

Landwards ^{@IAgrE}

The professional journal for the Institution of Agricultural Engineers

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information

In this issue...

- **People** – A new strategy
- **Conference report** – A vision of the future
- **Practice** – Agrivoltaics
- **Technical** – Award winning innovations



AGRICULTURE



HORTICULTURE



FORESTRY



ENVIRONMENT



AMENITY

"The launch of REnvP is a landmark moment for environmental professionalism, providing more individuals with the opportunity to gain professional registration and achieve external verification of their competence."

Dr Emma Wilcox

Chief Executive Officer of the
Society for the Environment

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launched in partnership between the Institution of Agricultural Engineers (IAgrE) and the Society for the Environment is the new grade of Registered Environmental Practitioner (REnvP).

This is a huge step forward to ensure high standards of professionalism and proven competence are met by those working to enhance and protect the environment across every sector.

This registration is timely and relevant for agricultural engineering and the associated technology sectors and the intention is that professionals in the industry will apply. The industry includes many different disciplines which need people to apply a professional approach and the Registered Environmental Practitioner grade is ideal for this.

Why should I register?

- Improve your career and salary prospects
- Stand out from the field
- Join a network of dedicated professionals
- Demonstrate your competence and skills.

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Although the standards are high, IAgrE makes the process simple.



Contents:

4 Agricultural engineering news and views

Perspectives from the people and profession

8 From the CEO's desk

The latest Institution activity

10 The President's musings

On a changing climate

12 Biosystems engineering

A review of some of the latest papers

16 Profession – Engineers Europe

A network of professional engineers

20 Practice – Conference report

Feeding the future

26 Practice – Technology trends

Looking forwards

30 Practice – Agrivoltaics

Can field scale solar and farming coexist?

32 People – The Douglas Bomford Trust

A new direction

36 Technical

Agritechnica medal winners

38 Membership matters

The latest branch and membership activity

48 Research round up

New and ongoing project updates



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Editors Welcome



For the first time in four years, yours truly (& friends) managed a few days in Germany at the Agritechnica event.

What an eye opener! As one global tractor manufacturer observed, “10 years ago, we were certain of two things, tractors ran on diesel and required an operator. Tractors were designed accordingly. Now, we are working on multiple scenarios concerning how machines are powered and how they are operated.” Indeed, lots of alternative fuel sources and a plethora of autonomous options, from almost standard machine assistance through to fully independent kit.

There were plenty of new ideas and developments, Practice from page 26 delves into some of the latest trends whilst Technical on page 36 looks at some of the Agritechnica innovation medal winners.

As a warm up for the trip, I thoroughly enjoyed participating in this year’s Landwards Conference at

the start of November. If you missed it, don’t worry there is a report from page 20, and the full sessions are available on the Institutions YouTube page.

Elsewhere in Landwards you can catch up on a recent Lunchtime Lecture with an interesting take on the solar panels vs farming debate with some US based research work which is aiming to validate the benefits of colocation on page 30.

I hope you have time to settle down and enjoy this edition over the festive period.

With my best wishes for Christmas and the New Year.

Andy Newbold

Andy Newbold Hon FIAgrE
Editor
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Reminder: Associate Members can upgrade free to Member grade

If you are an existing Associate Member you have the option to upgrade to Member grade providing you have completed 5 or more years in a relevant career.

However, if you prefer, you can remain as an Associate member for as long as you wish.

For more information please see;

<https://iagre.org/upload/1621421462.pdf>

or contact Alison at;

membership@iagre.org

Field robot event is back for 2024



- Registration is now open for the World FIRA event which takes place on 6 – 8 February 2024 in Toulouse, France
- WORLD FIRA showcases the very latest technological advances in the sector, as well as keeping you updated with regulatory changes, new scientific research and case studies.

This will be the event's 8th year

and visitors will be able to see a multitude of robots in action. World FIRA is designed to attract the ag robotic community such as farmers, manufacturer's, startups, OEM's, investors, tech and AI dealers – they will be gathering at this event to build the new era of Ag machinery.

If you are working with field crops or in the livestock industry, World FIRA

is the place for you. Exhibitors, demos and panels dedicated to these two sectors will be key events at the show in February next year.

Visitors will be able to take part in field demonstrations. There will be five real cultivated demo zones, making World FIRA the largest robot playground in the world. Get to the front row of the agriculture of tomorrow and see 20+ robot demos, from prototypes to marketed robots. From weed control to fertilizer, harvesting, picking and seeding, automation is in the spotlight on cultivated plots, vegetables, field crops, orchards, vineyards and livestock.

Visitors will also be able to discover the latest AI and automation innovations and take part in the future of Agriculture. Over 70 exhibitors will be showcasing their latest innovations for autonomous farming.

Landwards eXtra

Landwards eXtra is an ad hoc electronic supplement to Landwards. Occasional papers will be published in an electronic format only.

Recently uploaded is a paper by Brian Robinson entitled: Integrated on farm renewable energy - optimisation and the road to Net Zero

Head to;

<https://iagre.org/landwards-e-xtra>

to read on.





A new Tube map design celebrating the achievements of engineers worldwide

Transport for London (TfL), the Royal Academy of Engineering and the London Transport Museum have collaborated to create a reimagined version of London's iconic Tube map to honour the contributions of engineers in London, the UK and worldwide.

The new Engineering Icons Tube map was released on National Engineering Day, which is marked on the first Wednesday in November each year. The day aims to make engineering more visible and celebrate how engineers improve everyday lives. The map, which renames 274 Tube and Elizabeth line stations after notable engineers, was

created to encourage, and inspire more people to consider engineering as a career.

For National Engineering Day 2023, the Royal Academy of Engineering ran an #EverydayEngineering competition, inviting the public to release their inner engineer by submitting ideas and creations that

aim to make daily life more sustainable, and then voting for their favourite shortlisted entry.

Leading engineers from different fields including transport, defence, entertainment, computing and health have been selected for Tube and Elizabeth line stations on the map, including:

- Oxford Circus station has been renamed as Harry Beck, who was an electrical draughtsman and created the iconic London Underground Tube map 90 years ago in 1933
- Shepherd's Bush has been renamed as Professor Dame Ann Dowling, who was the first female President of the Royal Academy of Engineering and worked on pioneering noise-reduction research on Concorde
- Uxbridge has been renamed as Dr Gladys West, who was the first woman to receive the Royal Academy of Engineering's highest individual award, the Prince Philip Medal, for work that paved the way to Global Positioning System
- Ealing Common station has been renamed after Isambard Kingdom Brunel, who is the most celebrated civil engineer of the nineteenth century and was responsible for designing and constructing the Thames Tunnel in London, as well as many other transport projects
- Warren Street has been renamed as Ada Lovelace who is considered the world's first computer programmer
- Regent's Park station has been renamed as Alexander Graham Bell who was the inventor of the first practical telephone
- Abbey Wood station has been renamed after Isabel Coman who is TfL's Director of Engineering and who played a significant role in building the Elizabeth line
- Harrow-on-the-Hill station has been renamed after Sir Charles Kao who was known as the father of fibre optic communications and led the way in pioneering information technology, for which he won a Nobel Prize
- Nine Elms station has been renamed as Eneni Bambara-Abban who is a multi award-winning robotics engineer and stars in the new series of This is Engineering, which aims to bring engineering alive for young people

Lackham College receives Institution award



L-R : Mike Whiting; Branch Secretariat, Richard Robinson; Honorary Fellow and Past President of IAgRE, Sharon Jarvis; Deputy Head of Engineering Dept. Lackham College, Richard Ingram; Lackham Herd Manager and Rupert Caplat; Branch Chairman,

Representatives of Lackham College were presented with the IAgRE Team Achievement Award back in September. This was awarded in

recognition of successful teamwork and demonstrates what can be achieved through collaboration. Their citation specifically mentioned that

the award was for their commitment to student development.

From the CEO's desk



*The older you get;
the faster time goes!
It doesn't seem five
minutes since I was
putting some words
together for the
Autumn edition of
Landwards back in
August, and here we
are in damp cold dark
November preparing
for the winter edition.*

I hope people are finding the content we offer of interest, we've had some excellent lunchtime lectures recently, and of course more to come. November is of course our conference month, which I hope those who attended enjoyed. Food, climate, sustainability are all words used regularly and we wanted the conference to explore how we feed our growing global population. We

opted for an on-line format this year to remove the geographical boundaries, which a number of members welcomed. Will Downie from John Deere took us through the company's systems for providing data to growers in the continuous quest for efficiency and better farm management. Dr Toby Mottram gave us some interesting thoughts to ponder on tractors of the future, whether you call them driverless or autonomous, they're certainly on their way. Niels Kortstee provided an insight into growing in a totally controlled environment, or vertical farming as its often called, and his company are planning a follow up lecture soon. Finally Kirsty Pilcher gave us AGCO's view of how they're approaching decarbonisation. The conference provided four very different speakers and equally different subjects, but all focussed on how to grow food more efficiently and in a sustainable way for the planet. The event finished with an excellent panel discussion with questions fielded by Andy Newbold with our speakers. The event is covered in more detail from

page 20 and the presentations will be available on our YouTube channel, along with all the other great material we've produced.

A little bit more

Talking of material, I'm very keen to reinvigorate our Landwards e-Xtra, which hasn't been used for a number of years. The idea of the series is to provide a means for members to publish articles via IAgRE in an on-line only format that is considered too large or maybe too far off topic for Landwards and is not deemed academic enough for our Biosystems Engineering journal. You may wish to promote pieces of work you are doing, provoke comment on perspectives or simply provide detailed information on subjects for other members. Brian Robinson has kindly kicked us off with a paper aimed at farmers looking at optimisation of on-farm renewable energy. The various papers can be found on our website via;

www.iagre.org/landwards-e-xtra.



If you are interested in publishing pieces of work with us then please do get in touch.

Low carbon vehicles

In September I attended the Cenex Low Carbon Vehicle show at Millbrook proving ground in Bedford, where there was an array of alternative fuel road vehicles, many in prototype form. Battery electric was dominant, from electrified rickshaw's to 44T trucks, and everything in between. The significant investment was plain to see, whether it's the right solution in some cases is highly debatable!

You may ask "why attend basically a car show?", well I wouldn't normally except they had a "farm of the future" section, complete with straw bales and pictures of fields. The future farm section was actually supported very well with a few major manufacturers, including JCB and CNH who also spoke on their respective developments. We were informed of the usual hugely varying greenhouse gas figures that Ag produces; anything from 10% upwards.

With actual machine fuel responsible for around 1% of the latter, it's not really vehicles that are the problem; which is nothing new as ag vehicle pollution is pretty negligible in the whole scheme of things. The pace of battery development is immense, with battery densities hitting in excess of 350 Wh/kg with 15 minute charges. I think we'll certainly see battery electric creep up into larger machine power categories considering what's in development and on show. Also significant is the safety testing and validation effort, which is important when a single 21mm x 70mm battery cell in an automotive power pack can peak at 25Bar and 800°C just before it explodes! The future farm segment was excellent; however, I wish our industry groups were more joined up as the event seemed to be largely unpublicised in our sector.

Fees

Membership fees for 2024 will be due soon and although fee increases are kept well below inflation, and in some cases zero

for the last few years, we will be lifting fees by around 5%. Annual discounted Direct Debit is the most cost-effective way to pay, but if you wish to spread your fee over the year the monthly payment scheme continues.

The Institution continue to offer great value professional membership for those in the sector with an excellent range of content to suit all. The discounted registration offer we held through August resulted in a number of members progressing professional registration, which is great to see; we may even do another discount period, so keep a look out! If you are interested, then please do get in touch with Alison at

membership@iagre.org

And finally, seasons greetings to you all and best wishes for the New Year.

Charlie Nicklin CEng FIAgrE
ceo@iagre.org

President's Musings

Steve Constable



On climate change

On the 1st of November we held our annual Institution of Agricultural Engineers conference with an online format, for those of you that didn't manage to log in then please do try to view the content when it is becomes available on the IAgRE website, the subject was "Agricultural Engineering- Feeding the Future".

Sincere thanks must go out to the Secretariat team who arranged and administered the event and Andy Newbold who chaired the question-and-answer session and finally to our guest speakers who delivered interesting and thought-provoking content across a range of topics. The feedback received on the day has been very positive.

The subject of climate change is at the forefront of global concern for very good reasons, locally in Lincolnshire for example (historically

one of the driest counties) we have witnessed extreme flooding and twice the normal rainfall as have some other parts of the UK. A proportion of UK farmland has been waterlogged for many weeks as I write this, more rain is forecast over the next few days.

The more extreme weather patterns highlight the need for innovative engineering solutions to meet the ever-changing environment and increased useable data to allow

the farmer to farm efficiently and effectively. Our conference speakers examined the process of data collection, data utilisation, alternative solutions such as vertical farming, robotics, and developments to produce machinery and equipment with reducing environmental impact.

