: TBC
Monday 9 March or Tuesday 10 March 2020
Technical Talk: Robotics
Speaker: David May, Lincoln Institute for Agri-Food Technology
Venue TBC
Monday 27 April 2020
Technical Talk: Reducing Food Loss and Waste
Speaker: Marie Carmen, Cranfield University
Venue TBC
May meeting: Date to be confirmed
Visit: Ben Burgess dealership branch
Venue: TBC

WESTERN BRANCH

Contact: Mike Whiting
07751 345580
mike.whiting@newmac.org
Wednesday 11 March 2020 Evening
Technical Meeting: AGCO development of IDEAL combine harvester
Speaker: Tim Walters, AGCO
Broadguage Business Park, Bishops Lydeard, Taunton

WEST MIDLANDS BRANCH

Contact: Ian Moore
westmids@iagre.biz
No events listed yet for 2020

WREKIN BRANCH

Contact David Clare
01952 815097
dclare@harper-adams.ac.uk
Tuesday 14 January 2020 7.30pm
Technical Meeting: Details TBA
AEIC, Harper Adams University, Newport
Tuesday 11 February 2020 7.30pm
Technical Meeting: Car Advanced Driver Assist Systems
Speaker: AVL
AEIC, Harper Adams University, Newport
Tuesday 17 March 2020 6.30pm
AGM followed by Talk
AEIC, Harper Adams University, Newport
Tuesday 28 April 2020 7.30pm
Technical Meeting: TBC
AEIC, Harper Adams University, Newport
Tuesday 23 June 2020 6.30pm
Summer Visit TBC
AEIC, Harper Adams University, Newport

Dates and details are correct at the time of going to press

Further information and updates from the Events page at www.iagre.org

INDUSTRY EVENTS 2020

Tuesday 7 – Thursday 9 January 2020
Oxford Farming Conference
Oxford

Tuesday 7 – Wednesday 8 January 2020
LAMMA
NEC Birmingham

Wednesday 8 – Thursday 9 January 2020
Oxford Real Farming Conference
Oxford

Thursday 9 January 2020
Nottingham Farming Conference
Sutton Bonington Campus, Loughborough

Tuesday 4 February – Wednesday 5 February 2020
Doe Show
Ulting, Essex

Wednesday 5 February 2020
DairyTech 2020
Stoneleigh, Warwickshire

Wednesday 5 February 2020
Yorkshire Agricultural Machinery Show
Murton York

Tuesday 11 February 2020
Lincolnshire Farming Conference
Lincolnshire Showground, Lincoln

Thursday 13 February 2020
Norfolk Farming Conference
Norwich Research Park, Norwich

Thursday 13 February 2020
Farming Scotland Conference
Carnoustie Golf Hotel

Tuesday 25 – Wednesday 26 February 2020
NFU Annual Conference
Birmingham

Wednesday 4 March 2020
Farm Expo
Detling Showground Maidstone

Tuesday 12 -Wednesday 13 May 2020
Pig and Poultry Fair
Stoneleigh

Wednesday 13 – Saturday 16 May 2020
Balmoral Show
Balmoral Park, Lisburn, NI

Wednesday 10 – Thursday 11 June 2020
Cereals – The Arable Event
Duxford, Cambridgeshire

Wednesday 17 June 2020
The Arable Event
Weston under Lizard, Staffs

Thursday 18 – Saturday 21 June 2020
Royal Highland Show
Ingliston, Edinburgh

Wednesday 24-Thursday 25 June 2020
Groundswell 2020
Lannock Manor Farm Hertfordshire

Monday 20 – Wednesday 21 July 2020
Royal Welsh Show
Builth Wells

MEMBERSHIP CHANGES

ADMISSIONS
Member
Cooper JC (Wrekin)

Affiliate
Schneider K (South Eastern)
Swanick S (Ireland)
Shropshire R (West Midlands)
Warnett K (South East)
Garrod J (East Anglia)
Crockford A (Yorkshire)

