



Queen's University
Belfast

Institute for Global
Food Security



WELCOME

Welcome to the fifth edition of our newsletter. The past six months have not been short of issues in terms of food security globally. Russia's ban of agricultural products from the EU, USA and elsewhere are causing massive fluctuations in commodity prices, further exacerbated by a record wheat crop. Globally wheat is the second most produced crop and bumper 2014 harvests have caused huge deductions in the cost of buying this commodity. Conversely, a prolonged drought in California has caused a massive failure of the almond crop. These are all examples of how geopolitical and climatic conditions can have huge effects on the availability and supply of food. The research at the Institute continues its activities to support national and international efforts to ensure a sustainable and sufficient supply of wholesome food for the population. I hope you enjoy reading about some of our important and exciting research activities. - Professor Chris Elliott



IGFS stakeholder programme launched



Professor Chris Elliott addressing invited guests at the inaugural IGFS stakeholder event

The Institute for Global Food Security hosted its first stakeholder event on November 21st at an excellent breakfast meeting in Riddel Hall. Over 80 invited guests from industry and government were given a briefing about the progress of the Institute and its future plans to further support the agri-food sector and development of government policy.

The Institute was also pleased to showcase some of Northern Ireland's

finest produce with products supplied by Great Taste Award winners such as Clondeboye Estate Yoghurt, Armagh Cider Company, Hannan Meats, Abernethy Butter and McKee's Farm Shop

It is hoped that these stakeholder events will become a common feature and take place regularly over the coming years. To register your interest or for more information please email igfs@qub.ac.uk

REF 2014 News

The Institute for Global Food Security has firmly secured its place as a centre of excellence for agriculture, food and veterinary science research. Queen's University Belfast submitted the research outputs of nearly 40 academic staff to the Research Excellence Framework (REF) exercise. The REF is the system for assessing the quality of research in UK higher education institutions and is conducted at 6 yearly intervals.

The results published on the 18th December showed that the Institute has climbed from No 21 in the UK University ranking for our area of research (based 2008 exercise) to a top 5 position. The REF data indicated that the research was world-leading in terms of originality and significance. The Institute director, Prof Chris Elliott, stated "This is a wonderful outcome for the Institute and clearly shows the quality of our research staff and the importance of the research they are undertaking in food security globally". Queen's University as a whole also performed extremely well in the REF exercise and reinforcing its position within the top 20 research active universities in the UK.

IGFS researchers in QUB Horizon 2020 funding first

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020). Researchers from the Institute for Global Food Security will co-ordinate and lead the first Horizon 2020 project to be agreed and signed between Queen's University Belfast and the EU.

The MET-A-FOR project (grant agreement No. 642380) was successful in receiving funding (€820,000) under the first call for the Marie Skłodowska-Curie Actions (MSCA) Curie Innovative Training Networks (ITN-EID) programme. MET-A-FOR will be led by Dr Mark Mooney (PI) and Prof Chris Elliot (CoI) within IGFS and will involve joint collaboration with Prof Tom Buckley and Mr Mark Sherry from Irish Diagnostic Laboratory Services based in Kildare, Ireland.

Over the 4 year period of the project, MET-A-FOR will provide early stage researchers (ESRs) with the interdisciplinary and intersectoral analytical skills needed to identify the misuse of prohibited drugs in bovine and equine animals. Additionally MET-A-FOR through ESR completion of defined interconnecting PhD projects will aim to bridge the knowledge gaps that exist between commercial end-users of emerging diagnostic methods and academia.

ESR Fellows graduating from the MET-A-FOR training programme will be uniquely situated to lead, innovate, and collaborate on future technological innovation in the field of analytical monitoring and forensic testing of performance and food producing animals as the challenges in this area increase.

Alzheimer's Network Cooperation Group meet at IGFS

The 5th meeting of the Network Cooperation Group developing applications for metabolomics technologies for studying Alzheimer's disease (AD) and dementia took place at Queen's on 10th November 2014. Funded by Alzheimer's Research UK the multi-disciplinary group led by Dr Brian Green is exploring how untargeted LC-MS metabolomics approaches could improve both the diagnosis and the scientific understanding of dementia.

The team presented their most recent findings illustrating how the exquisite profiling work being undertaken in IGFS, including how different types of dementia can be identified.

Dr Stewart Graham (Director of Metabolomics research, Beaumont, Michigan) showed how brain tissue affected by AD can be easily discriminated from Dementia with Lewy bodies (DLB). Dr Xiaobei Pan presented her Invest NI-funded work which is developing novel blood metabolite panels for identifying which patients with mild cognitive impairment (MCI) are at short term risk of developing AD.

Mr Muhamamad Bin Nasarrudin produced a summary of his project profiling lipid and lipid-like molecules in dementia. Dr Brian Green presented an overview of the groups' metabolomics research activity on novel AD models, and assessed the relevance for patients living with dementia.