Flying High

I was interested to hear the news yesterday regarding the UK Civil Aviation Authority issuing Virgin



Atlantic a permit to fly a world-first transatlantic 100% Sustainable Aviation Fuel (SAF) flight.

Virgin Atlantic plans to fly across the Atlantic from London Heathrow to New York JFK on 28 November 2023 to test and showcase the feasibility of flying on 100% SAF. It has been calculated that using 100% SAF will reduce current emissions by 70%. The processes to produce SAF, include algae, synthesised fuels from hydrogen waste, or from directly capturing carbon dioxide.

This development is thought provoking, as rather than re-inventing the wheel the government might be better placed to invest more resources into the development of synthetic fuels as the airline industries are leading. This could have the advantage of utilising existing technologies and supply chains which would complement the rural applications requiring sustained high torque and power requirements used in agricultural

field practices. The use of EV for this type of operation may be less successful and capital heavy which has led to some manufacturers already investigating the bio/synthetic option in both agricultural and construction industries. More funding into this area from government to industry would help accelerate the development of this technology whilst reducing emissions in the most economical way.

Members

The IAgRE needs more members, especially the younger generation. The Institution spends a high proportion of time and effort communicating with schools, colleges, universities, and industry promoting the institution and investigating ways to convey the advantages of training and registration as professional engineers. The IAgRE is not alone in the drive to develop more professional engineers, and we are

working with our partners to spread the word as wide as possible.

As a member I ask myself what more can I do to help? At our recent executive meeting we discussed the idea that every member of the executive team could introduce at least one new member per year to the institution as a minimum and I appreciate that some members are already exceeding this number. Just imagine the effect however if every person in the wider membership introduced a new member every year. If you would like to learn more about what the Institution can offer, then please look at the website or ask the office for literature which highlights the benefits that you can pass onto colleagues and friends.

Finally, I would like to wish you all a very Merry Christmas and a Happy and Prosperous New year.

Steve Constable

president@iagre.org

Biosystems Engineering

Biosystems Engineering, owned by the IAgRE, and the official scientific journal of EurAgEng, is published monthly with occasional special issues.

Head to <https://www.sciencedirect.com/journal/biosystems-engineering> to view the full article list of the latest edition and

to find out more about depth and breadth of articles accepted for publication.

Reduced subscriptions are available to IAgRE members. Go to <https://iagre.org/biosystemsinformation> for details of the preferential rates for both paper and electronic versions.



Biosystems Engineering

Volume 232, August 2023, Pages 13-28

A tactical planning model for fresh produce production considering productive potential and changing weather patterns

Omar Ahumada, Xaimarie Hernandez-Cruz, Rodrigo Ulloa, Miguel Peinado-Guerrero, Francisca Quijada & J. Rene Villalobos

International Logistics and Productivity Improvement Laboratory, Arizona State University, AZ, USA

Universidad Autonoma de Occidente, Colombia

Tactical planning models for fresh produce help growers optimise production by considering, among other things, the decay

of fresh products, labour management issues and weather patterns that could further impact traditional planting periods. A generic yield model, known as “SIMPLE” was used to determine the yield of fresh produce market crops based on observable parameters, such as daily temperature and radiation. These also allow the analysis of current production conditions and the impact of climate change on the profitability of open field crops. The yield predictions can be used within a tactical planning model then based on a mixed-integer program with the objective of maximising profits for an individual, or groups of growers, of fresh produce. The planning model considers crop price estimation, current and potential weather conditions, yield distribution, labour cost, labour availability, product decay and transportation to determine the

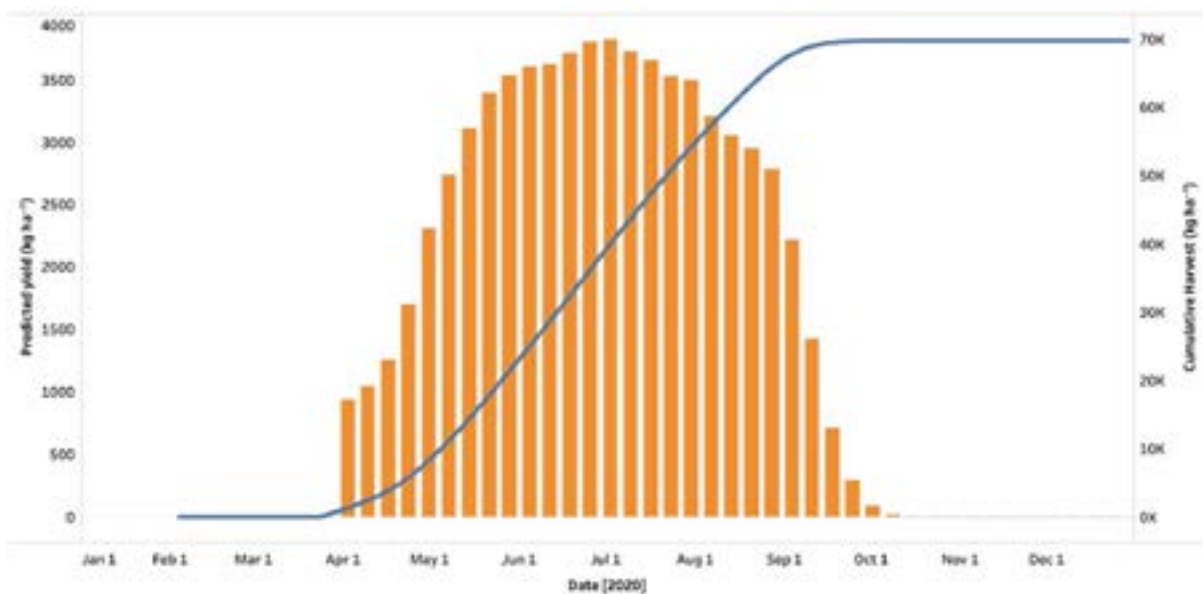
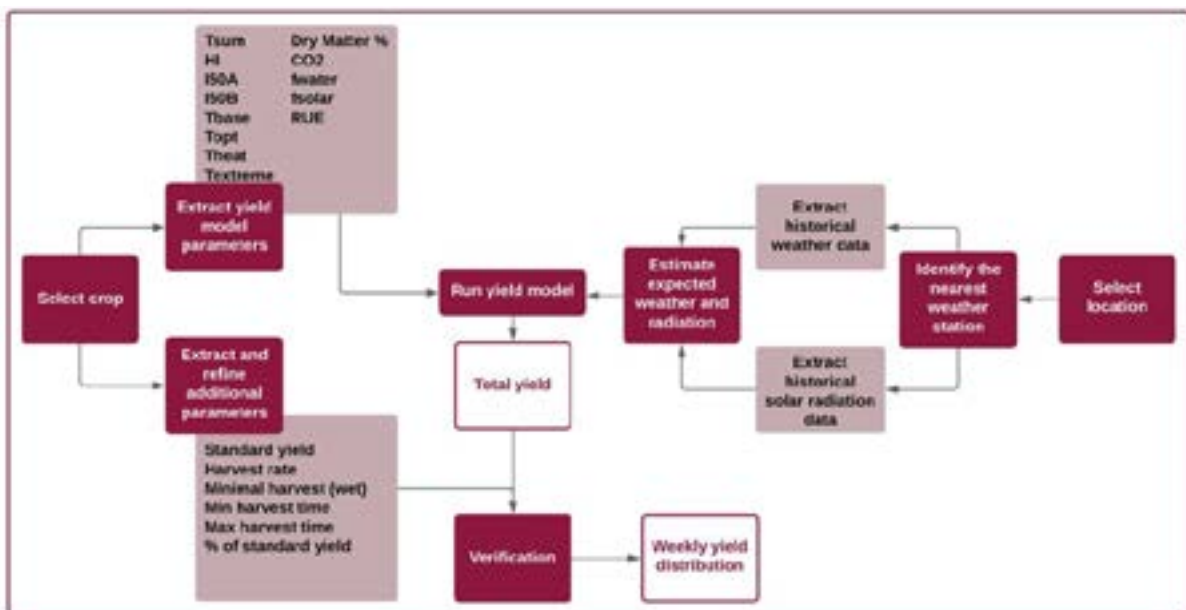
profitability of a planned planting action. The model can help growers gain insights and provide better planning decisions, particularly around planting dates, to succeed in a very complex supply chain. As demonstrated through the case study provided in the article, the use of these tools has the potential of improving significantly the revenue obtained by the potential users. A factorial design of the most relevant factors in the fresh produce industry provided further insights into needed future changes if labour becomes scarcer. Adaptations in technology and planting decisions may also be required to deal with changing weather patterns. For those interested, different versions of the tools presented in the article are available at;

www.terra-fresh.com

The senior editor of Biosystems Engineering, James Taylor has kindly summarised a selection of papers published in the past three issues, which will be of interest to IAgRE members.



Figure. Top: The framework of the yield prediction model that provides a weekly yield prediction distribution (bottom) based on planting date and expected weather conditions. The improved yield distribution predictions permit the grower to use the platform to plan and optimise supply chain opportunities.



Biosystems Engineering

Volume 233, September 2023, Pages 1-20

Removing temperature drift for bee colony weight measurements based on linear regression model and Kalman filter

Bowen Jia, Fangchao Yang, Menghao Zhao, Liangyu Chu, Bingxue Chen, Honggang Li, Qingqing Li, Deng Zhang, Yunfan Li, Chuanqi Lu, Yuntao Lu, Shengping Liu & Wei Hong

MOE Key Laboratory of Fundamental Physical Quantities Measurement, Hubei Key Laboratory of Gravitation and Quantum Physics, Huazhong University of Science and Technology, Wuhan, China

Intelligent Computing Hardware Center, Zhejiang Lab, Hangzhou, China

School of Basic Medicine, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

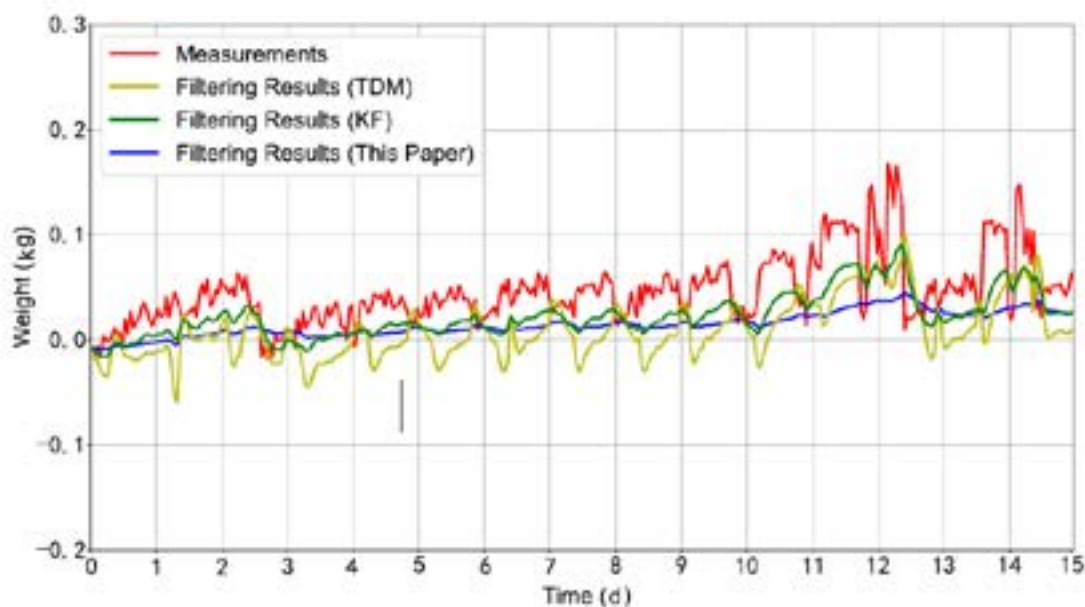
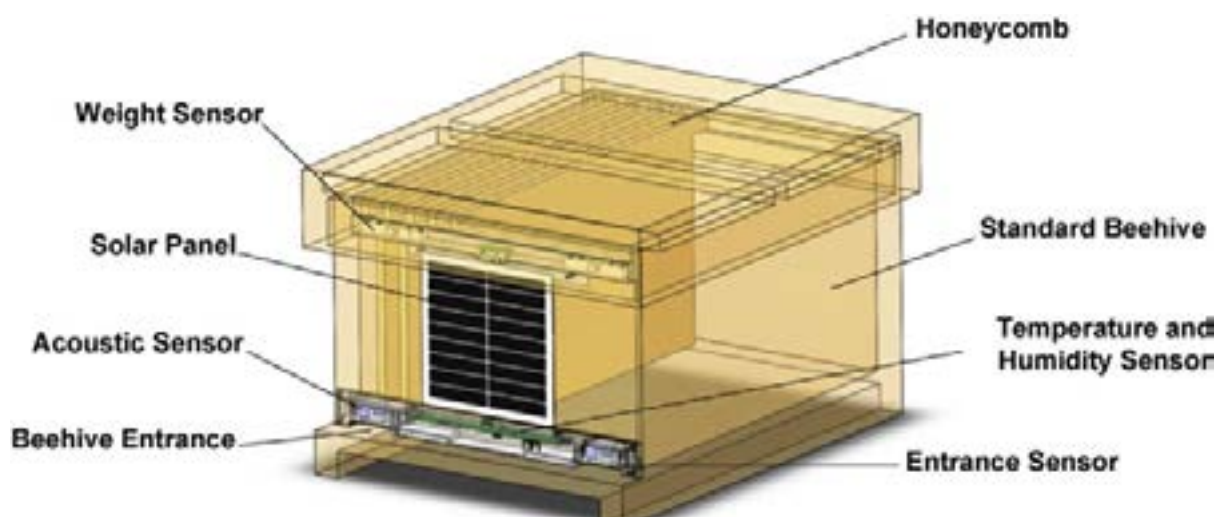
College of Engineering, Huazhong Agricultural University, Wuhan, China