STUDENTS
Cranfield University
Lees C

Aberystwyth University
Castillo Villamore LC

Myercsough College
Ball J

Pallaskenry College
Breen N
Clarke J
Cleere K
Coyle R
Cunniffe T D
Fallon M
Gallagher D
Gill P
Guntrip S
Healy P
Joyce K
Kearney S
Kelly R
Keogh C
Marnell M F
McDermott P
O'Beaglaoich S B
O'Brien D
O'Connor T
O'Brien C
Reardon G
Reidy J
Rothwell L
Sheridan D

READMISSION
McKechnie R – Member
Erskine C - Affiliate

DEATHS
We have recently learned of the death of the following members and we send our condolences to their family and friends:
Mr D N (Heuston) *Dagg IEng MIAgrE – died suddenly – a member since 1974*
Dr S J Twomlow *CEnv MIAgrE– a member since 1989*
Mr W Charnley *EngTech MIAgrE – after a short illness - a member since 1979*

TRANSFERS
Fellow
Nelson PG IEng (Western)
Member
Farmer GJ (West Midlands)
Associate Member
Calcutt KM – (Southern)
Technician
Worth E (Wrekin)
Hopkins WJ (East Midlands)

ENGINEERING COUNCIL REGISTRATIONS
EngTech
McKechnie R EngTech MIAgrE

LONG SERVICE CERTIFICATES (October-December 2019)

IAgrE extends warm congratulations to the following members on reaching significant milestones

Name		*Date of Anniversary*
60 years		
John Alastair Coates Weir	Hon FIAgrE	10 Nov 2019
Matthew Jamieson	FIAgrE	13 Nov 2019
35 years		
Anthony Goodhall	MIAgrE	15 Oct 2019
Barry John Higginbottom	MIAgrE	22 Oct 2019
Brian George Felton Mathew	MIAgrE	30 Oct 2019
Christopher Michael Thomson	AMIAgrE	31 Oct 2019
Robert Edward Crook	MIAgrE	1 Nov 2019
Johannes Gerardus Hendricus Portegijs		AMIAgrE
21 Nov 2019		
John Philip Metcalfe	MIAgrE	22 Nov 2019
Nigel Leonard Warner	MIAgrE	22 Nov 2019
Stanley John Sherrell	AIAgrE	24 Nov 2019
Michael John Watchorn	AMIAgrE	30 Nov 2019
Peter Daniel Fisher	MIAgrE	18 Dec 2019

Name		*Date of Anniversary*
35 years		
Christopher Jaworski	MIAgrE	18 Dec 2019
John Michael Sharp	MIAgrE	19 Dec 2019
Timothy Margetson Place	AMIAgrE	19 Dec 2019
Michael John LeFlufy	MIAgrE	12 Jul 2019
Richard James Dain	FIAgrE	12 Jul 2019
George Howard Jackson	FIAgrE	12 Jul 2019
Luis Ferdinand Waldmueller	AMIAgrE	13 Jul 2019
Trevor Roy Cumby	MIAgrE	24 Jul 2019
Melvyn George Kay	FIAgrE	28 Jul 2019
John Christopher Jeffery	FIAgrE	30 Aug 2019
Nigel Pemberton Donkin	AMIAgrE	30 Aug 2019
25 years		
Geoffrey Howard Fletcher	FIAgrE	12 Oct 2019
Basile Kotschoubey	MIAgrE	4 Nov 2019
Raghavan Vijayakumar	MIAgrE	15 Nov 2019

ACADEMIC AND COMMERCIAL MEMBERS

ACADEMIC MEMBERS

Berkshire College of Agriculture
Hall Place
Burchetts Green
Maidenhead
Berks SL6 6QR

