



THE UNIVERSITY of EDINBURGH
Global Academy of
Agriculture and Food Systems

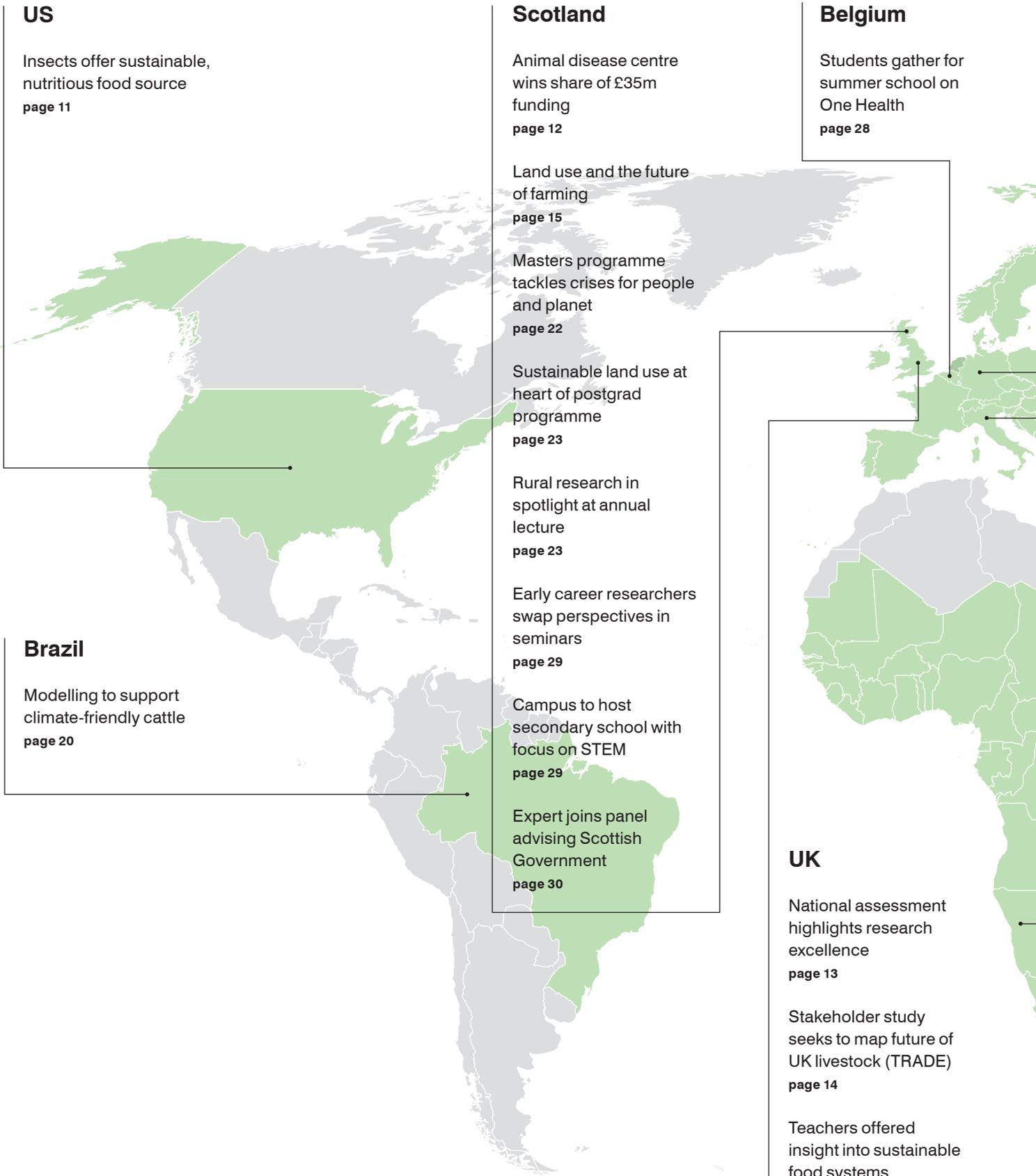
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SUMMER 2023

Sustainable farming in the spotlight

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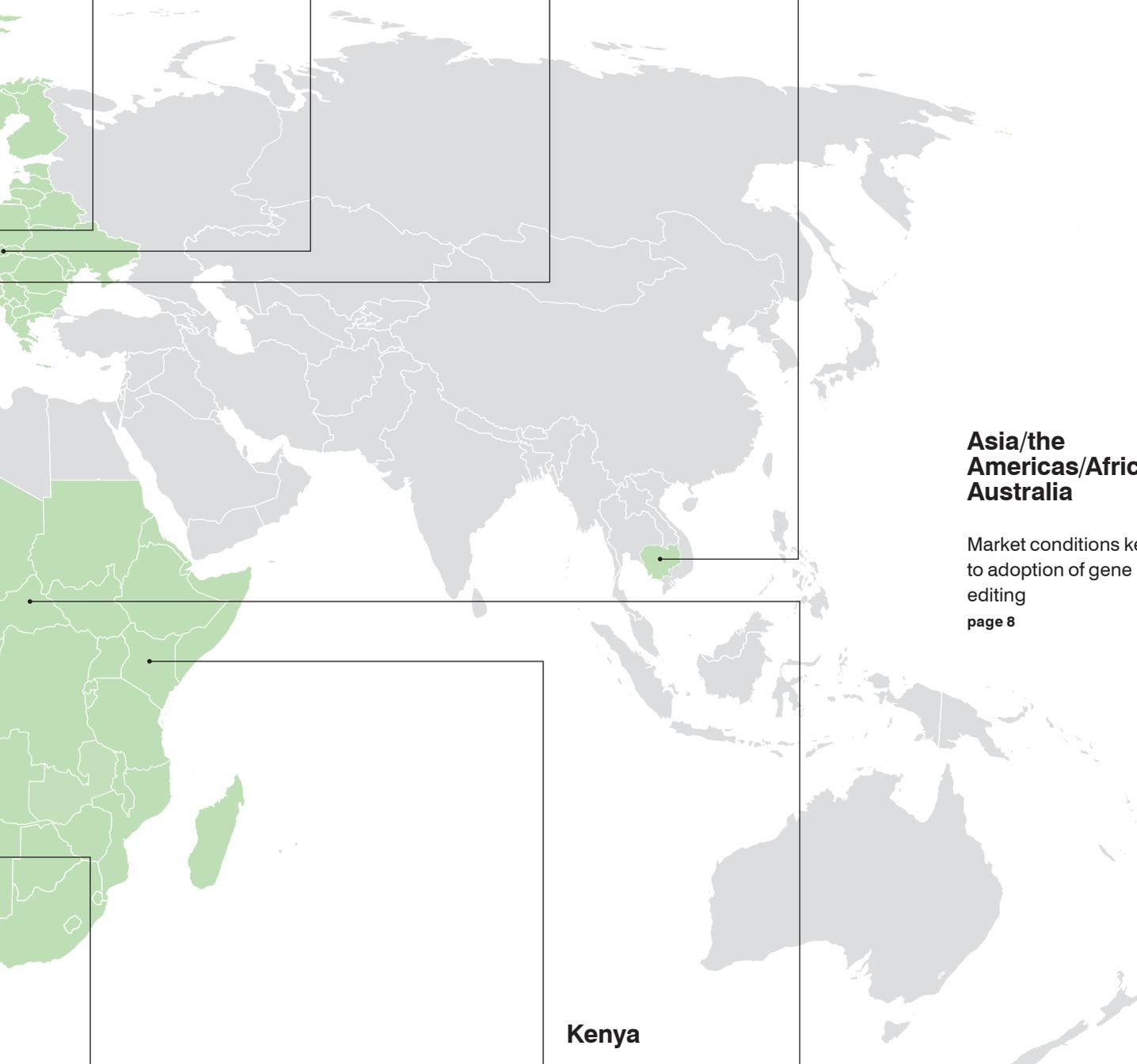
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Welcome

Welcome to our latest Global Academy of Agriculture and Food Systems (GAAFS) newsletter – providing a round-up of news over the past year, and a look ahead to some key events in the coming year.