Key Laboratory of Agricultural Blockchain Application, Chinese Academy of Agricultural Sciences, Beijing, China

In precision bee keeping, bee colony weight is an important indicator to monitor bee behaviours, such as foraging and swarming. However, when weighing a hive, the ambient temperature can affect the measured values. In this paper, a new method is proposed to remove the temperature drift of bee colony weight caused by ambient temperature variations. The principle of the proposed method is to introduce a linear regression model of temperature drift into a Kalman filter. This combined method allows for an accurate description of the drift characteristics and permitted optimal weight estimation for each bee colony. The effectiveness of the proposed method was verified

through real monitoring data from smart hives, and by comparison with linear model fitting and Kalman filtering on their own. Measurements and modelling were performed under three different conditions - without bees or honeycomb (i.e. effectively empty), with honeycombs but no bees, and with both honeycombs and bees in the hive. The experimental results show that the mean absolute errors can be decreased under all three conditions and by over 40% during periods of no honeycombs. However, when bees are present, the percentage correction from filtering is less, but was still best when using the new combined proposed method. The newly proposed filter is dedicated solely to the issue of temperature drift removal in bee colony weight sensors. It is important to note that other factors such as humidity should be taken into account in the future research on more thorough data drift elimination. The proposed method improves the reading accuracy of bee colony weight, and thus it has the potential to benefit precision beekeeping and basic research on bee activities.

Top: A schematic of the smart beehives used in the study and, **Bottom:** an example of the filtering of hive weight over time using various approaches, including the new method proposed in the paper (smoothest blue line)



Biosystems Engineering

Volume 234, October 2023, Pages 1-12

The added value of 3D point clouds for digital plant phenotyping – A case study on internode length measurements in cucumber

Frans P. Boogaard, Eldert J. van Henten & Gert Kootstra

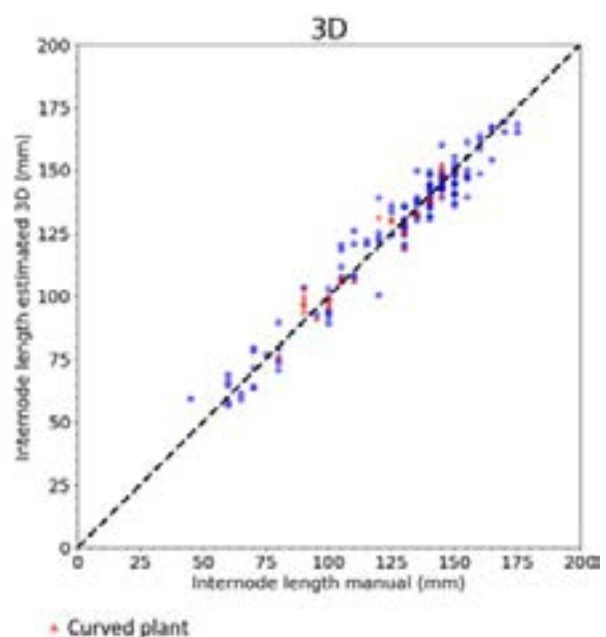
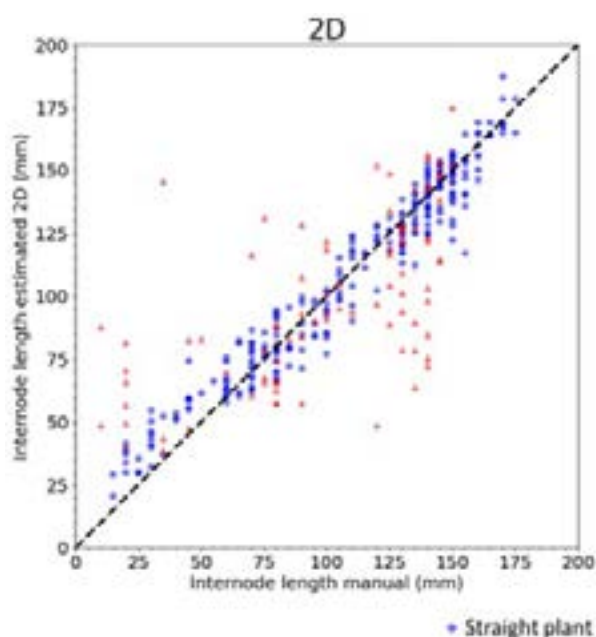
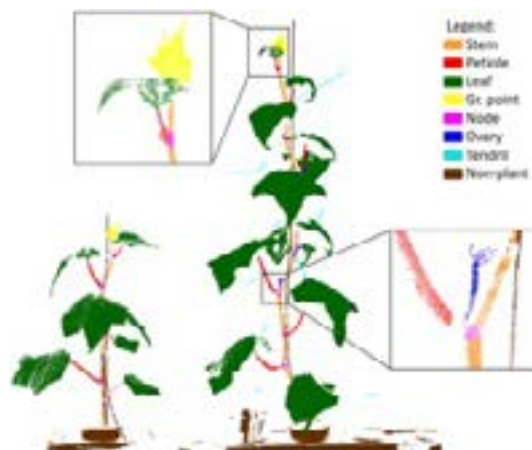
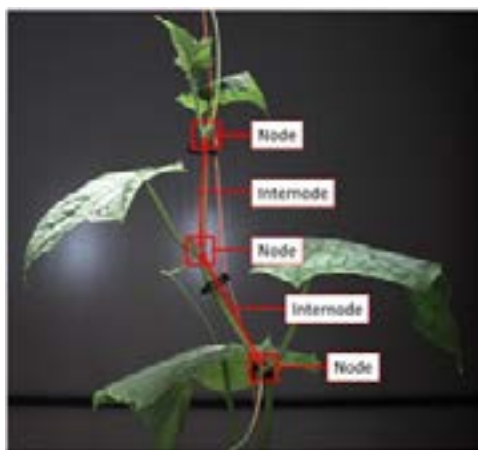
Wageningen University & Research, Agricultural Biosystems Engineering Group, Wageningen, the Netherlands

Rijk Zwaan Breeding, Fijnaart, the Netherlands

A 2D image (bottom left) and 3D point cloud (bottom right) showing different morphological features in the two different spaces. The plots on the bottom show a comparison of observed vs measured internode length in cucumber plants from 2D and 3D measurements, with better results obtained from the 3D approach.

Computer-vision based methods contribute to the availability of high-quality phenotypic datasets. Most computer-vision based methods for plant phenotyping are based on analysis of 2D images. However, previous research has shown that for traits related to plant architecture, like internode length, a major limitation of 2D methods was an inability to accurately measure plants with a curved growing pattern. In this work, it was hypothesised that methods based on 3D data can overcome this limitation, and improve the overall accuracy of internode length measurements. To test the hypothesis, a method was proposed to estimate internode lengths from 3D point clouds of cucumber plants. First, a deep neural network based on PointNet++ was trained to segment the point clouds into plant parts. The points that were predicted as 'node' were then selected and a clustering algorithm was used to group points belonging to the same node. The Euclidean distance

between the detected nodes was used as an estimate of the internode length. The results were compared to the results of a previously published method based on 2D images. The 3D method was significantly more accurate than the 2D method. Moreover, in contrast to the 2D method, the internode length estimates of the 3D method were equally accurate for curved plants as well as for straight plants. The results clearly demonstrated that computer-vision based methods to measure plant architecture in general, and more specifically to measure internode length, greatly benefit from the availability of 3D data. A limitation of the 3D method was that not all nodes were detected due to occlusion and a lower resolution of the point clouds as compared to the 2D images. It may be that a combined 2D-3D fusion approach, in which the advantages of both the 2D images and the 3D point clouds can be utilised, may provide even better predictions.



Profession

European
Engineering



Alastair Taylor

Before I stood down as CEO at the Institution back in 2019, I was asked if I would represent the Engineering Council and network of Professional Engineering Institutions on the European Monitoring Committee (EMC) – Alastair Taylor reports.



Engineers Europe was set up to facilitate the prosperous and peaceful development of European society

About Engineers Europe

It is important though to understand who oversees the EUR ING title. This is an organisation called “Engineers Europe”. EE for short with more information at <https://www.engineerseurope.com>

EE was founded in 1951, a few years after the end of the second world war, by a group of French and German engineers who thought that through technology, their common field of activity, it would be possible to create links between former adversaries, and so to facilitate the prosperous and peaceful development of European society. Associations from seven European countries immediately joined this initiative.

Today, associations from 33 European countries are represented in EE, bringing together more than 350 national engineering associations, all of which are recognised in their countries as the representatives of the engineering profession at the national level. Through these national associations, EE represents the interests of approximately 6 million professional engineers in Europe.

EE is a founding member of the World Federation of Engineering Organisations (WFEO) and collaborates with many other organisations dealing with engineering and technology issues and engineering education. EE is officially recognised by the European Commission as representing the engineering profession in Europe.

The federation also has consultative status with UNESCO, UNIDO and the Council of Europe.



ENGINEERS EUROPE

Fédération Européenne d'Associations Nationales d'Ingénieurs
European Federation of National Engineering Associations
Föderation Europäischer Nationaler Ingenieurverbände

The purpose of the committee, I was told, was to monitor the quality and content of engineering education across wider Europe, working alongside various other countries and review the applications of those professional registered engineers seeking to join the register of European Engineers with the title of

EUR ING. Four meetings a year in different European Countries, usually at the head quarters of the relevant equivalent of Engineering Council.

That sounded like an interesting proposition, so I readily agreed. And then along came the pandemic which meant that all meetings took

place on-line on Teams. Ah well... Although we have now started meeting physically for interim meetings.

My joining EMC coincided with a project to review the arrangements for EUR ING and me being me, I rolled up my sleeves to get involved.

Profession European Engineering

EUR ING Registration

For many years, it has been possible for professional engineers to become registered as EUR ING with a few IAgRE members taking this up. Even though the UK is outside of the EU, the title is a popular way of demonstrating competence against the required standards.

The EUR ING Certificate is delivered by Engineers Europe and is designed as a guarantee of competence for professional engineers, in order

- To facilitate the movement of practicing engineers within and outside the geographical area represented by ENGINEERS EUROPE's member countries and to establish a framework of mutual recognition of qualifications in order to enable engineers who wish to practice outside their own country to carry with them a guarantee of competence

- To provide information about the various formation systems of individual engineers for the benefit of prospective employers
- To encourage the continuous improvement of the quality of engineers by setting, monitoring and reviewing standards

The starting point is assurance that the qualifications held by the engineer meet the requirements defined earlier and to the end, Engineers Europe maintains the:

European Engineering Education Database (known as EEED)

This lists the institutions of engineering higher education in European countries represented within Engineering Europe, and their engineering programmes, which are all recognized as fulfilling the mandatory education requirements for the EUR ING Certificate.

The process for applying for EUR ING has been simplified with a new on-line system for application launched in January 2023. It is a very straight forward approach and involves the candidate in providing information and completing the following steps:

- Personal data
- Motivation
- Higher Education, additional studies and professional registrations
- Professional experience
- Continuing Professional Development (CPD)
- Career Learning Assessment (For individuals with no formal engineering higher education)

This information is reviewed by the relevant National Member of Engineers Europe (in UK the Engineering Council) and if sufficient is passed to the European Monitoring Committee for review. On occasions follow up information is requested

It is important to note that UK registered Chartered Engineers and Incorporated Engineers (along with registered engineers in a few other European Countries) are acknowledged as having a suitable level of education and experience although on occasions, further clarification is sought. The key for any applicant is to provide as much information as possible.