Bishop Burton College
York Road
Bishop Burton
Beverley HU17 8QG

Brooksby Melton College
Asfordby Road
Melton Mowbray
Leics LE13 0HJ

Coleg sir Gar
Gelli Aur Campus
Llandeilo
Carmarthenshire SA32 8NJ

Cranfield University
Cranfield
Bedfordshire MK43 0AL

Duchy College
Stoke Climsland, Callington
Cornwall
PL17 8PB

Easton & Otley College
Easton
Norwich, Norfolk, NR9 5DX

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

Harper Adams University
Newport
Shropshire TF10 8NB

Hartpury College and University
Gloucester
GL19 3BE

Tralee Institute of Technology
Tralee Clash, Tralee
Co Kerry, Ireland

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

Manchester University
School of Electrical and Electronic Engineering
C39, Sackville Street Building
Sackville Street
Manchester M1 3WE

Myerscough College,
Bilsbarrow
Preston
Lancashire PR3 0RY

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

Pallaskenry Agricultural College
Co Limerick
Ireland

Plumpton College
Ditchling Road
Lewes
East Sussex, BN7 3AE

Reaseheath College
Reaseheath,
Nantwich
Cheshire, CW5 6DF

Royal Agricultural University
Cirencester
Gloucester, GL7 6JS

Sparsholt College
Sparsholt,
Winchester SO21 2NF

SRUC – Auchincruive
Auchincruive Estate
Ayr, KA6 5HW

University of Manitoba
Winnipeg
Canada
MB R3T 2N2

Warwickshire College Group
Warwick New Road
Leamington Spa CV32 5JE

Wiltshire College Lackham
Lacock
Chippenham
Wiltshire SN15 2NY

COMMERCIAL MEMBERS

Ace Aquatec Ltd
16B City Quay
Camperdown Street
Dundee DD1 3JA

Agri-EPI Centre
1-4 Bush House Cottages
Edinburgh Technopole
EH26 0BA

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, Hedington, Calne,
Wiltshire SN11 0PS

BAGMA
225 Bristol Road
Birmingham B5 7UB

Briggs Irrigation
Boyle Road
Corby, Northants NN17 5XU

City and Guilds
1 Giltsput Street, London EC1A 9DD

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

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

Douglas Bomford Trust
The Bullock Building
University Way, Cranfield
Bedford MK34 0GH

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

FEC Services
Stoneleigh Park
Kenilworth, Warwickshire CV8 2LS

Fullwood
Grange Road, Ellesmere
Cheshire SY12 9DF

Household Sprayers
Roughton Moor
Woodhall Spa, Lincs LN10 6YQ

HSS Hire
25 Willow Lane, Mitcham
London CR4 4TS

JCB Rocester, Staffs ST14 5JR

John Deere Ltd
Harby Road, Langar
Nottinghamshire NG13 9HT

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

Mastenbroek Ltd
83 Swineshead Road
Boston, Lincs PE21 7JG

National Fluid Power Centre
Carlton Road
Worksop, Notts S81 7HP

Orby Engineering
Craigmore Road, Newry BT35 6JR

Reesink Turfcare UK
1-3 Station Road
St Neots, Huntingdon PE19 1QH

PlantTech Research Institute
Bay of Plenty, New Zealand

Shelbourne Reynolds
Sheperds Grove Ind Estate
Stanton, Bury St Edmunds
Suffolk IP31 2AR

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

Teagle Ltd
Blackwater
Truro, Cornwall TR4 8HQ

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

Witham Oil and Paint Ltd
Outer Circle Road
Lincoln LN10 6YQ

Remap uses the talents of retired (mostly) engineers to solve individual mobility problems

ENGINEERING BESPOKE SOLUTIONS

LIKE many engineers, IAgrE member Martin Oldham wanted to find an outlet to continue his career of 'problem-solving' in retirement and outside the framework of a full-time career.

He had studied at the National College of Agricultural Engineering (NCAE) where the late John Kilgour was a lecturer, and recalled an article that John had written for *Landwards* around the year 2000 about his support for an engineering charity called Remap.