Photo below: The Network Cooperation Group from left to right: Mr Muhamamad Bin Nasarrudin (PhD student, IGFS), Dr Stephen Todd (Consultant Geriatrician, Altnagelvin Area Hospital), Dr Xiaobei Pan (PDRA (mass spectrometry), IGFS), Dr Stewart Graham (Beaumont Health System, Michigan), Dr Bernadette McGuinness (Consultant geriatrician, QUB/Belfast Trust), Dr Brian Green (Senior Lecturer (Network Coordinator), IGFS), Emma Cunningham (Registrar, Belfast Trust), Prof Christian Holscher (Neuroscientist, University of Lancaster), Prof Pat Kehoe (Neuroscientist, University of Bristol), Prof Peter Passmore (Consultant geriatrician, QUB/ Belfast Trust).



Commonwealth Shared Scholarships Scheme awardees enrol on IGFS MSc programme

A number of students have enrolled on the MSc in Advanced Food Safety programme having received awards from the Commonwealth Shared Scholarships Scheme (DFID Award).

These scholarships are competitively awarded to students taking one year taught postgraduate Master's degree programmes.

Christian Anumudu from Nigeria, Emelia Adator from Ghana, and Ozaye Dobson from Guyana (pictured to the right) all initiated their MSc programme at Queen's University Belfast in late September and will perform lab-based research projects within IGFS.

Christian Anumudu will also be sponsored by Neogen Corporation who have continued their support of students on postgraduate programmes in IGFS.

There are a total of 16 students enrolled on the 2014/15 MSc Advanced Food



IGFS Commonwealth Shared Scholarship MSc students, from left to right, Christian Anumudu, Emelia Adator and Ozaye Dobson

programme including both local students and international students from China and Mauritius.

Applications for the 2015/16

Commonwealth Shared Scholarships Scheme are now being accepted and more details can be found by **clicking here**

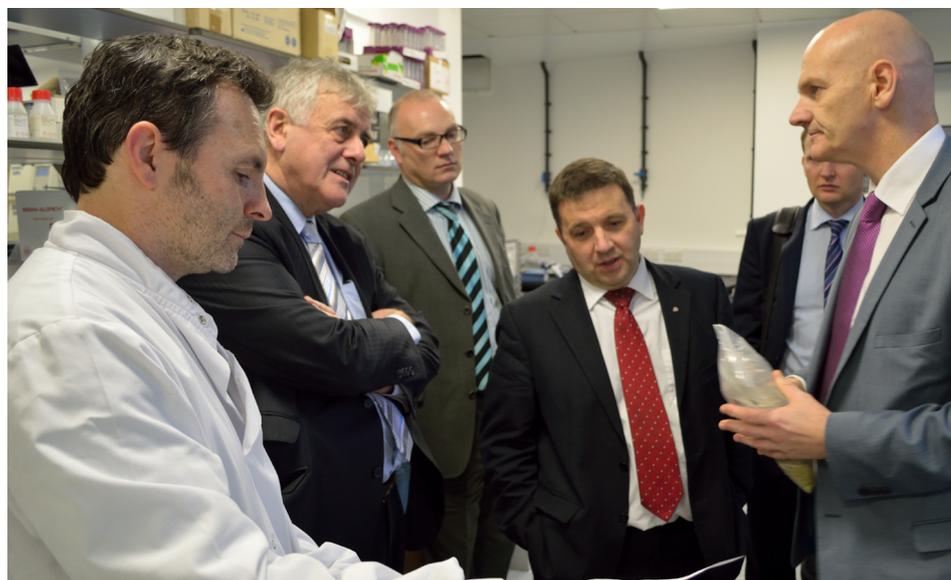
Jim Nicholson MEP and Robin Swann MLA visit the Institute

The Institute for Global Food Security was pleased to welcome Jim Nicholson MEP and Robin Swann MLA of the Ulster Unionist Party to view our lab facilities and hear about the research we conduct and how it impacts on industry and the wider agri-food economy. Discussions also took place regarding the EU's Horizon 2020 funding programme. Speaking after the visit Jim Nicholson MEP, who is a member

of the European Parliament's Committee on Agriculture and Rural Development and Committee on Environment, Public Health and Food Safety said: "Much of my work as an MEP relates to the agri-food industry and given the increasingly complex nature of the food supply chain one of the major challenges facing policy makers and industry alike is ensuring the integrity of the food we eat. The Institute for Global Food

Security at Queen's University Belfast is recognised as a global leader when it comes to developing systems which help to detect food fraud and protect consumers. It was fascinating to meet with the Institute's researchers, to view their facilities and learn more about their pioneering work – the Institute for Global Food Security is a local success story."