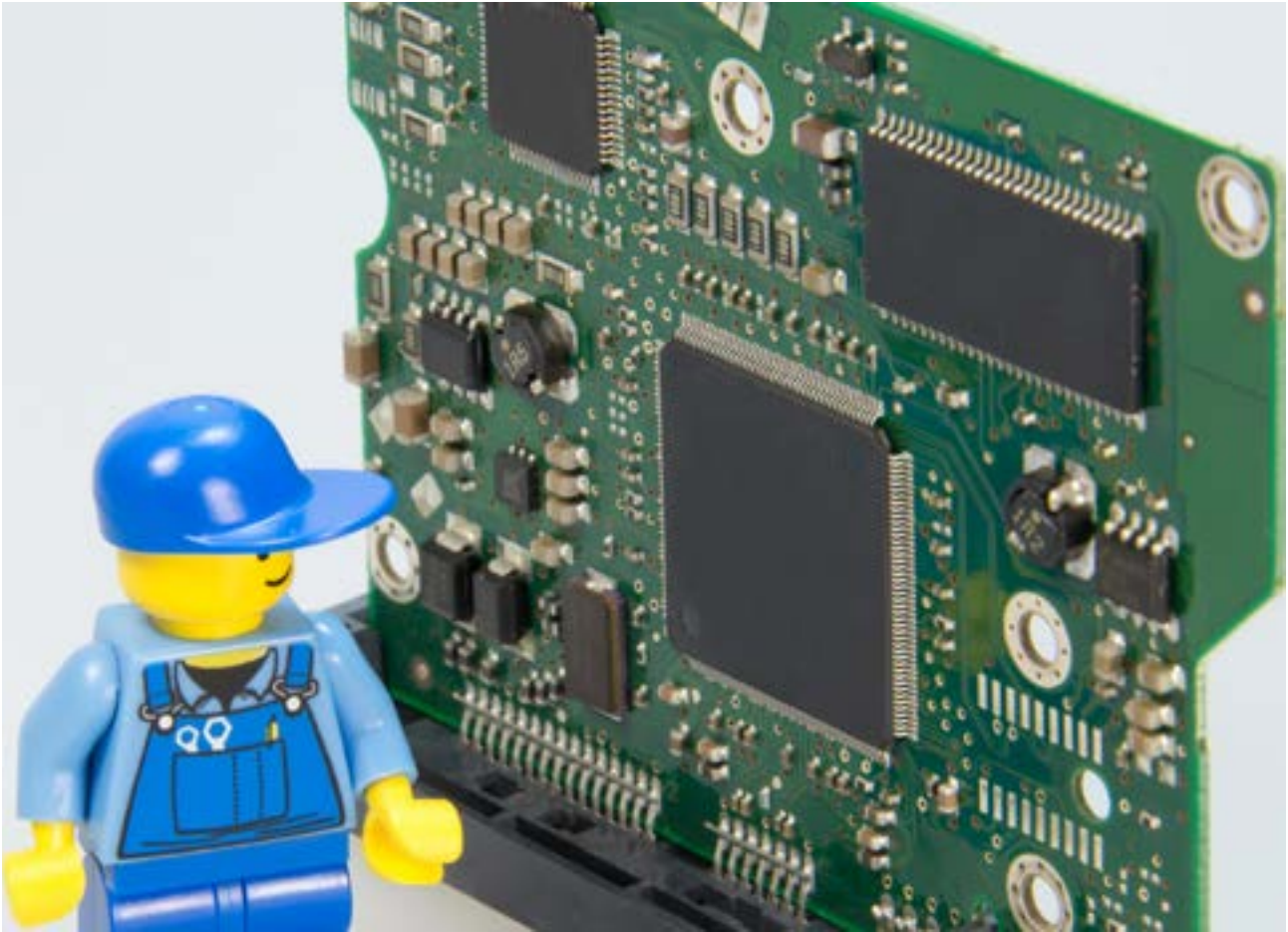
The table below shows the typical years of engineer experience required for EUR ING registration:

Education EQF Level	Typical Relevant Experience (Pre if applicable and Post Education)
EQF 7 (Masters Degree)	Experience (typically 2 to 5 years)
EQF 6 (Bachelors Degree)	Experience (typically 5 to 7 years)
EQF 5 (HND/HMC/Foundation)	Experience (typically 7 to 10 years)

EUR ING registration is for a five year period and at the point of renewal, the candidate is expected to demonstrate that they have kept themselves up to date through CPD. This is not a problem for UK engineers.

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An example registration certificate

Practice Conference Report



Will Downie



Views of the future

Farmers of the future might use a combination of best of conventional farming systems with elements of vertical farming, robotics and real-time crop quality assessment. Speakers at the Institution of Agricultural Engineers (IAgrE) conference presented a range of solutions to the problem of feeding the world's growing population.



**A range of engineering solutions
will support future food production.**

Agronomic and environmental improvements

Improvements in both agronomic and environmental performance might be offered by new on-the-go crop monitoring technology, suggests Will Downie, precision agriculture specialist from John Deere.

The company's NIR-based system enables farmers to assess the quality of grain as it is being harvested:

"That will enable users to make data-driven decisions on arable crops while in the field", he says.

When shared with agronomists, the data gained could help improve farm

operations in a range of ways.

That could include being able to cut the cost of inputs like fuel and seed, and the cost of applications and harvesting.

It could also be deployed to help plan rotations and future field work.

Rather than replacing the agronomist, he suggests the data collected would provide them with extra knowledge that would help them run the business:

"We are not agronomists and can't tell them how to farm, but we can give them the technical knowledge and skills to enable them to do this with other platforms".

The onus on the machinery company in this scenario would be to produce new machines and to provide support to the technology via a new style of technician and dealer network.

The new technology could help farmers achieve greater long term financial stability, as well as making the farm more environmentally sustainable.

It might also help them manage all the farm's operations off one system, greatly simplifying their data handling and storage.

That could feed through into better sustainability, as it would enable them to analyse data like the fuel use and emissions of individual machines, or the labour and costs involved in working an individual field.

When applied to arable crops, that could include sampling the moisture, protein, starch of wheat and barley – or the oil content of oilseed rape – with great frequency:

"Taking one data point per trailer load might not provide an accurate representation of the crop. One sample every half second is now the new data point".

Practice Conference Report

That frequency of sampling would provide a much more accurate yield map, and enable more effective marketing of the crop itself.

The resulting yield maps would accurately record the variations in nutrient removal across the field, which could help plan future fertilizer and related applications.

But farmers would still need to use their experience to assess other variables that might show up in the data. That might include assessing

whether lower yielding parts of the field might have still lost as much nitrogen as other better yielding areas because the grain contained higher protein levels.

Based on that information they might be able to either raise or reduce fertiliser applications so production was optimized and wastage reduced.

The same technology could also be used with a forage harvester to measure key quality criteria in harvested silage, such as sugar levels; ash and nutrient content.

It could also be fitted to manure spreading machinery so farmers knew exactly what they were applying and could ensure applications were matched to needs and that they obeyed NVZ regulations.

Autonomous explosion

Development of autonomous tractors had exploded in the wake of the Covid pandemic, says IAgRE Fellow Toby Mottram.

While only a few companies had

been working on the topic before then, now there were hundreds of autonomous vehicles in development:

“Most machines are being designed around single tasks by small companies driven by investor money”.

Supporting this new generation of complex machines would need a new type of engineer – one familiar with the multiple interfaces that the new machines would include.

And he wondered how the companies would set about supporting what might be relatively small populations of complex machines that might be distributed widely across the country.

While autonomous systems have much to offer horticulture, he says the sector will still be heavily reliant on manual labour for a whole host of crucial jobs.

And his views on the personnel involved in supporting and servicing the new equipment closely allied with those of Mr Downie:



Toby Mottram



Many autonomous solutions are being designed around single tasks



Vertical farms can provide a perfect summers day, every day

“We have a lot of mechanical engineers at the moment and we do need to provide more digital training. We are not really catering for those people yet”.

Two other key issues were the farmer’s ‘right to repair’ and brand exclusivity.

Farmers would expect to be able to repair equipment themselves, although he points out that they might need some sophisticated diagnostic technology and other tools to do the job:

“Farmers don’t like to be locked into one single supplier, so OEMs must allow other implements to be used with their machines”.

A future blend?

Niels Kortsee sees a combination of conventional farming and the vertical version he is helping develop with Intelligent Growth Solutions as the way forward.

At the moment vertical systems are used mainly to grow leafy green crops, which have a relatively low space requirement and short growing cycle.

But they could be used to propagate crops for transplantation, and grow them up to six times faster than can be achieved in a conventional polytunnel.

In a world trying to source more food while minimizing environmental impact, he suggests vertical systems have many other benefits to recommend them.

These include the fact that they can provide what he describes as ‘the perfect summers day every day of the year’.

That would be an improvement on existing polytunnels, he suggests, where it is not possible to control the weather or light levels.

Vertical systems open up the potential to cut water usage and



Niels Kortsee

manage with either far fewer or no pesticides and herbicides.

And the systems offer the opportunity to develop and produce crops with longer shelf life, which could cut some of the wastage currently suffered in the food chain.

The compact units – up to 12 metres high - can fit on a small footprint and powered by solar panels and other green energy systems.

That would facilitate local food production using renewable energy, minimizing both food miles and carbon footprint.

At the same time it would offer greater food security and all year round supply irrespective of weather conditions:

Practice Conference Report



AGCO's first commercial fully electric tractor the Fendt e105V

"We have the ability to grow crops like leafy greens and herbs from seed to harvest.

"These plants require only a small space and have a short growing cycle".

Other foods for which the method is suitable include small fruiting crops like strawberries and chillies, these crops' short growing cycles mean the units could switch between different crops very quickly:

"We are looking at vertical farming not to replace anything, but to integrate with traditional methods". He suggests farmers should consider how vertical farming elements could integrate into their existing operations.

And the post-Covid city landscape offers some clear opportunities, he adds, because the units could be tailored to fit into now empty office buildings and warehouses.

Future fuels

AGCO is fully embracing future fuels, says Kirsty Pilcher, the company's global sustainability manager.

The company will launch its first fully electric tractor in 2024. Initially this would be a 100hp model:

"Being the first one, it is just a standard tractor platform with a battery and electric engine on it.



“There will be future development from the ground up with tractors and platforms that are fully electrified”.

The company is investigating other fuels, including bio gas and methane, with its South American arm is investigating using readily available wastes:

“In South America there is a lot of sugar cane production which provides a ready source of feed stock, although there are some infrastructure issues”.

But development of hydrogen as a fuel was a little further off, due to what she describes as “significant concerns around safety”.

As a result she does not expect this to become a viable option until around 2040.



Kirsty Pilcher - AGCO

Watch again



If you missed the conference, you can watch all sessions on the Institutions YouTube channel here:

<https://www.youtube.com/@iagrevideos5783/videos>



Practice

Agricultural Engineering Trends



Stefan Böttinger



Trends in agricultural engineering

Prof. Stefan Böttinger, Head of Department of Fundamentals of Agricultural Engineering, University of Hohenheim gave an update before Agritechnica in November.

Agritechnica presented the current status of agricultural engineering in Hanover, Germany, and showcased many interesting innovations in addition to numerous new products. Certain trends are evident in the evolution of agricultural machinery.

Fertiliser application

The trend towards increasing efficiency, environmental protection and resource conservation is continuing in fertilisation technology in order to ensure the most efficient fertiliser

application with the lowest possible nutrient loss. One essential element of further developments is the integration of automation technology and simplifications in the operation and control of the application systems. There are numerous new and further



Increased output, reduced footprint and data-controlled machines are the headlines

developments in this regard in the area of centrifugal and pneumatic fertiliser spreaders and the application of liquid and solid farm manure.

Seed drilling

In addition to simple operation, uniform seed bed preparation and consistent seed depth placement are of particular importance in sowing technology. Row seeding systems with singling and also precision seeding systems are gaining in importance. This year, automatic coulter pressure adjustment is an additional topic

for innovations in row seeding. Another innovation trend is the simultaneous application of seed in order to meet the requirements for multiple crops on the field.

Crop protection

One of the focuses in machinery and equipment for plant protection is the optimisation of efficiency, i.e. through front-mounted tank systems, increased container volumes or self-propelled vehicles. In order to reduce the use of crop protection agents, many hoes are being enabled to operate even more precisely by means of camera control

and moving frames. This objective can also be achieved through spot application. One trend is clearly evident across all spraying systems: the operating rate of the sprayer can and must be further increased. Electronic aids are a crucial factor in achieving this. Very extensive activity can be seen in the area of autonomous systems, where numerous possible solutions are being developed. In the area of nozzles, systems that operate reliably and can be used to implement various options are now available for pulse width-modulated nozzles.

Practice

Agricultural Engineering Trends



New Hollands LNG powered T7 tractor

Tractors

In view of the CO₂ problem, focus has shifted to combustion engines for alternative fuels. In the area of gas engines, LNG engine concepts can now also advance to become a suitable drive option in farming thanks to new LNG tanks. Battery technology is constantly being evolved. Vehicles equipped with this are first and foremost likely to be suitable for light and medium-duty applications. Conversely, fuel cell drives are still in their infancy, whereas hybrid models might be a solution for medium or larger tractors. Gearboxes are undergoing evolutionary further development. Adaptations in vehicle technology and further developments in comfort functions can also be observed.