Remap uses the skills of mainly retired engineers to solve individual problems for people with disabilities. However, the demands of work and family meant that his time was limited, but John Kilgour's enthusiasm obviously made a mark, and 20 years on, Martin has joined his local Remap group in Bedford. The charity has no workshops or engineering facilities of its own, so divides the country into local panels, using the facilities of volunteers most of whom remain engineering enthusiasts and have well-equipped workshops at home in order to 'keep their hand in'.

"I'm amazed at the range of jobs that come to us from fairly straightforward woodworking projects to complex engineering manufacturing and fabrication as well as projects involving electronics" he says "Members of the panels either work alone or pool their skills and resources".

"Above all we need to be creative, and of course the one thing that agricultural engineers have in abundance is creativity!"

Small charities such as Remap constantly need to raise their profile on many levels. "First, we need volunteers with a variety of skills in order to increase the size of local panels, and of course we need to get our services known to a wider audience" says Martin.

"Of course, there are a tremendous range of aids available 'off-the-shelf' to help people with all sorts of disabilities, but in many cases, there are individual needs that simply cannot be met by volume producers. Remap is a true bespoke supplier in such cases".

"Once an engineer, always an engineer" adds Martin "and whilst this may not be agricultural engineering specifically, the acknowledged problem-solving skills of our community could be of great use to Remap panels up and down the land".

HISTORY

In 1964 Pat Johnson, an engineer with ICI, decided to help his disabled sister by making some improvements to her home. She had had polio as a child and as a wheelchair user she was experiencing difficulties in managing daily life.

Pat built a wooden ramp to his sister's front door using some scrap wood and installed an electric hoist, with a runway in the ceiling of her bungalow. She was overjoyed with the ramp and hoist as they gave her a level of independence she had never enjoyed before. Pat could see that his relatively simple solutions had made a huge difference to his sister's life, so resolved to try and bring similar changes to other people's lives.

Pat got together with some other engineers and formed a group dedicated to improve the quality of life for disabled people. Geoffrey Gilbertson an ICI senior manager who was also a wheelchair user became the first Chair and by 1968 he had set about developing a network of groups or "panels". The acronym Remap officially stands for Rehabilitation Engineering Movement Advisory Panel (but these days it can be known as "*Resourceful Engineers Make Anything Possible*"!)

In the early years Remap operated under the wing of the Royal Association for Disability and Rehabilitation (RADAR), but broke away in 1990 to become an independent charity.

Today Remap covers the whole of the UK and completes 4000 projects every year helping disabled people to become more independent.

HOW IT WORKS

Current CEO David Martin says "Engineers who have spent a lifetime in the profession were often just a cog in the production cycle. With Remap they get the opportunity to work on projects from concept to finished article".

Volunteers are invited to apply through the charity's head office at Sevenoaks, where they will be put in touch with a local panel. Interviews are held to confirm the competence and experience of volunteers, and meetings are generally held every 6-8 weeks to discuss new projects or get updates on on-going work. "Requests for help come in from a variety of sources" says David Martin "but commonly they emerge from occupational therapy teams at local hospitals".

Projects range from the very simple to the much more complicated (as

Our feature looking at the hobbies and pastimes of IAgrE members when not engaged in their day-jobs. CHRIS BIDDLE reports

can be seen from the Case Studies), but solutions must be fully compliant with the demands of regulatory bodies (eg safety standards etc).

"We sometimes run into issues particularly when adapting existing equipment, often on loan to a client rather than owned outright" says David Martin. "In such case we may be forbidden to alter the basic structure, but more than often the skill sets of our volunteers overcome problems. What we are looking for is ingenuity and the ability to put ideas into practice"

Members of Remap are often engineers with a wide skills set, and there is a growing trend for companies to allow engineering staff to participate in Remap projects as a way of contributing towards local charitable activities that help those with living difficulties.

Everything provided by Remap is free of charge. The charity aims to help people achieve independence and quality of life, filling the gap where no suitable equipment is available commercially.

Remap PROJECTS

SAFE SAILING

Bolton Sailing Club is part of the national RYA Sailability scheme. They offer people of all abilities the opportunity to enjoy the fun and freedom of sailing.