Global and local food matters continue to be very much in the news headlines. Both natural and human-induced events are affecting food security in several parts of the globe, with wider consequences including significant food price rises in many regions, including our own. These events prompt us to redouble our efforts to help develop more sustainable and ethical food systems for healthy people and a healthy planet, through our work and partnerships.

Earlier this year we celebrated the fifth anniversary of our official launch by Bill Gates and Penny Mordaunt MP. We continue to grow, with over 40 staff, approaching 40 PhD students and around 30 staff associates. Activities of many staff and students – and our wider partnerships – follow, and there are more details on our website. Last year we moved to superb new offices in the Charnock Bradley Building at the University of Edinburgh's Easter Bush Campus, pictured opposite.

Our new Strategic Advisory Group met for the first time in May and provided much encouragement and helpful guidance – you can read more about the membership of the group on our website. The group was very positive about our new flexible education programmes – read more inside about these, including our new Masters programmes in Planetary Health and Sustainable Lands and Cities launching in the 2023/24 academic year, in partnership with the Edinburgh Futures Institute.

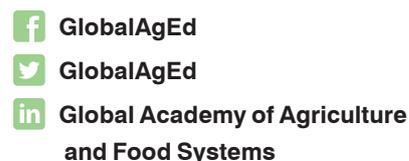
Finally, we send our warmest congratulations and best wishes to Professor Lisa Boden, who holds a joint appointment with us and the Roslin Institute, on her appointment as the next Head of School here at the Royal (Dick) School of Veterinary Studies.

Many thanks for your time in reading our news – as always, your feedback is welcome!



A handwritten signature in black ink, appearing to read 'Geoff Simm', written in a cursive style.

Professor Geoff Simm
Director, Global Academy of
Agriculture and Food Systems



GlobalAgEd

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**Global Academy of Agriculture
and Food Systems**

Research news in brief

Image by Tria Adji/Unsplash.



Smallholder farming benefits nutrition in under-fives

Families who keep livestock are helping to reduce the risk of malnutrition in their children, a large-scale research study has found.

Smallholder farming brings many benefits for nutrition and health in children, but efforts should be made to limit the associated risk of disease from livestock animals.

Results from a systematic review on the practice of smallholding, which is common in many low- and middle-income countries (LMICs), suggest that a One Health approach, which aims to safeguard the health of people, animals and the environment, may help optimise its impact.

A team of researchers led by Dr Taddese Zerfu from the Global Academy of Agriculture and Food Systems carried out

the comprehensive review of references across 12 databases relating to livestock keeping, nutritional status and disease among women of childbearing age and under-fives over three decades, in LMICs.

The study, carried out with the International Livestock Research Institute, is the first to examine the associations between smallholder farming and nutrition and illness in both women and children. These groups constitute a significant proportion of the populations studied and are at direct risk from contact with animals and each other.

The outcomes, published in *Nutrition Research Reviews*, could help inform policymaking and smallholder practices at a time of rising populations and international efforts towards sustainable development.

Fertiliser costs could lead to undernourishment for millions

Soaring energy and fertiliser prices will be the biggest factors affecting food prices in future decades, modelling analysis shows.

High fertiliser prices could put an additional 100 million people at risk of undernourishment.

Reduced food exports from Ukraine are less of a driver of food price rises than feared, researchers say. Instead, a modelling study led by the Global Academy of Agriculture and Food Systems suggests surging energy and fertiliser prices will have by far the greatest impact on food security in coming decades.

The team used a global land-use model to simulate the effects of export restrictions and spikes in production costs on food prices, health and land use until 2040.

It suggests the combination of export restrictions, increased energy costs and fertiliser prices could cause food costs to rise and lead to poorer diets for many.

The findings indicate there could be up to 1 million additional deaths and more than 100 million people undernourished if high fertiliser prices continue. The greatest increases in deaths would be in sub-Saharan Africa, North Africa and the Middle East.

The study, in *Nature Food*, involved the University of Edinburgh's School of GeoSciences, Karlsruhe Institute of Technology in Germany, Rutgers University in the US and the University of Aberdeen.

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This could be the end of an era of cheap food. While almost everyone will feel the effects on their weekly shop, it's the poorest people in society, who may already struggle to afford enough healthy food, who will be hit hardest.

Dr Peter Alexander

Global Academy of Agriculture and Food Systems and School of Geosciences, University of Edinburgh

Market conditions key to adoption of gene editing

Consumer acceptance and commercial cooperation are key to enabling the adoption of gene-editing technologies towards sustainable agriculture, an international study has found.

Research into regulatory frameworks for genome editing in agriculture, led by Global Academy of Agriculture and Food Systems PhD student Hellen Mbaya, has highlighted the challenges and opportunities faced by countries around the world in implementing the technology.

Gene editing presents an opportunity to contribute to sustainable agriculture, and offers market access for small and medium-sized organisations, the survey found.

However, challenges are presented by international trade barriers and limited customer acceptance of gene editing technologies, it showed.

Researchers sought to understand how countries are regulating frameworks for gene editing tools, by interviewing government officers in regulatory agencies, and academic experts, in Asia, the Americas, Africa and Australia.

All the regions chosen have activity related to genetically modified crops in regulation, production or trade.

The research, published in *Frontiers in Bioengineering and Biotechnology*, was carried out with the Centre for Tropical Livestock Genetics and Health, and supported by the Bill & Melinda Gates Foundation and the UK Foreign, Commonwealth and Development Office.

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Gene editing can play a key role in supporting the development of sustainable foods, and effective communication by stakeholders can ensure that consumers can see the benefits of the technology for themselves, farmers, livestock and the environment, as part of a mix of solutions to the challenge of climate change.

Hellen Mbaya

Global Academy of Agriculture and Food Systems





Parental work in agriculture affects child development

Child development is negatively affected when both parents work in agriculture, compared to when they work non-agricultural jobs, a large-scale study has found.

These outcomes highlight the need for interventions to support parents working in agriculture, especially as the world shifts towards sustainable farming, which can be more time consuming.

Researchers at the Global Academy of Agriculture and Food Systems sought to examine how the early years of a child's life, which are critical for their development, are affected when their parents work in agriculture.

The first study of its kind found that families where both parents are employed in agriculture become more reliant on alternative caregivers than families where both parents are employed in other sectors.

Children of parents working in agriculture are often less likely to attend early childhood care and education programmes.

Women were found to be less empowered in households where both parents worked in agriculture, and previous research shows empowerment can positively influence early childhood development.

In light of this, researchers concluded that parental agricultural employment may be an important risk factor for early childhood development.

This research involved more than 8,500 young children and their families living in low- and middle-income countries in Africa, Asia and the Caribbean.

This study was published in PLOS Global Public Health and was carried out in collaboration with researchers from the International Food Policy Research Institute and Harvard University in the US.

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Our study sheds light on the family environment, and particularly the role of parental agricultural employment in shaping early childhood development. More work is still needed to adequately support parents engaged in farming to ensure their children thrive.

Dr Lily Bliznashka,

Global Academy of Agriculture and Food Systems
and International Food Policy Research Institute

Post-pandemic diet shifts could avert premature deaths

Covid-19 recovery plans should focus on healthier diets as much as economic growth to prevent huge numbers of avoidable deaths, research involving the Global Academy suggests.

Encouraging people to eat more fruit and vegetables post-pandemic could avert up to 26 million deaths every year by 2060.