Combine harvesters

Manufacturers are presenting numerous innovations in the area of

threshing crop harvesting. Important innovations in threshing and separating as well as for ensuring performance stability and work quality are being presented in combine harvesters. Power density with limited installation space and automation are continuing to increase. The trend towards harvesting headers such as belt cutting systems that can be adapted to diverse conditions is continuing as is the trend towards an increased power density and the automation of combine harvesters. When harvesting on the flat and on lateral slopes, performance stability and work quality are being further increased through control technologies and semi-automated calibration technologies.

Potato equipment

Optoelectronic sorting systems are increasingly being used in the preparation of ware potatoes. In the case

of combined units consisting of soil tillage, planting and ridging tools, the separate adjustment or use of the assemblies facilitates adaptation to changing operating conditions during potato field cultivation. Technical development in the area of mechanical potato cultivation has not yet achieved the dynamic pace seen with other crops, e.g. sugar beets. In addition, halum plucking machines, thermal flame weeding devices and electric halum desiccation are available for completely chemical-free haulm reduction procedures.

Sugar beet harvesting

The self-propelled beet harvester with bunker – usually with 6 and 9 rows, also often with 12 rows – is the standard in beet harvesting. All manufacturers are working on detailed improvements focusing above all on lower vehicle weights with a longer wearing part service

life and cost savings. Telemetry support and integrated weighing systems are optimising the process chain, serve to ensure monitoring and provide assistance in maintenance and service. Initial project results for the sensor-controlled automation of lifting tools to relieve the driver's workload are being launched onto the market.

Forage technology

From mowing to harvesting, all developments are aimed at handling the harvested crop according to its intended use and at increasingly

relieving the drivers' workload. This includes front-mounted mower control that is adjusted to the inclination and curve as well as automatic mower conditioner adjustment. The cutting qualities of self-loading trailers are aimed at a lower percentage of excessive lengths. The objective of round balers with a variable bale chamber is bales with the same dry matter content while the goals of forage harvesters are consistent cutting qualities and a very high throughput. Dimensionally stable, gas-tight round bales remain the ultimate goal for nets and wrapping films.

Digital systems and IT

The trends towards the increased use of digital systems and IT remain clearly recognisable both in agriculture and in the upstream and downstream sectors. The innovations range from tramline planning and machine automation and from management systems and apps to irrigation, crop protection and fertilisation management. Focus is usually placed on the optimisation of entire production systems while increasing work performance and quality at the same time. The trend towards cross-manufacturer solution approaches is clearly recognisable.



Lemken's autonomous 'Combined Powers' unit, jointly developed with Krone

Practice

Agrivoltaics

Lunchtime Lecture



Side by side - sustainably co-locating agricultural and photovoltaic electricity systems

Paul Mwebaze, Agricultural economist at the University of Illinois, Urbana Champaign gave a lunchtime lecture back in August, Andy Newbold reports.

The declining cost of photovoltaic technology and rising market and policy incentives for solar energy make it increasingly profitable to convert cropland to solar farms, leading to a potential conflict with food crops. Agrivoltaics (AVs), the co-located production of solar energy and crops, is an emerging technology that can reduce this competition for land, provide climate-smart solutions to improve land productivity (combined crop and electricity yield), crop water-use efficiency, profitability, and economic resilience of agriculture. Deployment of AVs in Asia and Europe is growing, and there is increasing interest among farmers

in the U.S. The project for Sustainably Co-locating Agricultural and Photovoltaic Electricity Systems (SCAPES) funded by the US Department of Agriculture aims to provide interdisciplinary scientific knowledge, extension and education for designing sustainable AV technologies that can increase the economic well-being and resilience of US farmers by maintaining/enhancing food production while increasing renewable energy generation across different biophysical environments in the US. In this talk, I will explore the profitability of several AV design configurations and scenarios and discuss the

implications and further work required.

Paul Mwebaze is an Agricultural Economist and project manager of SCAPES based at the Institute of Sustainability, Energy and Environment (ISEE) at the University of Illinois Urbana Champaign, US. He researches the economics of using land for food and energy production and is also a member of IAgRE.

Why Agrivoltaics?

Colocating photovoltaic systems within working farm land has a number of perceived advantages:



- Dual use of the land;
- Increasing crop yield during extreme heat and precipitation events
- Retaining soil moisture
- Higher value use for land
- A diversified income from the land

This project was initiated to enable conclusions to be drawn regarding the profitability of large scale, field size installations.

The paradox

Solar pv's best potential, happens to lie where the best farmland is, which should be no surprise, given that both farming and solar relies on the strength of the sun and also proximity to the electricity distribution grid for a network connection.

In crude financial terms, leasing land for solar panels is worth c\$1000/acre annually, in comparison to a potential profit of say \$200/acre for cropping corn/soya in the Mid West.

This work is helping to find ways for farms to continue cropping whilst benefiting from solar income.

The project

Is looking for the conditions under which solar panels and cropping offers the optimum return, in comparison to just one or the other of the potential land utilisations. The question is perhaps best framed as what are the conditions for agrivoltaics to work for farmers and growers? Not just does it work?

The work is looking for the most profitable areas for co locating farming and photovoltaics, with 3 sample areas, Colorado – grasslands, Arizona – dryland farming and Illinois – cropland.

The practicalities

Of course, a classic ground mounted solar array typically has a row spacing to enable a tractor and mower between the panels for grounds maintenance, and possible grazing.

Grazing with sheep around panels is fine, however with cattle they can tend to knock and damage the panels.

When considering row spacing and crops, standard PV needs say 5.5m between rows, but for tractors and machinery to be effective, this needs to increase to a minimum of say 9m and ideally 12 or 15m. This then enables field machinery to work

safely around the arrays.

The capital expenditure is about double for an AV installation than that for solar PV, however it does also leave a significant area of the land available for cropping. Which in turn can offset the increased investment requirements.

In summary, agrivoltaics may not be the cheapest way to feed the grid but it offers more, the project aim is to find out how much more.

Listen again

This is a very brief summary of the presentation. To listen to the full lunchtime lecture, head over to the Institutions YouTube channel for the full recording.

https://www.youtube.com/watch?v=FI4_Rb-j70Y



Professional

The Douglas
Bomford Trust



A new strategy

The Douglas Bomford Trust's outgoing secretary Alan Plom reflects on his time as Secretary and the Trust's new strategy:

During my six years as Secretary, the Trust has supported dozens of students, from A-level pupils through to PhDs - just as it has for half a century. It has been most rewarding to see them develop their confidence as well as knowledge and successfully achieve their qualifications to move on to

further studies, research or to work in the sector.

Personal development is also at the heart of the Trust's new Strategy, which charts a more proactive role for the Trust going forward. By focussing on 4 'themes', ie developing People, promoting

Collaboration, improving Communication and developing Technology, the Trust aims to play a major part in developing and promoting the role of 'engineers working in agriculture'. A description used by Charlie Nicklin.



**Developing people, promoting collaboration,
improving communication and developing technology**



The new strategy was launched at a summit in November

Professional

The Douglas
Bomford Trust

New Strategy

The Trust's new Strategy was launched with a short video

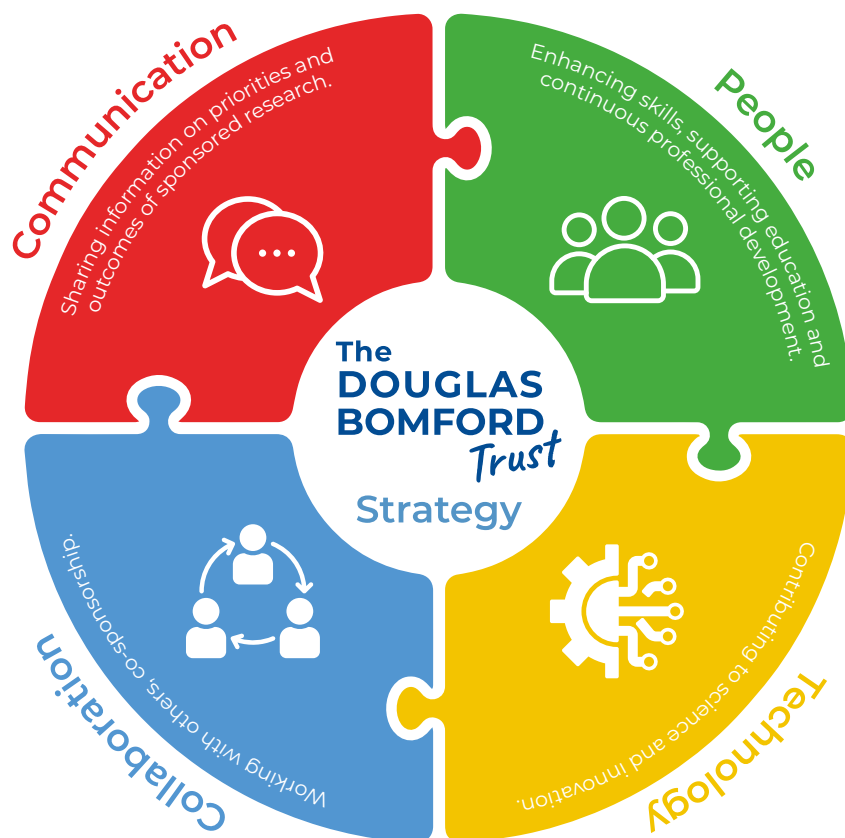
<https://youtu.be/2OMzLWMNW08>

at a 'summit' on "Delivering sustainable farming through agricultural engineering", convened by the Trust at Agri-EPI's Agri-Tech Innovation Hub.

Held during 'AgriTech Week', this unique event brought together all parts of the industry, complementing IAgRE's Landwards Conference and other events, eg run by AgTechE and Agri-EPI.

Trust Chair Nick August (an arable farmer on the Cotswolds) and Patron Dr David Llewelyn outlined the role of the Trust and purpose of the new Strategy. David highlighted education and training issues, followed by Mark Moore, (Vice-Chair and IAgRE President-elect), well-qualified as AGCO's Director of Government Affairs to summarise the national and global challenges facing the sector.

Trustee Paul Miller focussed on the task of identifying and funding relevant research, and offered some solutions, eg through collaboration. Horizon scanning research at Cranfield University, involving groups of MSc students over the past few years, has helped to give the Trust direction and the tools to develop our Strategy, and to identify priorities. Rather than being passive, up to 50% of our research funding will be allocated to developing technologies, control systems and strategies for sustainable farming, controlled environment food



production and use of energy sources (Net Zero).

A Farmer's Perspective

As Nick August explained: "It is my long-term use of technology and passion for sustainable farming systems that got me involved in the Trust. Technology which was primarily adopted to improve crop performance is now having a greater influence on sustainable farming systems and land stewardship.



Nick August

"The ag engineering landscape has dramatically changed in the 9 years or so that I have been involved with the Trust. Brexit and the war in Europe are enormous disrupters, especially to supply chains, logistics and labour supply. Pandemics, Covid 19, African swine flu, avian influenza and bovine TB have been devastating to the livestock sectors and immensely disruptive to food security too.

"The race to Net Zero, legislation, data collection and analysis, robotics, and soon AI, are all significantly influencing the direction and speed of development. This is why the Trust sought to adopt an updated strategy, to help trustees scope projects that support our core objectives through the broad arena that ag engineering has become, and to give clarity to stakeholders on those areas the Trust wants to focus on.

"We want to invest in people with ideas - ideas that advance our sector's sustainability and profitability. We want to engage

with students who are going to implement those ideas in the field, who are enthusiastic and aligned with our core values. We want to encourage collaboration with (and between) manufacturers, universities, food producers, the supply chain, and supermarkets to maximise the Trust's limited resources, both financial and trustee's time.

"I am in awe at the talent that is engaging in ag engineering and am impressed at the quality of research that is undertaken in the UK, but often disappointed at the lack of influence a lot of this knowledge has on improving farming systems and food security. Research has no value gathering dust in university archives and we need to be better at communicating (the practical findings) to the farming and food supply community.

"It is they (....me), that need to adopt better farming practice. Practices proven through research, data, and often real-world experience. In many instances that requires conveying repeatedly a simple concise unambiguous message endorsed by respected industry experts."

Workshop

During a breakout session, the 50 delegates (representing farmers, manufacturers and dealers, education and training, research and sponsors) shared their concerns and suggestions.

Recommendations relating to education and training (at all levels) and the close interdependence between developing and using new technologies, have already been passed to Defra's Independent Labour Review Team. This is just the start of the process, and the report on the event will be used to inform (and hopefully influence) other emerging Government policies.