For people who have difficulty getting in and out of their boats, they use a hoist (a type of crane) to allow them to embark safely.

Because the hoist can lift over 100 kilos, it stays on dry land. This meant the yachts also needed to be brought onto dry land and relaunched every time someone wanted to get on or off.

Could Remap find a way to lift people from their wheelchair and onto their boat, without bringing the boat ashore or sending anyone for an unexpected swim?

Together with apprentices from Jaguar Land Rover, the Bury, Bolton and Rochdale panel took on the challenge. They adapted the sailing club's existing jetties to make them wheelchair accessible. They are even safe enough for the mobile hoist to be mounted at the end.

Now wheelchair users can board their yachts from the jetty with everyone else, so the yachts can stay on the water. The faster changeover times have even meant that the club have had to buy a second boat to keep up with demand!

MOTORCYCLE BENCH

The project for the Remap West Midlands Panel was to design and build a workbench that could also pick up a motorbike so the client could maintain them. Lifts on the market were manufactured so you couldn't get a wheelchair under.

The solution was to produce a workbench that has no step below or ramps to allow wheelchair access – and that could lift more than 125 KG.

Commercially available solutions meant that the frame on the floor was too big and the wheelchair would not fit under the workbench. The size of the platform needed to be increased to accommodate a wheelchair, and the operating mechanism needed to be fitted to the top of the workbench and the lower frame attached to the floor to increase stability.

A local fabrication company supplied all the metal and also laser cut the sides. Initial build was quick and the basic item worked, however, getting it to lift 250 KG was the problem as all the measurements had been increased to allow wheelchair access. Initially electric jacks and then electric actuators were used and both worked until the full weight was used.

Using electric screw type actuators would have also given the workbench a locking mechanism but the panel were unable to find an electric actuator with enough power at a reasonable cost.

A hydraulic company were approached and they supplied a pump and cylinder to enable the workbench to operate and lift the weight required, but this brought its own problems with a control box for the pump and safety mechanism.

The hydraulic cylinder is fitted with locking valves, but the panel felt that it also required a ratchet type lock when the workbench was raised. So now in the control box is a Pico relay, similar to a programmable logic control (PLC) but not as complex.

This now lifts the ratchet safety mechanism out of the way before the workbench can power down and then drops the spring loaded ratchet back into the correct position.

The workbench was secured to the floor and all the operating system is secured to the wall of the client's workshop.

The work bench is just what the client was after so he can carry on maintaining motorbikes and do his wood working projects. He does still require assistance to get his motorbike on and off the workbench and secure it in the wheel clamp (donated by my friend), but he was soon stripping the motorbike and doing what he had wanted to do for a long time.

IAgrE MEMBERS

Interested in helping the disabled lead more independent lives?

Learn more about volunteering opportunities
www.remap.org.uk
Learn more about completed projects
www.makeability.org.uk
Contact: 01732 760209

LAMMA'20

7-8 January 2020, NEC

Registration now open!

Join the LAMMA Buzz

LAMMA is a great shop window for visitors to view and purchase the latest machinery and innovations showcased by our exhibitors, as no other event in the UK offers LAMMA's scope of agricultural machinery, technology and innovation in one place.

Over 700 exhibitors - the 11 halls will be packed with exhibitors introducing ground-breaking innovations to the market.

Farming 4.0 Zone - a look at tomorrow's farming and how technology will help sustain the future of food production

Farm Safety Zone - will assess and improve your on-farm safety, sponsored by Safety Revolution

Innovation Trail - follow the Innovation Trail, showcasing award-winning exhibitors and their products

CPD points - Collect BASiS, DairyPro & NRoSO points on each day of the event

> *Impressed @lammashow today. Lots of kit and farmers. I always felt when our industry lost Smithfield and The Royal we lost more than the events themselves. It was good to witness what felt like a statement of faith in the future of UK ag at the NEC*
>
> Guy Smith, NFU Vice-President & Essex Farmer

Registration now open!

Register for your free ticket at www.lammashow.com

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