Premature deaths from conditions such as heart disease, stroke and cancer – which are also risk factors for Covid-19 patients – could be prevented by including measures to reduce global meat consumption in recovery plans, researchers say.

Reducing the amount of meat eaten globally would also make food more affordable – particularly in low- and middle-income countries – and be better for the environment, the analysis shows.

The findings suggest post-pandemic plans prioritising economic recovery above all else would lead to millions more deaths linked to poor diet, be worse for the environment and do less to reduce food costs.

A team led by the University of Edinburgh used a computer model to assess the impacts that various Covid-19 recovery plans could have between 2019 and 2060.

Researchers modelled four post-pandemic scenarios and considered how the global food system would be affected by each of these.

The study, published in the journal *The Lancet Planetary Health*, also involved researchers from Karlsruhe Institute of Technology, Germany.



The Covid-19 recovery stimulus packages present an opportunity to reduce the impact of the food system on some of the most urgent global challenges, including diet-related diseases, the impact of the food system on the environment, and the affordability of food, especially for those on the lowest income.

Aimen Sattar, PhD student
Global Academy of Agriculture and Food Systems



Photo by Sepehr Behnamifa/Unsplash.

Insects offer sustainable, nutritious food source

Edible insects are a healthy, efficient low-carbon food that is likely to become more accepted in Western diets.

Consumption of insects is growing in popularity, and there are more than 2,000 edible varieties available, Dr Peter Alexander wrote on The Conversation website.

Insects' high protein and mineral content helps to explain why they already feature in the diets of people in many parts of the world, Dr Alexander explains.

Cultivated insects can convert their feed into energy more efficiently than conventional livestock animals, and a larger portion of the animal can be eaten, according to the report.

Insects also breed more frequently than most farmed animals, producing many generations in a year, and take up a relatively small land area.

They also offer the benefit of consuming by-products or food waste, contributing to a circular food system.



The acceptability of foods can change over time. Tomatoes were regarded as poisonous in Britain and dismissed for over 200 years. Lobsters, now an expensive delicacy, were formerly so abundant in the US that they were served to workers and prisoners and were used as fertiliser and fish bait.

Dr Peter Alexander
Global Academy of Agriculture and Food Systems

Pandemic's first wave had minimal impact on Indian farming

Indian farmers experienced disrupted labour, supply chains, and access to credit and markets owing to Covid-19, but did not significantly shift their cropping patterns and cultivation practices.

Research led by the Global Academy and the Council on Energy, Environment and Water examined the impact of the pandemic in a nation where nearly half of the population works in agriculture, in a system largely based on input-intensive monocropping of staple crops.

Researchers interviewed more than 3,500 farmers across India following the first wave of coronavirus, in December 2020 and January 2021, to understand how the pandemic had impacted on farmers' choice of crops planted and their adoption of sustainable agricultural practices.

Despite disruptions to agri-food supply chains during the first wave of the Covid-19 pandemic in India, and about one in five farmers sampled reporting recent Covid-19 symptoms, most farmers continued with prevailing cropping patterns.

The study, published in PLOS Sustainability and Transformation, was carried out in collaboration with partners in India and Monash University, Melbourne, Australia.

"Government support, peer-to-peer training networks, and market linkage support will be required to shift farmers to more nutrient-dense crops and sustainable farming practices." - Professor Lindsay Jaacks, Global Academy of Agriculture and Food Systems.



Photo by Field team at the Centre for Sustainable Agriculture.jpg.

Animal disease centre wins share of £35m funding



A centre of expertise on animal disease, involving scientists from the Global Academy of Agriculture and Food Systems, has won support from the Scottish Government.

The Scottish Government Centre for Animal Disease Outbreaks (EPIC) has been awarded a share of more than £35 million secured for four Scottish centres delivering scientific support, research and advice on key issues affecting the climate, water, animal disease outbreaks and rural communities.

A five-year investment package will benefit EPIC as well as climate research centre ClimateXChange (CXC), the Centre of Expertise for waters (CREW), and SEFARI Gateway, which leads on knowledge exchange and innovation.

The investment is aimed at strengthening existing partnerships, helping to safeguard against a range of issues that affect the rural economy, environment and the communities that depend on it.

Funded by the Scottish Government's Rural and Environment Science and Analytical Services Division (RESAS), the Centres seek to provide an efficient, accessible, coordinated route for government to access scientific expertise.

EPIC is a consortium of six Scottish research institutions, including scientists from the Global Academy and the Roslin Institute, working to improve livestock health by advising the Scottish Government on the surveillance and control of animal diseases.

"This support will enable EPIC's vital work in understanding, modelling and mitigating animal disease outbreaks, and in communicating this to decision-makers." - Professor Lisa Boden, Professor of Population Medicine and Veterinary Public Health Policy, Global Academy of Agriculture and Food Systems and Co-Director, EPIC.

National assessment highlights research excellence

The Global Academy of Agriculture and Food Systems has an outstanding environment in which to conduct scientific research, enabling outputs with an excellent impact on wider society, according to the latest national assessment of UK higher education institutions.

In a joint submission to the latest UK Research Excellence Framework exercise, research at the Royal (Dick) School of Veterinary Studies (R(D)SVS), of which the Global Academy is a part, and Scotland's Rural College (SRUC) has been ranked number one in the UK for agriculture, food and veterinary sciences by combining Times Higher Education's ratings for each institution.

The judgement, based on the quality and breadth of research, maintains the R(D)SVS and SRUC's position as the strongest provider in these subject areas.

The institutions' research environment was classified to be 100 per cent world leading or internationally excellent for agriculture, food and veterinary sciences research.

The Vet School and SRUC submission was also assessed as being 100 per cent world leading or internationally excellent in terms of the impact its research work has on wider society.

Case studies submitted to the assessment included work on modelling to support sustainable agriculture in Brazil, and improving preparedness and outbreak responses to foot-and-mouth disease in Scotland.

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Our outstanding results are testament to the strength and breadth of our expertise, and to the strong relationships we have fostered with our collaborators. We look forward to building on this.

Professor Geoff Simm

Director of the Global Academy of Agriculture and Food Systems





We look forward to supporting informed dialogues among sector stakeholders, including scientists, farmers, processors, retailers, consumers, investors and policymakers, and will seek to find consensus on how livestock production systems will need to change to meet the UK's net-zero targets.

Professor Dominic Moran

Global Academy of Agriculture and Food Systems

Stakeholder study seeks to map future of UK livestock

Researchers are to work with stakeholders in UK livestock to seek consensus on the sector's increasingly contested role in the economy, against a backdrop of climate change targets.

A team of scientists is to engage with farmers, retailers, policymakers and others, aiming to balance the sector's market value and opportunities for innovation with its less tangible contributions to food systems, health, rural economies and social wellbeing.

The three-year initiative, led by the Global Academy of Agriculture and Food Systems, will aim to define an agreed pathway to transform UK livestock in readiness for a changing future.

It gets under way as sustainability in UK livestock is called into question over the environmental and health impacts of meat and dairy production and consumption.

The project, named Transforming the Debate about livestock systems transformation (TRADE), is funded by UK Research and Innovation's Transforming UK Food Systems Strategic Priorities Fund.

Its team of scientists will explore better integration of social and scientific understanding to mitigate societal, political and economic barriers to potential solutions.

Their objectives include mapping UK stakeholders, understanding production and consumption patterns and associated impacts; and understanding competing views on regulation, as well as determining evolving health and social impacts and public preferences for livestock goods and related ecosystem services.

The team will also seek to understand regulatory objectives and establish consensus on roles and responsibilities of market participants and government.

In addition, they will model the livestock system and develop a pathway to specific, measurable outcomes related to market, environment health and social impacts of production and consumption of livestock products.