The film, agenda, presentations and report on the event are all available on our event webpage via:

www.dbt.org.uk

Farewell.....

I envy my successor (David White, a Senior Lecturer at Harper Adams and former Trustee) who takes over as Trust Secretary from the end of November. The Summit was a great note on which to end my involvement. Fantastic opportunities lie ahead for the Trust and for 'engineers working in agriculture', but it is time for me to retire, 'gratefully'. I wish you all the very best in your endeavours.

'We want to invest in people with ideas, ideas that advance our sector's sustainability and profitability.'

For further information, see the Trust's website:

www.dbt.org.uk

or contact the Secretary Alan Plom via:

enquiries@dbt.org.uk

You can also follow:

[@BomfordTrust](https://www.instagram.com/BomfordTrust)

on 'X' and on LinkedIn, for news of interesting events, opportunities, or developments.



Technical

Innovation Awards

Award winning developments

The winners of the gold and silver medals of the Agritechnica Innovation awards 2023 have been announced. The leading innovation award scheme in the agricultural machinery industry received 251 entries of which 218 were approved for the list of exhibition innovations.

STEYR Hybrid CVT

Among the diverse measures that are being implemented to reduce CO₂ emissions, the development of alternatives to the diesel engine are relatively high up on the agenda. This also applies to off-road vehicles such as tractors, forage harvesters and combine harvesters.

With the STEYR Hybrid CVT, CNH is presenting a modular hybrid concept for medium and large standard tractors. The prototype that has been presented is based on a serial production model of the 6-cylinder entry-level tractor with an output of 132 kW (180 hp) and a wheelbase of 2.79 m. While the stepless hydrostatic-mechanical gearbox has been taken over 1:1 from the original, the diesel engine outputs 191 kW (260 hp) and is fitted in a completely new front end with sprung independent wheel suspension and two integrated electric motors. The generator is driven by the diesel engine via a transmission stage and forwards the generated electrical power of up to 75 kW (102 hp) to the electric motor via the power electronics. This converts the electrical energy back into mechanical energy, which is conducted to the crown gear of the front axle differential via a two-stage gearbox.

With its Hybrid CVT tractor's diesel-electric drive, Steyr has succeeded in integrating a range of additional functions into tractor technology.



STEYR Hybrid CVT

Multi-dimensional 3-point power lift regulation for tractors

In modern tractors, tractive power is usually regulated via the lower links. Raising or lowering the 3-point power lift often leads to the circumstance that soil tillage implements are no longer positioned parallel to the ground and that the front and rear working depths are therefore different.

To optimise this, CLAAS is now also integrating the hydraulic upper link into its multi-dimensional 3-point

control system. Height measurement sensors that transfer the signals to the tractor's control electronics are mounted at the front and rear of the implement to determine the position. Via an additional hydraulic system control unit, these can be converted into a regulation specification for the upper link length, leading to automatic adjustment of the implement's longitudinal inclination. This allows the implement to be guided parallel to the ground and therefore enables the achievement of consistent work quality.



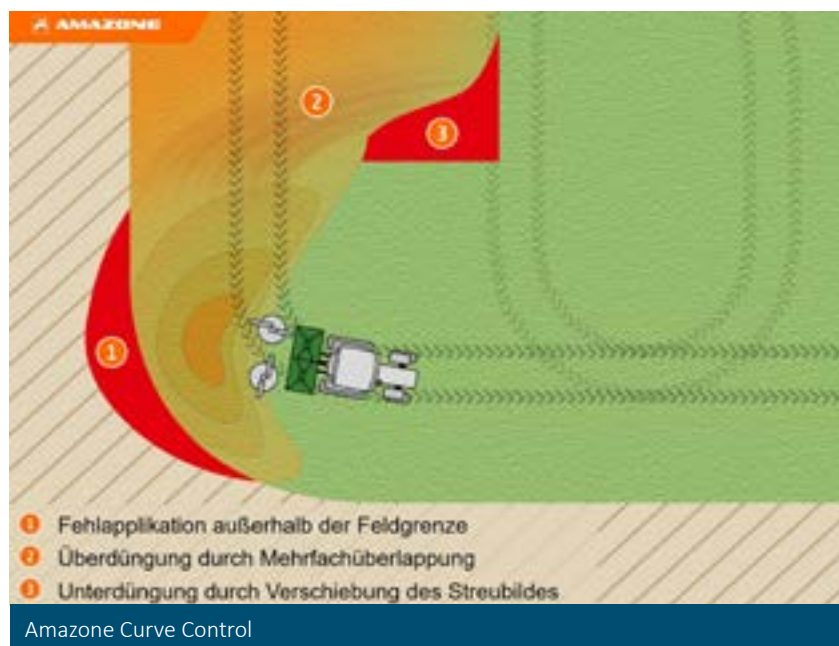
Multi-dimensional 3-point power lift regulation for tractors

CurveControl for centrifugal spreaders

The effect that the speed increases significantly at the outer radius while decreasing in equal measure on the inner side of the curve on cornering is particularly noticeable in the case of large working widths, which inevitably leads to changes in the output quantity.

Conversely, the throw of a centrifugal spreader is up to twice the working width, and the application point is located many metres behind the spreading device depending on the type of fertiliser and the working width. In addition, the spreading disc is shaped like a kidney. Besides adjusting the quantity within the curve, the shift in the spreading pattern therefore particularly has to be taken into consideration on a spreader. All of this necessitates precise knowledge of how the spreading device works with different fertilisers and requires accordingly complex implementation in a control algorithm.

For the first time, Amazone has adjusted the spreading pattern of a centrifugal spreader on cornering with the CurveControl system.



The silaging chain begins with mowing, but external influences such as the weather and the grass crop play equally as big a role as adapted mowing technology.

With its automatic conditioner adjustment, Fendt is striving to achieve a clear objective: a constant dry matter content across a field and a cut. To do this, the biomass growth is determined either by creating an application map

using satellite data or by having a sensor record the yield data directly while driving over the field. The data collected in this way are sent via ISOBUS to the mower's job computer, which calculates the appropriate settings and forwards them directly to the electric motor on the conditioner's counter comb. The result is more consistent feed – both within a field and within a cut.

Automatic conditioner adjustment

Forage quality directly impacts the milk and meat yield as well as the profits of livestock farmers.



Fendt's automatic conditioner adjustment

Membership Matters

East Midlands Branch

Branch reports

Visit to Garford Farm Machinery

*Report by Nigel Penlington
and Phil Spencer*

Some 15 members attended the July meeting with a trip to Garford Farm Machinery, at Frognall, Market Deeping, Nr. Peterborough.

On arrival, following refreshments and a warm welcome by their M.D. Jonathan Henry, Jonathan introduced his colleagues who were helping with the evening, and then presented a history of the Company.

The company was founded in 1986 by Norman Garford and his 3 sons, along with Ted Chamberlin. They were all from a farming background and often modified equipment to suit their own requirements. Then working closely with the NIAE, they formed the company to design a skew bar topper to fit different makes of sugar beet harvester. This topper removed the leaves from the top of the sugar beet, without taking the top off the beet enabling farmers to harvest a higher tonnage of crop. They later developed a complete beet harvester with the spiral cleaning system, which improved the machines performance. There were prototypes in 1988, and 3 and 4 row machines, followed later by a 6 row. Even at this stage most of their machines were exported widely around the world.

Then in 1998 they worked with Silsoe Research Institute where they pioneered and developed precision guidance for inter row hoes....one for beet, one for cereals, and one for vegetables. Known as the Robocrop system, the machines were fitted with cameras sending images of the crop back to a tractor-mounted

computer, which was steering the Hoe in between rows. Capable of working at speeds of 12 km per hour, and also at a time of labour shortage, and restrictions/rising costs of chemicals, the machines soon became popular, and have a world wide market.

Their latest development is the Inrow weeder. Cameras and greater use of sensory technology enables the machine to be fitted with weeding rotors, enabling weeds not only to be removed between the rows, but guiding the cutting blade 360 degrees around each plant





(working accuracy is within 8mm of each plant). This means that 98.5% of the soil is weeded.

From here we moved down to machines parked up, and Jonathan's colleagues gave demonstrations of these machines at work.

In closing, Jonathan informed us that their work force has grown from 41 to over 60, and they also support their own apprenticeship programme. Legislation from the European Parliament means that growers are looking for Garford's products, demand is growing with sales now exceeding £10M and 90% of the company's production is exported.

It was a brilliant evening and it was very obvious that Jonathan and his team put a lot of thought and hard work into organising it. The evening concluded by a vote of thanks by Peter Leech on behalf of all those present.

PS. For those who have not seen displays of the machines at various shows etc, videos are available at;

<https://garford.com/products/robo-crop-inrow-weeder/>

Visit to the Nottingham Corporation "Model Farm" at Bulcote

Report by Phil Spencer

Earlier in the year when planning our 2023 programme, it was arranged with Severn Trent that the last event of our year in September would be a visit to Severn Trent Green Power Ltd at Stoke Bardolph Estate. However, when our committee member David Yates contacted the Operations Manager, John Jackson, in early September to finalise details, he recommended we had a last chance to visit their original premises of the Nottingham Corporation "Model Farm" at Bulcote, near Burton Joyce, which was built between 1904 & 1906 as an experiment to solve the increasing sewage problems from Nottingham City a few miles north east. The farm is a series of grade 2 listed buildings and is now to be converted into a housing estate, hence the last chance to visit. David Yates had been there on a visit before and strongly recommended we took up the offer to have a tour of the Farm.

In the late 1800s Nottingham was an expanding city, with back to back slums, with one of the worst mortality rates in children in the

country. Disease was rife and as in many cities at this time, sewerage was either collected by trailer or just allowed to run into the water courses /rivers.

Victorian Engineers designed and built a series of tunnels and ditches from Nottingham down to low lying land where it was spread onto the fields. Model Farm was given a lot of thought and planning. The total site was some 650 acres and Model Farm was built so that cattle could be grazed and then managed as part of the farming enterprise and continued operating until the 1980s.

As we arrived on site, we passed an old railway station which was built to bring supplies of building materials to build the farm, and later it was used to transport goods from the farm to Nottingham. The milk was delivered to many of the hospitals as well as sheep and pigs.

Continuing along the road we could see a row of beautiful houses, built for the farm staff. (Some are still owned by retired staff).

Entering the main gate we passed over the original weigh bridge and into the central yard where the cow and pig sheds once stood and

Membership Matters



located on both sides were rows of stables for the Shire horses. We were then greeted by our hosts, a retired dairyman, and a local historian. Following an introduction and an excellent video presentation, we were told more about the history of the farm prior to a walking tour. On a number of tables where we sat, they had laid out the record documents, and news clippings covering over 100 years containing some amazing information and some of the statistics were staggering in today's terms. Along with this, from their accurate book keeping of stock and inventories of equipment, you could see generations of farming from horse power to steam power and then tractors and all the mechanisation. The records also showed that at one time there were over 100 Shire horses in work, with every stable having an inventory of equipment, almost military in detail. Over 400 pedigree pigs were sold all over the world.

On our tour we also saw remnants of old milling machinery, block and tackle for lifting grain sacks into the lofts and equipment rooms, used long before bulk milk tanks. There was also a "modern" dairy, which is now derelict and will soon be demolished making way for the new homes.

We also heard many stories of events from over the period. We visited the hay barn (which is still in use today) and here it was alleged that two women from the Suffragettes movement came in and set fire to the hay as a protest over woman's vote and work rights.

It was indeed a brilliant evening, and as a Branch we were lucky to see (if only briefly) the work and thinking behind how the cities started to modernize, helping to reduce diseases, river pollution, and steady mechanical developments to farming practice.....all on one site.

As always, a very sincere vote of thanks was expressed to all

concerned by the 20 members and guests who attended.

Our evening ended with a thanks and presentation to Richard Trevarthen who after 12 years as Branch Chairman and Secretary has decided to stand down.

Northern Ireland Branch

IAgrE members travel South

Terence Chambers reports

Northern Ireland Branch IAgrE members and guests recently travelled South to Co Wexford to visit both a large dairy farm and several business sites for a large wide ranging agriculture production and supply business.

Ballywalter Farms Ltd has more than 500 dairy cows housed on a modern site, near Kilmuckridge, where they are fed on a Total Mixed Ration. Unlike most other farms, where a manually driven tractor draws and powers a diet mixer along the feed passages, in this case 3 electrically powered Trioliet feeding robots operate without drivers. The grass silage, grain forage, maize silage and other ingredients are held in on-site (30 cubic metre capacity holding up to 20 tonnes) auto bunkers to which the mixers regularly travel for automatic loading of the programmed ration amounts. When it mixes its 3 cubic metre contents the Trioliet robot travels on, suspended on an overhead rail system, to dispense its contents quietly to the feed troughs in the appropriate buildings. The mixer can be carried at various heights to suit discharge to different feed troughs and provide high clearance as when traveling across between buildings.