Land use and the future of farming

In a blog for the Scottish Land Commission, Dr Kirsteen Shields, Senior Lecturer in International Law and Food Security, reflects on a discussion of the Commission's Land and Human Rights Forum, exploring food systems' concerns related to land and their impact in the context of human rights.

Dr Shields' blog explores current connections between food systems and land, and the need for reform in response to global, environmental and health crises. It outlines drivers to reform including demand and regulations, and suggests that implementing changes to practices might be viewed as an opportunity to reinvent agriculture in the 21st century.

 edin.ac/3YHBwx3

Shaping guidelines on gene conservation

Our researchers' work in the Innovative Management of Animal Genetic Resources (IMAGE) project, a collaboration focused on genetic collections in gene banks, has been used to inform new guidelines from the United Nations' Food and Agriculture Organization for the cryoconservation of animal genes.

This work will support genetic diversity of livestock, an important resource in enabling the livestock sector to meet a range of environmental and economic challenges.

 edin.ac/3kVgkW2



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Research features

Drylands partnership project looks toward delivering impact

In more than 18 months since the Jameel Observatory for Food Security Early Action was established, partners have forged a path to providing research outcomes to support food security in drought-affected regions of East Africa.

The partnership seeks to address food security in areas affected by droughts and other systemic shocks. It brings together expertise from the Global Academy with Save the Children, International Livestock Research Institute, Jameel Poverty Action Lab and investment partner Community Jameel.

Since the Observatory's foundation, it has established a community of experts focused on identifying how best to respond to the needs of stakeholders in East Africa, where pastoralist food systems that were already under pressure

from changing land use, population growth, and drying climates have been ravaged by a series of droughts.

It seeks to improve forecasting and anticipatory action to limit the extent of crises.

"Acting in advance of a crisis reduces human suffering and costs less money. It's much better to be prepared, rather than to respond in emergency mode. That's the nub of what the Jameel Observatory is about," says Professor Alan Duncan, Professor of Livestock & Development. Such actions might involve, for example, providing emergency cash resources, or enabling livestock trading in advance of a drought.

"Since we got going, we've had a strong emphasis on making sure that we are being demand-led. We've had a long

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A combination of different skills and outlooks is the strength of the Jameel Observatory. Getting the right people in the room, talking and engaged, is definitely the first milestone for us and I think that's been successful. The next stage is for some of these projects to come on stream and to begin to deliver.

Professor Alan Duncan

Professor of Livestock & Development



consultation process with stakeholders in this area and a series of mini dialogues with experts on a range of topics. We've spent a lot of energy in making sure that the questions are coming from those at the frontline and then responding to those.

"All of that has helped us define the scope of the Observatory: key topic areas where there is work to be done."

Key challenges for research identified by the team include better use of data to predict oncoming crises, having the relevant funds in place to put in place humanitarian measures, and how best to coordinate efforts. In addition, it is studying how to better build reliable data that people can trust, and how to connect community and local initiatives with formal, international efforts to deal with food crises. Research is ongoing in all these areas.

The Observatory's partners aim to translate research into action over the next couple of years.

"We've developed a theory of change that sets out what various stakeholders would need to do differently for us to respond more effectively to food crises. I hope that we will be moving some of those outcomes forward. For example, having a better coordinated system of predicting food shocks, rather than multiple different systems," adds Professor Duncan.

"Also, building on local pastoralist expertise in predicting crises and connecting that with international efforts would be a good outcome."

 jameelobservatory.org

Developments in livestock breeding aid food security

Sustainable breeding programmes combined with new breeding tools will continue to contribute significantly to food security and sustainability, writes Professor Geoff Simm.

The fortunes of the human race have been closely intertwined with animal husbandry since we first domesticated livestock around 10,000 years ago.

Over that time, we have selected for animal characteristics that best suit our needs – for food, fibre, transport, draught power, and so on.

Increasingly sophisticated methods have been used over the past 70 years, especially in poultry, pig and dairy cattle breeding, and particularly in richer countries.

Effective genetic improvement programmes have achieved cumulative annual rates of change typically of 1 to 3 per cent in traits of economic importance.

These changes look small on an annual basis but can be dramatic over a few decades. For example, much of the over four-fold increase in the average yield of dairy cows in the UK since the 1930s is down to selection between and within dairy breeds.

Some applications of genetics that have focussed too narrowly on production or efficiency have had a negative impact on animal health and welfare.

So too, a drive towards specialisation of breeds has eroded genetic resources globally.

Improved scientific understanding over the last few decades is allowing the design of more sustainable breeding programmes that better balance the emphasis on productivity and animal health and welfare, address environmental impacts, and promote sustainable use of farm animal genetic resources.



A recent international review of dairy cattle breeding programmes, for example, showed that the emphasis in selection has changed from being focussed almost exclusively on milk production a century ago to now placing around half of the selection emphasis on other traits. This trend towards more balanced breeding goals is growing in most farmed species.

Changes in livestock performance generally lead to reductions in feed and other resources used per kg of product, and hence in greenhouse gas per kg product too, or GHG emission intensity. For instance, a comparison of US dairy systems in 1944 and 2007 estimated that modern systems required 21 per cent of the animals, 23 per cent of the feedstuffs, 35 per cent of the water, and only 10 per cent of the land per billion kg of milk produced.

The 2007 systems produced 24 per cent of the manure, 43 per cent of methane, and 56 per cent of the nitrous oxide per billion kg of milk compared with 1944 systems.*

Similarly, selection of chickens bred for meat production is estimated to have reduced feed required per kg of weight by around 35 per cent over 25 years with corresponding savings in land use and GHG emissions.*

Over the past 12 years or so, genomic selection has begun to revolutionise livestock breeding.

Genomic selection involves breeding animals based on the use of genome-wide genetic markers to identify individuals and families carrying markers known to be associated with traits of interest.

This can allow earlier identification of elite breeding stock, and also allow selection for traits that are difficult or expensive to measure in commercial herds or flocks – such as feed intake, methane emissions or disease resistance – once markers have been identified that are associated with these traits.

Genomic selection is superseding progeny testing in the dairy sectors of most industrialised countries, as it allows earlier and more accurate estimation of genetic merit of bulls. Likewise, it is becoming widely used in pig and poultry breeding and in some beef and sheep programmes, with benefits in accuracy and the range of traits targeted.

While there are indirect improvements in GHG emission intensity from selection for productivity, there is growing interest in developing breeding programmes to directly target methane emissions.

There is good evidence of heritable variation in methane emissions in cattle and sheep. However, there are complexities in measurement at scale, and potential unintended consequences of selection unless relationships with other traits of interest are understood and accounted for.

Research from the Netherlands has predicted that ongoing selection on the current national dairy breeding index will lead to a 13 per cent reduction in methane produced per kg of milk by 2050, without direct measurements of methane emissions. However, by adding direct measurement of cow methane emissions and putting greater emphasis on reducing methane, reductions of up to 29 per cent could be achieved by 2050.*

Recent research in Edinburgh has identified microbial genes with significant impact on methane emissions using genomic selection based on the abundance of these microbial genes, and could lead to a reduction of up to 6 per cent each year in methane emissions. Work is in progress to develop and test this, and explore relationships with other traits of interest.*

Genetic improvement of productivity of farm livestock in many countries over the past few decades has helped to increase the availability and affordability of highly nutritious food, increased food security, and improved resource-use efficiency.

Achieving sustainable food production globally requires moderation of animal-sourced food consumption in higher-consuming countries. However, improved knowledge about the design of sustainable breeding programmes, and new breeding tools, will continue to contribute significantly to food security and sustainability too.

This feature is based on an article produced for Science for Sustainable Agriculture.

*For references see <https://edin.ac/3FHwvhM>

Modelling to support climate-friendly cattle

Researchers are developing bio-economic models to help governments and companies understand the cost-effectiveness of measures to reduce the environmental impact of beef production.

Monica Hoyos-Flight

Food production contributes more than one-third of global greenhouse gas emissions, with animal-based foods accounting for more one-tenth.

Despite calls for a shift in high-income countries towards plant-based foods and sources of animal protein with a lower direct carbon footprint, such as chicken and farmed fish, the demand for meat from low- and middle-income countries (LMICs) is continuing to rise.

Dominic Moran, Professor of Agricultural and Resource Economics, says: “We need to optimise the productivity of livestock systems, especially in those parts of the world that are able to produce meat with lower emission intensity than others.”

Animal farming supports the livelihoods of many people, particularly in low- and middle-income countries. Sustainable intensification of livestock systems in these countries could tackle food security and conservation.

“The carbon footprint for livestock production varies a lot,” says Dr Rafael De Oliveira Silva, Lecturer.



It could be zero or even negative if you consider carbon sequestration, but if it is associated with deforestation, it can be over 100kg of carbon dioxide equivalent per kilogram of meat.

By using innovative bio-economic models, Dr De Oliveira Silva and Professor Moran can analyse the impact of changes to land use, land management and the demand for meat, as well as the adoption of new technologies, on the greenhouse gas emissions of beef production.

In 2020, Brazil was the world’s largest exporter of beef, providing close to 20 per cent of total global beef exports. It is also the most forested country, with about 60 per cent of the Amazon rainforest.

As beef production grows so does the need for pastures, which drives deforestation. Urgent measures are needed for Brazil to reconcile its biodiversity conservation with beef demand.

“Brazil has set itself very ambitious targets, committing to reduce greenhouse gas to 43 per cent below 2005 levels by 2030, mostly by ending Amazon deforestation,” Dr De Oliveira Silva explains.

He has been working with the Ministry for Agriculture in Brazil (MAPA) to help the Brazilian Government achieve pledges from COP21 and the Paris Agreement of 2015.

Dr De Oliveira Silva has developed bio-economic models that compare the cost-effectiveness of MAPA’s sustainable agricultural intensification (SAI) policies for livestock production. These policies aim to reconcile a desire for increased productivity per hectare of land while reducing greenhouse gas emissions.

The effects of various greenhouse gas mitigation measures were analysed in the central Brazilian savannah or Cerrado, which supports more than 30 per cent of Brazil’s cattle herd. The results showed that by far the most effective measure for reducing emissions is pasture restoration, by chemical and mechanical treatment of the soil to encourage the growth of grasses.

Restored pasturelands reduce emissions by sequestering carbon into the soil and increasing the efficiency of cattle feed production, leading to cost savings. Further reductions in greenhouse gas emissions are achieved by avoiding the need to clear additional forest.

“Brazil’s greenhouse gas emission targets can be achieved by restoring 15-20 million hectares of degraded pastureland, representing approximately 10 per cent of Brazil’s pastureland.” Dr De Oliveira Silva says.

To drive pasture restoration, MAPA has been providing financial incentives for farmers since 2010. Dr De Oliveira Silva’s work demonstrates the effectiveness of the scheme and supports investing in a second phase between 2020 and 2030.

“After a slow start, the Low Carbon Agriculture programme has gained traction and today lots of farmers are adopting measures to restore pastures in Brazil,” he says.

In addition to informing government policies, Dr De Oliveira Silva is working with the Brazilian company JBS, one of the largest meat processing companies in the world, to devise a greenhouse gas emissions reduction plan to achieve net-zero by 2040. “We are helping JBS to identify measures to not just reduce carbon dioxide, but methane emissions as well.”



Reducing methane emissions is more complicated than reducing carbon dioxide emissions, because it requires different, more expensive technologies.

Selective breeding, feed supplements and some promising additives can help cattle use feed more efficiently and reduce their methane production, but these approaches are yet to be widely adopted.

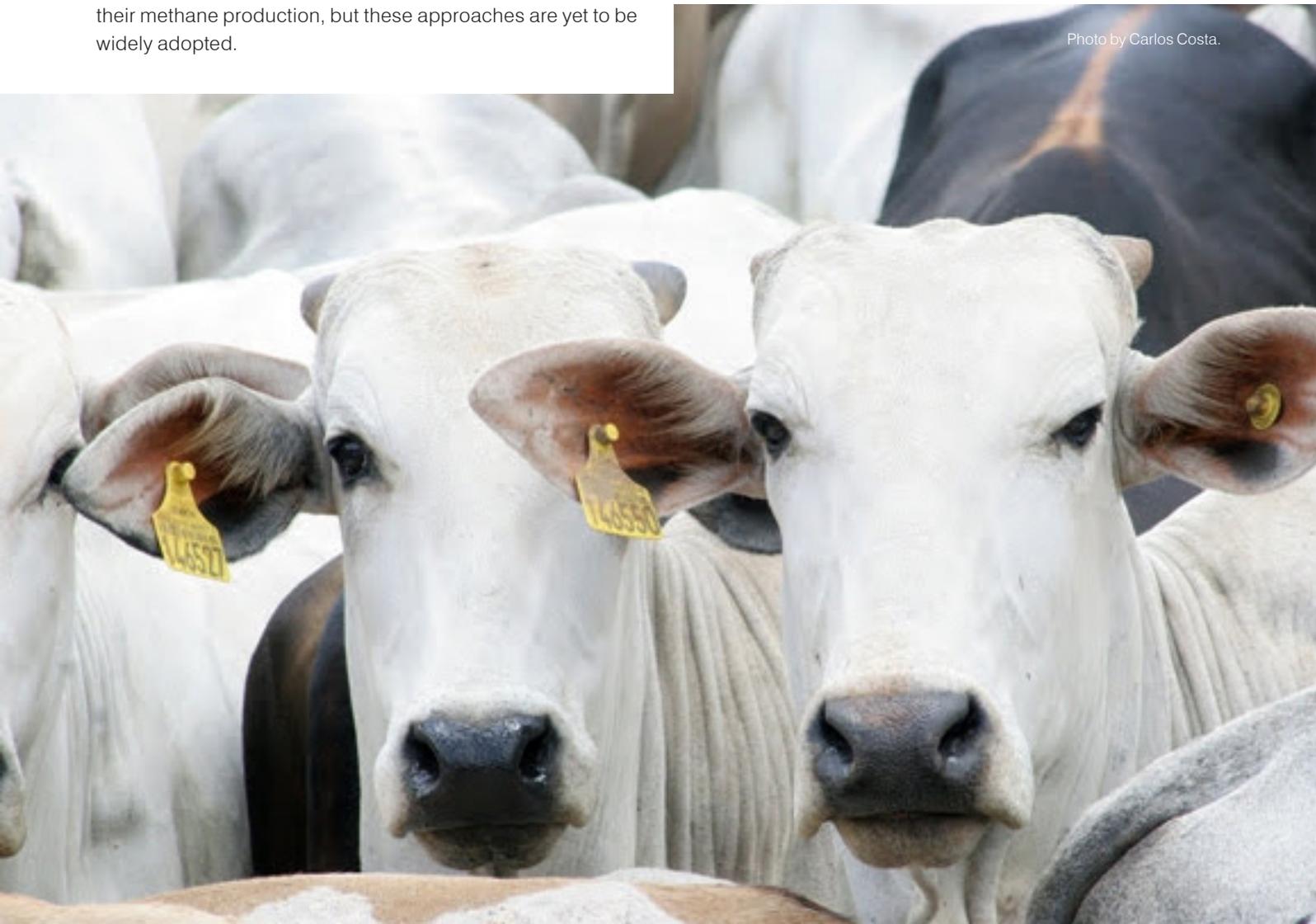
While most models for calculating the environmental impact of meat production provide a fixed number, the model developed by Dr De Oliveira Silva can capture the effects of changes in demand.