The slatted passages in the livestock buildings are kept clean by regular operation of the automatic JOZ slurry scrapers and a programmed pump-based contents re-circulation system operates regularly to minimize both crusting and the build up of gas in the tanks. This facilitating tank emptying at any convenient time without the need for further mixing.





The overhead automated robotic feeding system mixes and delivers the feed at Ballywalter Farms in Co Wexford

The cows present themselves for milking at 8 separate automatic robot stations on the site.

Herd manager Gary Jones explained all the detail of the herd and forage management systems to us as well as answering all of our many questions. Explanation around the technology and operation of the feeding system was also provided by Trioliet's own Ireland Area Sales Manager, Mr Padraig O'Kane, who is also a Northern Ireland Branch IAGrE member and organised all the visits for this trip. More technical details around Trioliet's range of products can be viewed on www.trioliet.com

Arable perspective

We also visited some of the working sites operated by the large agriculture production and supply group of Cooney Furlong, founded in 1998 by the current directors, Kevin Cooney and Walter Furlong, and is still run as a family business.

The first visit was to Cooney Furlong Machinery Company at Enniscorthy, a main dealership covering the Counties of Carlow, Wexford and Wicklow. Its main agencies include CASEIH tractors, Trioliet diet mixer feeders, Vaderstad cultivation and seeding equipment as well as the Austrian built range of Goweil balers and wrapping products. Sales specialist Matthew Banville

showed us around the impressive, spacious and well equipped sales, spare parts and service facilities. He explained the currently available wide range of CASE IH tractors (from 50hp compacts up to specialist higher power versions for arable work). Both sales and hire are now popular with 15 -20 new tractors hired each year for intensive use by customers during the spring to autumn season. Tractors, with up to 1000 working hours on the clock and still with valid warranty, then get sold on to new owners. We observed actual examples of most of the tractors including the artic-steer rubber tracked 620hp Quadtrac. One of the largest tractors in Ireland, it is mainly used for large scale arable seed bed preparation / seeding work. We had a close look at several working examples including one in the fleet of Walter Furlong's own grain farming enterprise.



The party then went on to visit the Cooney Furlong Grain Company's large modern grain storage and treatment facilities at Dranagh. It handles 100,000 tonnes of grain each year, to Irish Grain Assurance Scheme (IGAS) standards, with a minimum of 20,000 tonnes held on site at any time. The facilities also store around 7,000 tonnes of oilseed rape as well as wheat, oats and beans. Cereal growers in Wexford and South Kilkenny sell their produce there for cleaning, drying, storage and conditioning in the specialist controlled ventilated facilities. The crops are then selected to be sold on to their various specialist market applications. One example is malting barley going on to specialists like the Guinness group and others. Achieving the high standards required for malting grain can add around 70 euros per tonne to its value. The recent season's difficult harvest weather conditions have resulted in some reduction in the normal expected proportion of crop meeting the required malting standard. Good malting barley can then be held in store for up to 2 years.

Cooney Furlong are extensive cereal growers themselves using their own fleet of high capacity soil preparation, seeding and harvesting machinery. 8x4 straw bales, many of which are sold on to Northern Ireland, are still an important cash crop although this year the yield is down by about 30%. The available supply of straw from Irish growers is also being reduced by farmer uptake of an official straw to soil incorporation incentive scheme.

Membership Matters

The company has also set up and developed Target Fertilisers which is now a well known importer, blender and wholesaler of fertilisers for Ireland and beyond. Their ingredients are sourced from up to 150 separate countries.

The company also provides a seed supply and agronomy service advising customer growers on crop husbandry field issues. They also supply animal feeds, agrochemicals and veterinary products as part of a wide range of farm supply items. It was a privilege to see and hear directly how the various activities are co-ordinated and managed.

This was a most enjoyable and informative trip. We are most grateful to our hosts and their staff members for making us so welcome and to our own branch colleague Padraig O’Kane who organised and co-ordinated all of the visits.

Western Branch

Confessions of a Test Engineer - Richard Robinson CEng HonFIAgrE

Report by Nick Handy

The IAgRE Western Branch was treated to a very entertaining and informative talk from IAgRE past-President, Richard Robinson. The talk covered some memorable moments from Richard’s career in agricultural engineering, and the meeting room at Wiltshire College, Lackham was full to capacity with IAgRE members and guests as well as students from the college.

Richard began by recounting his start in the industry; as a 12 year old boy on his father’s farm. His father bred shire horses, and also cultivated some unusual – but very profitable – crops. It was during harvesting one such crop, wild white clover,

that Richard’s interest in developing machinery began; modifying his father’s MF780 combine to suit the characteristics of clover. Richard also operated the farm’s New Holland Super 68 baler – experience that would serve him well as a test engineer.

After schooling, Richard enrolled at university to read metallurgy. However, upon realising that this wasn’t for him, he joined New Holland as an engineering trainee. He told the group of his experiences of spending three months in each department before establishing himself as the go-to baler expert in the test department.

One of Richard’s first tasks at New Holland was to resolve welding quality related issues with the 268 balers that were built in the UK to an American design. He had to develop a kit that could be supplied to dealers to solve problems that farmers were experiencing in the field. The problems were mounting to such a degree that New Holland’s managing director at the time, Ted Whittaker, promised the dealer network that they would have a new baler the following year. To develop this new baler, Richard was sent to South Africa by Robin Morris who was in charge of field testing. Robin’s advice to Richard was to ‘pack a hat and a dinner jacket’. Richard duly set off with his hat and dinner jacket during the November of that year and returned the following Easter. On arrival he bought a couple of 268s from a dealer and set about testing and developing them. This activity led to the NH 276 baler, with the first pre-production model being built on a farm in South Africa.

Richard’s time with New Holland also took him to New Zealand to investigate issues with PTO shaft UJs and slip clutches. He recounted that – much to the amusement of those present – that one particular farmer often utilised a shotgun to help convey his message of displeasure with one particular baler! Anyway, not being put off by this, the issues were solved and the farmer threw a great party in celebration. Richard also presented some entertaining stories regarding how the end drum of a NH435 mower, based on the NH445E, flew off during a demonstration to New Holland top-brass, embedding itself in the wheel of the trailer they were being transported on.

After New Holland, Richard joined Watveare, the Devon-based importer of Fahr machinery. Once again he set about developing products, working to improve a 9’ cut mower that was not best suited to UK grass conditions.

Upon leaving Watveare in 1977, Richard founded Autoguide Equipment Ltd – a company he chairs today. One of the first projects here involved BvL fodder beet harvesters, before the company’s focus switch to pick-up hitches and the Auto-Roller cricket pitch roller. Today, Autoguide has a vast array of engineering experience being involved with auger drives, screw piles, grass cutting machinery and vibrating post drivers to name just a few.

At the end of his talk Richard took questions from the audience and received a vote of thanks from Branch Chairman, Rupert Caplat.



Wrekin Branch

Visit to Classic Motor Cars, Bridgnorth

Report by Dave Clare

Ten members of the Wrekin Branch plus a few guests met at Classic Motor Cars (CMC) of Bridgnorth for a tour of their works. We were hosted by Paul Peach the Operations Manager and Marcus Wortans the Front of House Manager.

The company was formed in 1993 and can be split into three areas, retail, restoration, and vehicle storage. The tour started in their main showroom and annex showroom, where Paul gave a background to the company. The showroom had a small range of cars including a humble Fiat 500, 'Frog Eyed' Sprite, Datsun 260Z, and several Jaguar E Types, the latter being CMC's speciality. All were immaculately restored and presented. The retail side of the business covers the sale of cars, the majority being sold on behalf of customers, but also covers the servicing and repair of cars. The latter sometimes leading to restoration when the condition of car is not as expected.

The tour then moved on to the restoration side of the business. The age of cars being restored are usually 1947-77. They do work on cars outside this range, but do stay clear of cars with electronics. Paul emphasised that everything they do is to an exceptionally high standard, the company being the only company to receive the Restoration of The Year Award twice, and a typical restoration taking 1500-1800hrs to complete. The restorations are usually for enthusiast customers and not as investments. After restoration, the value of a car is usually less than the restoration cost.

The process starts in the technical strip and body shop, with the strip where all the mechanical, electrical and trim parts are removed and then palletted so nothing is lost. The body is then fully evaluated to

establish the full extent of the body restoration required. An example in the workshop was of an E Type that originally came in for minor body repairs and paint, but after inspection the rear of the car was found to be rotten, and so a whole new rear for the car was being built. The first step is paint removal by chemical means to stop any body deformation. Shot blasting is occasionally used on heavy sections such as a chassis. The body is then given a protective coat of paint to stop any further deterioration. The body will pass between the body and paint shop several times as repairs progress, the ultimate 'sign off' being by the paint technicians when they are happy with both the panel fit and paint finish. A car will typically spend 160-240hrs in the paint shop and cost £26K. In the meantime, any mechanical work and initial trim restoration will be taking place. The next major step is retrimming. This may involve some mechanical and electrical work as well if parts are behind trim. All trimming is done in house from hide (or vinyl sheet) to finished items, and can include matching luggage if required. At the time of the visit a rare (1 of only 3), Aston Martin was being trimmed. Next step is mechanical assembly and finally detailing. Although Jaguar E Types are their speciality, there

were a number of other vehicles in the mechanical assembly workshop, including a Daimler hearse and the recently restored Aston Martin Bulldog. The Bulldog was built in 1979 and could theoretically reach 200mph, but never did. It took CMC two and a half years to restore and recently achieved its design speed of 200mph, and was in for a gearbox rebuild.

The next part of the tour took us into the vehicle storage area. CMC will store cars for customers, some all year round or for long term storage while cars await restoration or customers are deciding to restore or not, others just for the winter when not being used. As part of the service they will trickle charge batteries and periodically run cars up to temperature.

The tour finished by the entrance to the storage area where CMC have a two-wheel dynamometer. All restorations or repairs involving an engine rebuild will spend the equivalent of 200 miles on the dynamometer before a final road test.

Everyone had a thoroughly enjoyable and informative afternoon and our thanks go to Paul and Marcus.



Membership Changes

1/8/2023 - 31/10/2023

Admissions

Fellow

Member

Mr Philip Brown (East Anglia)
Mr Eoin Murphy (Western)
Mr Robert Walker (East Anglia)
Mr Paul Raby (East Anglia)
Mr Ian Baldwin (Wrekin)
Mr Rodrigo Rocha (USA)

Associate Member

Miss Laura Bentley (Western)

Affiliate

Mr James Szabo (East Midlands)
Mr Matthew Burnhope (East Midlands)
Dr Andre Aarnink (Netherlands)

Technician

Student

Readmission

Member

Associate Member

Mr Calum Evans (Norway)
Mr John Mugford (Western)

Affiliate

Mr James Sandercock (East Midlands)

Deaths

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

Mr David B Williams CEng MIAgrE

Mr Williams was a member of the Institution for nearly 50 years. He joined the Institution as an Associate Member in February 1975 and upgraded to Member in July. He gained his Chartered Engineer (CEng) Registration in February 1994.

Transfers

Fellow

Mr Daniel Hefft (East Midlands)

Member

Mr Robert Barker (Wrekin)
Mr Thomas Ray (East Midlands)

Associate Member

Mr Benedict Churchhouse (East Midlands)
Miss Annabelle Taxis (West Midlands)
Mr William Flittner (East Anglia)
Mr Dominic Neal (Southern/Wrekin)

Affiliate

Technician

Engineering Council

Registrations

CEng

IEng

Mr Kyle Reed (Wrekin)

EngTech

Mr Dominic Neal (Southern/Wrekin)

Society for the environment

CEnv

Long Service Certificates

50 years

Name	Grade	Date of Anniversary
John Peter Neat	FIAGR	4 Oct 2023
Robert Graham Wilson	MIAGR	8 Nov 2023
Malcolm St John Carr-West	HonFIAGR	8 Nov 2023

35 years

Dominic William Barraclough	FIAGR	1 Nov 2023
Stephen Charles Constable	MIAGR	1 Nov 2023
Clive Champion	AMIAGR	17 Nov 2023
Stuart George Fraser	MIAGR	14 Dec 2023
David Nicholas Green	MIAGR	18 Dec 2023

25 years

Mark Robert Geary	MIAGR	7 Oct 2023
Timothy Ivor Stacey	MIAGR	12 Oct 2023
Mark Orton Goodwin	AMIAGR	11 Nov 2023
Simon Anthony Bentley	AMIAGR	12 Nov 2023
Lawrence Kipkoech Kaptoge	MIAGR	20 Nov 2023
Kevin William Ford	AMIAGR	10 Dec 2023

Forthcoming Events

Lunchtime Lecture - Machinery for Harvesting and Processing Cereal Straw for Thatching

Dr Andy Scarlett, Scarlett Research Ltd - Machinery for Harvesting & Processing Straw for Thatching The production of cereal straw for thatching is a small but vitally important industry in the UK ...