“Demand is the main driver of technology adoption,” Dr De Oliveira Silva says.

In Brazil, if the demand for beef increases, farmers have to intensify production in the context of deforestation-control policies, which stimulate the adoption of pasture restoration measures resulting in reduced greenhouse gas emissions. Conversely, and counter-intuitively, reduced demand for beef could lead to an increase in emissions due to reduced incentives to restore pastures.

Applying these models to other beef production systems around the world could shed light on how to mitigate the environmental impact of production and still meet demand.

Photo by Carlos Costa.



Programmes and events

Masters programme tackles crises for people and planet

A postgraduate programme aims to provide students with the critical and data skills needed to understand and address global challenges that impact the health and wellbeing of people and the environment.

The MSc in Planetary Health will focus on the impacts of the climate emergency, extreme poverty, conflict, biodiversity loss and insecurities within the health, education, energy, culture and environment sectors.

It will equip students to work with local and national governments, finance and industry organisations and international agencies.

Students may opt for full-time or part-time study through online or on-campus learning, or a blend of the two.

The Planetary Health programme is led by the Edinburgh Futures Institute in a collaboration with the Global Academy of Agriculture and Food Systems, the Global Health Academy, the Usher Institute and the School of Health in Social Science, drawing on expertise from across the University of Edinburgh.

Participants will learn about key planetary health concepts, understand the relationship between various drivers of health across the globe, and be supported to build careers focused on tackling climate collapse, health and other inequalities.

They will develop legal and business skills alongside entrepreneurial thinking, and develop their ability to use large-scale data to address global challenges.

The programme is suitable for recent undergraduates and mid-career professionals, including leaders in all sectors of business and industry, especially in strategic roles relating to wellbeing and societal development.

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Complex elements of human, animal, environment and economic systems often combine to drive the ill-health of people and our planet, with examples such as malnutrition, cyber insecurity and environmental degradation. The MSc in Planetary Health programme seeks to equip graduates to explore the ways in which this happens, and to meet the challenges presented by it.

Dr Fiona Borthwick

Global Academy of Agriculture and Food Systems.

 edin.ac/3qODslx



Photo by Matteo Catanese/Unsplash.



Sustainable land use at heart of postgrad programme

The fundamental nature of land – how it can be defined, understood, managed and used – is the focus of a postgraduate programme in Sustainable Lands and Cities.

The programme, led by Edinburgh Futures Institute, combines expertise from the Global Academy of Agriculture and Food Systems and the Edinburgh School of Architecture and Landscape Architecture, bringing together people who are committed to creating, shaping, and conserving sustainable communities.

It is launched at a time when the climate emergency brings an urgent awareness of the relationships between land and human development, and pervasive exploitation of natural systems means populations face fundamental challenges for their future.

The programme is available full-time over one year, or part-time over two or three years, leading to an MSc, a postgraduate diploma or postgraduate certificate.

It is designed for both recent graduates and professionals from a variety of backgrounds in the public, private, and third sectors.

Participants will develop the skills needed to influence and create resilient and sustainable relationships between lands and cities, such as exploring rural and urban environments, harnessing practices of smart growth, understanding planetary boundaries, and opportunities for advocacy for justice and equity.

 edin.ac/3ObJKvA

Teachers offered insight into sustainable food systems

Teachers can be introduced to key dimensions of food security and food systems through a Continuing Professional Development (CPD) course involving the Global Academy of Agriculture and Food Systems.

Each topic is accompanied by classroom activities that can be used to begin to explore the complex issues of sustainable food production, environmental impacts of our food systems, and break down the dimensions of food security into concepts that teachers can reflect on. The programme is endorsed by Education Scotland.



Photo by Tumisu/Pixabay.

Rural research in spotlight at annual lecture

Opportunities offered by rural research were the focus of an annual event co-hosted by the Director of the Global Academy of Agriculture and Food Systems.

Professor Geoff Simm, Executive Committee Chair of the Scottish Consortium for Rural Research, jointly hosted the SCRR/Royal Society of Edinburgh's Peter Wilson Lecture 2022 'The time for rural is now'.

Participants discussed how research and practice in rural Scotland can address crises of climate, biodiversity and livelihoods in a resilient, sustainable way.

The event was co-hosted by Royal Society of Edinburgh interim Chief Executive Dr Eve Poole.

Eursafe conference focuses on transforming food systems

Researchers from across Europe and beyond met in Edinburgh last year to share the latest thinking on the ethical, societal and policy issues around agriculture, agricultural biotechnologies, aquaculture, animal use, food and the food supply chain.

More than 90 presentations at the European Society for Agricultural and Food Ethics (EurSafe) conference focused on the need to transform food systems effectively, ethically and sustainably to meet the multiple challenges of feeding a growing population without exacerbating the climate emergency.

Plenary sessions included a presentation by Professor Geoff Simm, Director of the Global Academy of Agriculture and Food Systems, entitled: 'How will we feed 11 billion people sustainably and ethically?'

He proposed a raft of solutions to accelerate the systemic change required. These include farming system innovations such as vertical, precision, and circular farming, novel foods and feeds and lower impact livestock, as well as social, economic and political innovations and interventions.

Topics covered elsewhere at the conference included research on food governance, animal ethics, land ethics, novel foods and genome editing.

Among the themes explored were the generation of local food identities, ways to ensure the inclusion of missing voices in the debate of planetary boundaries, the acceptability of novel foods and their nutritional value.

The conference also covered sessions on animal breeding, supply chains, food waste and veterinary education and practice, and further ethical aspects of transforming food systems, including the use of antimicrobials and rewinding.



Photo by Blissful Penguin/Unsplash.

National meeting focuses on food security challenges

Barriers to food security, and how these could be resolved, were discussed by the Director of the Global Academy of Agriculture and Food Systems at an industry event.

Professor Geoff Simm joined senior politicians and representatives from across the agricultural sector at the meeting of the UK Agricultural Partnership, a forum created by the UK Department for Environment, Food & Rural Affairs, which brings together farmers, researchers, businesses and policymakers across the UK.

In a talk entitled 'Food Security research and innovation', Professor Simm outlined the role that research and innovation can play, and their limits.

As part of a panel discussion focused on solutions, he emphasised the need to tackle food insecurity in a systemic manner, along with the intersecting challenges of climate change, nature and loss of biodiversity, malnutrition and inequity, at local and global levels.

Panellists at the event, hosted by the James Hutton Institute in Dundee, also examined the impact of climate change, the biggest long-term threat to UK food security.

"Food security is a complex local and global challenge that calls for interventions from a range of angles, including social, economic, and political, as well as technical contributions. It is vital that all relevant parties come together to develop systemic solutions."

- Professor Geoff Simm, Director, Global Academy of Agriculture and Food Systems



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Student News

Welcome to our recently arrived postgraduate research students

Puff Ray Mukwaya

Evaluating returns to climate emergency humanitarian early intervention

George Tsitati Mayenga

Assessing locally led anticipatory action options to climate induced humanitarian crises in East Africa

Apisit Boupai

Does crop genotype utilisation of soil organic matter lower greenhouse gas emissions from soil?

April Liu

Environmental, social, and corporate governance in Chinese food and agriculture

Haosheng Yang

Composition-function relationship of soil microbial diversity for nutrient cycling under climate change

Leslie Cai

Regenerative grazing methods for nitrogen cycle soil management, biodiversity and greenhouse gas emissions

Nishmeet Singh

Understanding and improving food environments, diets and nutrition

Abahan Majumdar

Impacts of climate change on soil carbon and nitrogen dynamics and crop productivity in the rice-based wetland agroecosystems in Bangladesh

Congratulations to our national rugby star

Undergraduate student Elliann Clarke won her second cap for Scotland when she joined the Women's Six Nations squad for their game against England. The game, at Kingston Park, Newcastle, ended 58-7 in England's favour.

Elliann (pictured left) plays in the loosehead position for Scotland.



Appetite for kelp work leads to African adventure

A speculative approach for work inspired by an Instagram post has helped an undergraduate gain skills and insights from four months spent on a coastal farm in Africa.

Eden Zandstra, a Global Agriculture and Food Systems student, spent the season between her second and third years conducting environmental monitoring on a newly established pilot kelp farm in Namibia.

She secured the opportunity after learning about the Kelp Blue farm on social media, and approaching the organisation's Chief Executive Officer with her CV.

In her first experience of visiting Africa, she travelled to the desert coastal town of Lüderitz, where Kelp Blue is based, to spend the winter there.

As part of the Kelp Blue team, Ms Zandstra took part in environmental monitoring of the kelp forests.

She joined colleagues in patrolling the forests to test the water quality and monitor conditions such as temperature, salinity, and dissolved oxygen, and assessing the status of

sediment and plankton. She also took part in coastal monitoring, gathering data on local species.

Aside from trips to monitor the kelp, Ms Zandstra also spent time in labs conducting analysis and completing admin. She also had the opportunity to take part in sector conferences.

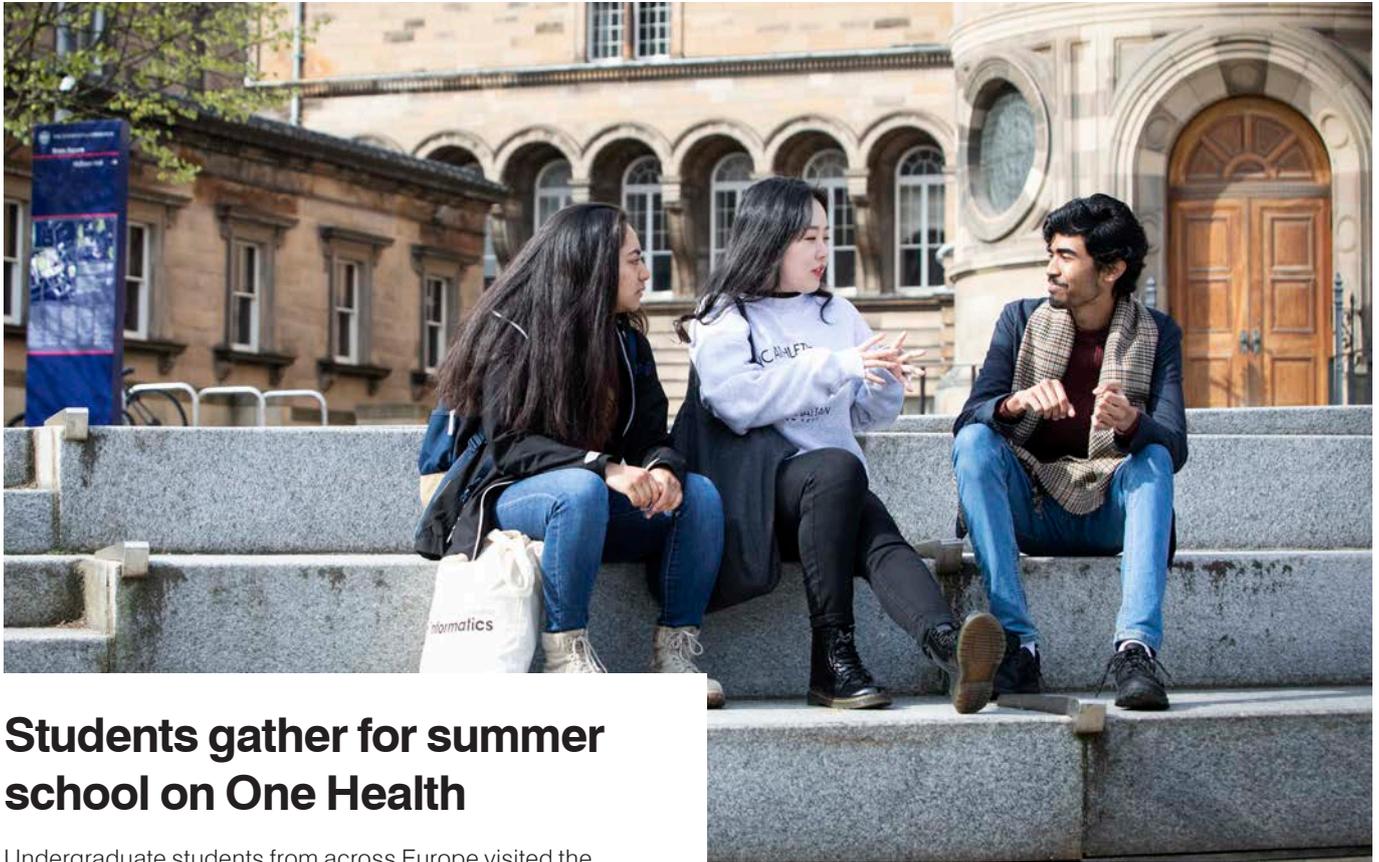
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What I enjoyed most was making connections with people with a shared interest, such as walking with a marine biologist along the shoreline and remarking on all the things we saw. It was great to learn from their experience.

Eden Zandstra, Undergraduate student
Global Academy of Agriculture and Food Systems



Photo by Eden Zandstra.



Students gather for summer school on One Health

Undergraduate students from across Europe visited the University to take part in a summer school focused on One Health – an approach that considers the inter-related health of people, animals, plants and the environment.

The event, led by Global Academy scientists, brought together students and staff from across Una Europa, a collaboration of leading European research universities.

Some 52 undergraduates spent two weeks in Edinburgh, working with mentors and researchers at the first Una Europa One Health Summer School.

Professor Lisa Boden led the project with colleagues from the University of Edinburgh and other Una Europa institutions.

Participants worked together to develop their knowledge of One Health and Planetary Health by tackling challenges related to the United Nations' Sustainable Development Goals – targets designed to develop a sustainable future for all people and the planet by 2030.

Students learned through lectures, seminars and group work.

The School's interdisciplinary programme is designed by world-leading academics from across Una Europa.

Participants have the opportunity to develop their networks through the collaborative, interactive programme.

They gain experience in working on real-world challenges and in doing so acquire valuable skills in teamwork, communication, research and presenting.

The DDI Talent initiative, which enables training in data skills for the AgriTech sector, supported the Summer School.

Una Europa, based in Brussels, involves University College Dublin, Freie Universität Berlin, KU Leuven, Universidad Complutense de Madrid, Université Paris 1 Panthéon-Sorbonne, and the universities of Bologna, Helsinki, Leiden, Kraków and Zürich, as well as the University of Edinburgh.

“

We are very excited to be part of this cross-European initiative to deliver world class training in One Health approaches for tackling global challenges.

Dr Smaragda Tsairidou

Global Academy of Agriculture and Food Systems

Early career researchers swap perspectives in seminars

Early career researchers from a wealth of backgrounds are building on the success of a weekly forum in which they meet to share ideas and progress their work.

The diversity of expertise and experience among students at the Global Academy of Agriculture and Food Systems – many of whom are undertaking a career change – has helped create an environment where everyone can benefit from a variety of perspectives.

The early career researcher seminar series was intended as a departure from traditional seminars, which are based on published research and usually invite senior people to speak. The focus is on researchers at the start of their careers, but more senior staff can benefit too.

Sessions have covered research project reviews, classes in preparation, thesis chapters in progress, and PhD theses already defended, across topics including modelling, global supply chains, ethics and sustainability, and antimicrobial resistance.

Seminars are held in person and online, with at least 10 researchers taking part.

Senior researchers are encouraged to see the seminar space as an opportunity to discuss their research ideas and methodologies with students.