12/12/2023 - 1pm-2pm

Online via Zoom

Lunchtime Lecture - New powertrains and efficiency technology for tractors

Alastair Hayfield, Senior Research Director at Interact Analysis, will talk about how different powertrain technologies are being adopted by tractor manufacturers ...

16/01/2024 - 1pm-2pm

Online via Zoom



Academic members

Askham Bryan College

Askham Bryan, York, YO23 3FR

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

City College Norwich

Easton, Norwich, Norfolk, NR9 5DX

Coleg Cambria – Llysfasi

Rhuthin, Sir Ddinbych, LL15 2LB

Coleg sir Gar

Gelli Aur Campus, Llandeilo,
Carmarthenshire, SA32 8NJ

Cranfield University

Cranfield, Bedfordshire, MK43 0AL

Duchy College

Stoke Climsland, Callington,
Cornwall, PL17 8PB

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

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

Munster Technological University

Tralee Clash, Tralee, Co Kerry, Ireland

Myerscough College

Bilsbarrow, Preston, Lancashire,
PR3 0RY

Newcastle University

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

Plumpton College

Ditchling Road, Lewes, East Sussex,
BN7 3AE

Reaseheath College

Reaseheath, Nantwich, Cheshire,
CW5 6DF

Royal Agricultural University

Cirencester, Gloucester, GL7 6JS

Salesian Agricultural College

Pallaskenry, Co Limerick, Ireland

Sparsholt College

Sparsholt, Winchester, SO21 2NF

SRUC – Auchincruive

Auchincruive Estate, Ayr, KA6 5HW

Suffolk New College

Suffolk Rural Campus, Charity Lane,
Otley, Suffolk, IP6 9EY

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

Writtle University College

Lordship Road, Writtle, Chelmsford,
Essex, CM1 3RR

Commercial Members

Ace Aquatec Ltd

16B City Quay, Camperdown Street,
Dundee, DD1 3JA

Agri-EPI Centre

Easter Bush, Roslin, EH25 9RG

Alois POTTINGER UK Ltd

15 St Marks Road, Corby,
Northampton, Northants, NN18 8AN

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

Amazone Ltd

Orchard Farm, Hurst Lane, Aukley,
Doncaster, South Yorks, DN9 3NW

Autoguide Equipment Ltd

Stockley Road, Hedington, Calne,
Wiltshire, SN11 0PS

BAGMA

225 Bristol Road, Birmingham, B5 7UB

Case New Holland

Cranes Farm Road, Basildon, Essex
SS14 3AD

City and Guilds

1 Giltspur Street, London, EC1A 9DD

City Farm Systems Ltd

25 Hepplewhite Close, High
Wycombe, Bucks, HP13 6BZ

Claas UK Ltd

Saxham, Bury St Edmonds, Suffolk,
IP28 6QZ

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

Fullwood

Grange Road, Ellesmere, Cheshire,
SY12 9DF

Househam Sprayers

Roughton Moor, Woodhall Spa, Lincs,
LN10 6YQ

HSS Hire

Building 2, Think Park, Mosley Road,
Manchester M17 1FQ

John Deere Ltd

Harby Road, Langar,
Nottinghamshire, NG13 9HT

Knight Farm Machinery

Wireless Hill Industrial Estate, South
Luffenham, Rutland, Leicestershire,
LE15 8NF

Kubota UK Ltd

Dormer Road, Thame,
Oxfordshire. OX9 3UN

Magna Specialist Confectioners Ltd

Magna House, Stafford Park 3,
Telford, Shropshire, TF3 3BH

Marks & Clerk LLP

90 Long Acre, London, WC2E 9RA

Mastenbroek Ltd

83 Swineshead Road, Boston, Lincs,
PE21 7JG

Merlo UK Ltd

The Paddocks, Headlands Business
Park, Salisbury Road, Ringwood,
Hampshire BH24 3PB

National Fluid Power Centre

Carlton Road, Worksop, Notts,
S81 7HP

NFU Energy Services

Stoneleigh Park, Kenilworth,
Warwickshire, CV8 2LS

Nick Young Tractor Parts

Unit 2, The Forge, Moor Road, North
Owersby, Market Rasen, Lincolnshire,
LN8 3PR

Ploeger UK Ltd

Holt Road, Fakenham,
Norfolk, NR21 8JH

Reesink UK Limited

1-3 Station Road, St Neots,
Huntingdon, PE19 1QF

Shelbourne Reynolds

Shepherds Grove Ind Estate, Stanton,
Bury St Edmunds, Suffolk, IP31 2AR

Spaldings Limited

25-35 Sadler Road, Lincoln,
Lincolnshire, LN6 3XJ

Spraying Systems Ltd

Headley House, Headley Road,
Hindhead, Surrey, GU26 6UK

Teagle Ltd

Blackwater, Truro, Cornwall, TR4 8HQ

Witham Oil and Paint Ltd

Outer Circle Road, Lincoln, LN10 6YQ

Research Round up



SRUC joins new centre tackling food security and climate change

Scientists from SRUC will carry out research into plant breeding and animal nutrition to increase productivity and reduce greenhouse gas emissions as part of a new centre announced by UK Prime Minister Rishi Sunak.

The UK-CGIAR was launched at a global food security summit hosted by the Bill & Melinda Gates Foundation, the Children's Investment Fund Foundation and the Foreign, Commonwealth & Development Office (FCDO) in London recently.

With funding from the Foreign, Commonwealth & Development Office, the UK-CGIAR aims to harness the country's strengths in science and technology to help tackle the interconnected challenges of global food security and climate change.

It will do so by strengthening existing partnerships and forging new collaborations between CGIAR - a global partnership that unites international organisations engaged in food security research – and science centres in the UK and the Global South.



A new project will develop solutions that increase the productivity of livestock systems in Sub-Saharan Africa

Scientists at SRUC will work with the International Livestock Research Institute (ILRI), part of CGIAR and co-hosted by Kenya and Ethiopia, to drive a step change in the breeding and manipulation of forages and crop residues for use in ruminant production systems.

The project, which starts next year, will combine ILRI's expertise in plant breeding and SRUC's track record on ruminant nutrition, to develop tools to accelerate the development of new forages and plant residues for Sub-Saharan Africa that boost animal production while decreasing greenhouse gas emissions.

Lead researcher Professor Jamie Newbold, Provost, and Deputy Principal at SRUC, said: "Livestock is a fast-growing, high-value agricultural subsector accounting for 15–80 per cent of GDP in low- and middle-income countries. In Africa and Asia, demand for livestock products is expected to grow 200 per cent by 2030.

"Ruminants can make use of feed substrates such as crop residues and forages not otherwise nutritionally available to humans. However, such systems are associated with higher levels of greenhouse gas emissions and low productivity, particularly in the Global South.

"There is a need to develop solutions that increase the productivity of livestock systems in Sub-Saharan Africa while also reducing their environmental impact."

The summit sessions can be viewed live on Zoom:

<https://ukglobalfoodsecuritysummit.com/programme>

For more information, visit:

<https://www.cabi.org/uk-cgiar-centre/>

Research Round up



Rothamsted to partner in global “green ammonia” initiative

Research will focus on production and use of nitrogen fertilisers Rothamsted will be a partner in a new initiative to explore the potential of using “green ammonia” to mitigate climate change whilst still supporting food production.

The UK, with the US, Canada and Australia, has invested £61 million in the US National Science Foundation’s Global Centers programme on clean energy and climate change. Of these, the Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE) will provide timely and crucial insights into rapidly evolving technological innovation to produce ammonia using renewable energy for clean energy and food production.

NICCEE will be spearheaded by the University of Maryland Center for Environmental Science (UMCES) with partners in the U.S. (New York University and University of Massachusetts Amherst), Canada (University of Guelph), and the U.K. (Rothamsted Research).

“Rothamsted has a long-standing expertise in monitoring ammonia use connected with agriculture,” said Rothamsted’s lead on input into the NICCEE Prof Adie Collins, Science Director for Net Zero and Resilient Farming. “This new initiative will enable us to look at the issue in a more global context – a vital approach if we are to address climate change whilst still ensuring food supplies.”

Current industrial ammonia production is heavily energy-intensive and primarily dependent on fossil fuels, contributing 1-2% of global greenhouse gas emissions.

A “green ammonia” approach would use solar energy or other renewable energy supplies to produce ammonia without carbon dioxide emissions. This could lead to decentralization of fertilizer production, enhancing use and bolstering food production in countries where nitrogen (N) fertilizer accessibility has been limited. It will also aim to improve the timing and dosing of fertilizer to better match crop needs and thereby reduce N losses.

However, care is needed: more abundantly available N fertilizer could also exacerbate the current severe environmental problems of N losses to air and water from overuse and inefficient use of N fertilizers.

The new partnership is part of a £18m UK investment in the **Global Centers on Clean Energy and Climate Change** that will conduct innovative research to tackle hard-to-decarbonise sectors across the UK economy. Funding is provided through UKRI’s Building a Green

Future fund and International Science Partnerships Fund.

“The Global Nitrogen Innovation Center addresses the urgent need to respond to the impending technological innovation to produce ammonia using renewable energy known as ‘green ammonia,’” said Center director Xin Zhang, professor at the University of Maryland Center for Environmental Science. “By doing so, we hope to be able to harness the technological innovation of green ammonia production to bolster clean energy initiatives, combat climate change, and secure food supplies for the future, while minimizing risks of unintended consequences.”

NICCEE will serve as an information hub with state-of-the-art cyberinfrastructure to monitor the lifecycle and effects of nitrogen in agriculture-food-energy systems, an innovation platform to facilitate the co-development of technological and socioeconomic solutions, and an education center to nurture the next generation of scientists and innovators championing sustainable and climate-smart nitrogen management.

The international effort involves collaborators from eight countries,

across academia, NGOs, international organizations, government, and private companies, and brings together expertise in biogeochemistry and agronomic science, chemical engineering, complex system modeling, environmental sociology, economics, statistics and data science, coastal ecology and equity in the geosciences, science engagement and evaluation, remote sensing, environmental law and policy, atmospheric modeling, sustainability science, life cycle assessment and translational science.

The new Global Centers are sponsored by multilateral funding led by NSF and five partner funding organizations: Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO), Canada's Natural Sciences and Engineering Research Council (NSERC) and Social Science and Humanities Research Council (SSHRC), and the United Kingdom's UK Research and Innovation (UKRI).

Dame Ottoline Leyser, CEO UKRI, said: "We are excited to be partnering with our sister organisations in the US, Canada and Australia to accelerate progress toward this crucial goal.

"Our combined investment in Global Centers enables exciting researcher and innovation-led international and interdisciplinary collaboration to drive the energy transition. I look forward to seeing the creative solutions developed through these global collaborations."

Innovate UK funds three-year programme to study regenerative potato commercialisation

Emerald Research Ltd (ERL), has been awarded another Innovate UK funded research programme following on from the recent Postcova project.

In collaboration with a consortium of key industry, academic and farming partners, including Dyson Farming, Bangor University, The James Hutton Institute and Light Science technologies, the three-year programme is titled Transformative Reduced Inputs in Potatoes or TRIP for short.

The TRIP programme is dedicated to exploring innovative regenerative approaches aimed at revitalising farm soil organic matter. Additionally, it focuses on finding solutions to tackle the environmental challenge posed by greenhouse gas emissions in the UK's potato farming industry, with a particular emphasis on reducing the notable levels of CO₂ and N₂O emissions.

Large scale commercial potato crops require intensive soil cultivation to prepare the seedbed and typically require levels of inputs (fertilisers, herbicides, fungicides and insecticides) in order to produce crops that meet commercial quality and tonnage requirements.

Conventional potato production's current carbon footprint comprises: fertilisers (55%, including N₂O emissions from soil application of nitrogen fertiliser), storage energy (29%), seed (9%) and transport (5%).

Simon Fox, MD of ERL, said: "We believe that this project has the ability to fundamentally change the soil tillage and input regimes used to produce potatoes in the UK." He elaborated further: "We are excited about the very real potential not only to reduce the carbon footprint of UK potato production, but to do so in ways that are practical and economically rewarding for the farmer."

Throughout the three-year programme, led by Dyson Farming, there will be regular updates from the consortium partners through the official TRIP communication channels and from farm-scale and replicated trials taking place through the farming partners SDF Agriculture, F G Pryor and Son Ltd., Colwith Farm Potatoes Ltd. and CP Richards & Son Ltd.



The Institution of Agricultural Engineers

Do you employ technicians and engineers?

Have you considered professional membership and registration for your employees?

This not only supports their personal development, but also demonstrates your professionalism as a business.



How do my employees join?

It couldn't be easier, visit www.iagre.org/why-join-iagre or contact Alison Chapman at membership@iagre.org or call us on **01234 750876** and we'll happily guide you.