Researchers are welcome to participate in seminars to share their experience, but also use this space to brainstorm, as a sounding board for new ideas, and to get cross-disciplinary feedback on work in progress.

The seminars are effective for sharing ideas and interdisciplinary problems, not only from outcomes, but work in development.

“We wanted to create a space for early career researchers to share ideas where we can cross-learn from each other, not only from our superiors. Global Academy students are very high achieving – we have an international mix of backgrounds, broad expertise and experience, from dietetics to agri-engineering to astrophysics.” - Divya Veluguri, Student Representative

Campus to host secondary school with focus on STEM

Secondary school students living close to the Global Academy of Agriculture and Food Systems are to benefit from a Science, Technology, Engineering and Mathematics (STEM) Centre of Excellence school to be built at the campus.

The University of Edinburgh and Midlothian Council have agreed plans to build a school at the Easter Bush site, to open by August 2026.

The council is progressing an agreement with the University to buy the land for the school, which will replace a nearby Community High School.

The facility will address a projected increase in pupil numbers from expanding communities in local areas.

The school will accommodate 1200 pupils, with capacity to expand up to 1600 pupils, and will have a dedicated learning space for children with additional support needs.

It will include community facilities appropriate for local needs, with indoor and outdoor sports facilities.

“Easter Bush is a world-leading research and innovation campus specialising in biomedical sciences, veterinary medicine and medicine. The new Centre of Excellence will not only raise attainment and help pupils secure high paying jobs in the future but linking with the University of Edinburgh, it will also become a knowledge base, helping inform improvements to building design, the curriculum and teaching methods across Scotland.” - Councillor Ellen Scott, Midlothian Council’s Cabinet Member for Education



Staff News

Welcome to our recently appointed colleagues



Emiliano Videla Rodriguez

Post-Doctoral Research Fellow



Pau Navarro

Senior Lecturer in Quantitative Genetics



Sarah Frank

Lecturer in DDI in Nutrition & Health



Judith Okoth

Lecturer in Nutrition and Food Systems



Otu Ibok

Research Fellow



Katie Adam

Lecturer in Innovation in the Life Sciences



Vera Mkenda

Teaching Fellow, DDI Agritech Talent programme



Ricki Runions

Research Fellow



Nathan Jensen

Jameel Observatory Senior Research Fellow



Rowan Jackson

Lecturer in Planetary Health and Food Systems



Tofel Haman

Visiting Researcher

Expert joins panel advising Scottish Government

A specialist in veterinary public health from the Global Academy of Agriculture and Food Systems has been appointed to a panel of experts which supports the Chief Scientific Adviser for Scotland's work with ministers.

Professor Lisa Boden brings expertise in population medicine and veterinary public health to the work of the Scottish Scientific Advisory Council (SSAC).

In addition to her position at the Global Academy, Professor Boden is Director of Impact and Policy for Scottish Government's Centre of Expertise on Animal Disease Outbreaks (EPIC), which supports policymakers with regard to managing incidents of animal disease.

Professor Boden is joined as a newly appointed member of SSAC by her colleague Professor Bruce Whitelaw, an expert in animal biotechnology from the Roslin Institute, which is also part of the Royal (Dick) School of Veterinary Studies.

Other experts from across the University of Edinburgh are among 12 newly appointed members of the SSAC.

Members will serve for three years, providing independent advice, through the SSAC Chair, to the Chief Scientific Adviser Professor Julie Fitzpatrick.

Their efforts will inform policy development and delivery across all areas of the Scottish Government's work.

The SSAC also supports the work of the Chief Scientist (Health), Professor Dame Anna Dominiczak, and the Chief Scientific Adviser for Environment, Natural Resources and Agriculture, Professor Mat Williams.



It is important that policy decisions reflect the best up-to-date expertise available on specialist issues and I am pleased to be able to add my input to that of others around the country in supporting the work of the Chief Scientific Adviser.

Professor Lisa Boden

Global Academy of Agriculture and Food Systems



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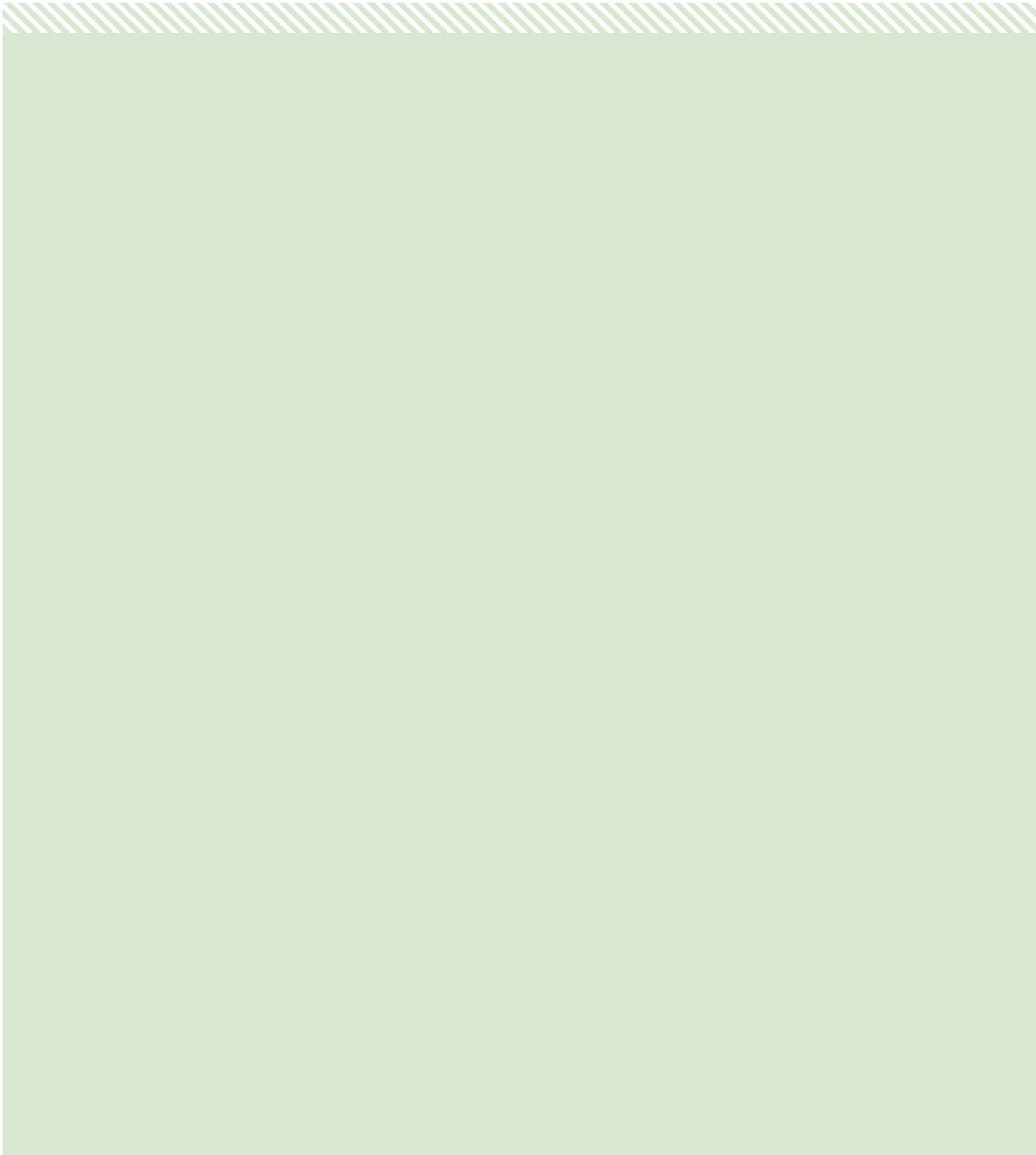
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