Robin Swann MLA who chairs Stormont's DEL Committee added: "Having previously worked in the agri-food industry I was impressed by the range of services developed by the Institute in conjunction with businesses. The innovative work with the Northern Ireland Grain Trade Association and its member companies to develop the Food Fortress scheme, a world leading feed assurance system, is just one example of the Institute's researchers providing practical solutions to problems through collaboration". "The level of demand for these services and for places on the Institute's courses reflects the global reputation the Institute and its researchers have built up in a range of research themes. I want to thank Professor Elliott and the team at IGFS for taking the time to discuss their work with us and wish them well for the future."



Pictured, from left to right, Dr Simon Haughey (IGFS), Jim Nicholson MEP (UUP), Kevin Mulhern (QUB), Robin Swann MLA (UUP) and Prof Chris Elliott (IGFS)

Rice: How safe is it?

The work of IGFS on arsenic and rice was brought into focus through a Channel 4 Dispatches programme shot at QUB, as well as the associated press coverage. These studies highlighted the fact that inorganic arsenic from rice was the dominant source of this carcinogen into the human food-chain, particularly for babies and young children.

What sets rice apart is that it is the only major crop that is grown under flooded conditions. It is this flooding that releases inorganic arsenic, normally locked up in soil minerals, which makes it available for the plant to uptake. Rice has, typically, ten times more inorganic arsenic than other. Chronic exposure can cause a range of health concerns including developmental problems, heart disease, diabetes and nervous system damage. However, most worrying are lung and bladder cancers.

The first food that most people eat is rice porridge, thought suitable for weaning as rice is low in allergens, has good textural properties and tastes bland. As babies



are rapidly growing they are at a sensitive stage of development and are known to be more susceptible to inorganic arsenic than adults. Babies and young children under five also eat around three times more food on a body weight basis than adults, which means that, relatively, they have three times greater exposures to

inorganic arsenic from the same food item. The rice product market for young children, which includes biscuit crackers and cereals is booming. If the child is gluten intolerant then rice breads and rice milks can be added to this list. Gluten intolerant adults are also high rice consumers, as are those people of South-East Asian origin

New ESRC and FSA funded project to tackle global food fraud

Professor Chris Elliott and Dr Moira Dean will lead a £470,000 project on the Analyses of Food Supply Chains for Risks and Resilience to Food Fraud/Crime funded jointly by the Economic and Social Research Council and the Food Standards Agency. The project partners include Professor Jean Allain, Professor Jack Anderson and Dr Brian Jack from the School of Law, Dr Katrina Campbell from IGFS, Dr Alexander Koensler from the Institute for the Study of Conflict Transformation and Social Justice and Dr John Spink from the University of Michigan USA.

As food supply chains have become increasingly global and complex new and challenging risks have emerged. While food fraud is usually considered to be for economic gain, recent cases have highlighted significant food safety concerns. For example, melamine, which was added to milk and infant formula in China, showed how the addition of an adulterant introduced a cancer-causing

toxin into the food chain. Also, fraudulent replacement of authentic food substances with ingredients which is unfit for consumption or different to that described, can also threaten human health. For example, swapping of one fish species with another that may be riddled with contaminants/allergens. In such cases, food fraud can also lead to the reduction in the quality of the end product resulting in lost source credibility, trust and sales, as demonstrated from the UK horsemeat scandal.

The main aim of the project will be to investigate current and future vulnerabilities to fraud and criminality in food supply chains and find ways of improving the collection and exchange of information on food fraud detection so that fraud opportunities and suitable proactive, preventative controls and countermeasures can be identified within a framework of global governance and international political economy.

To do this the project partners will take an interdisciplinary approach to food fraud using theories and methods from psychology, political economy, sociology, anthropology, criminology and law. The innovative approach will foster close collaborations between natural and social scientists, who will utilise the best methods from their respective disciplines to achieve the proposed objectives.



Graduate employment stories from IGFS students

Earlier this year Alice Marks, NPD Customer Relations Manager at Willowbrook Foods and former Graduate from Queen's University Belfast, was nominated and short listed for the very prestigious Food Manufacturing Excellence Awards – Young Talent of the Year Award.

Alice was one of six candidates in the final from the whole of the UK with others being from companies such as Thornton's Chocolate, Hovis, Fresh Olive and Windy Ridge Cheese. This was a fantastic achievement for both Alice as a young professional and for Willowbrook Foods as an established food business in Northern Ireland.

The awards ceremony was held in the Hilton Hotel on Park Lane, Central London on Thursday 20th November 2014. Alice and Managing Director of Willowbrook, John McCann, both attended and although Alice did not win, being short listed and attending the evening was a fantastic achievement in itself.



Roisin McGoran

BSc Food, Quality, Safety and Nutrition with Professional studies

Work experience - During my third year at QUB I completed a 46 week placement with Kerry Foods Coleraine as an R&D undergraduate. Throughout my time I took lead in a number of projects on site developing new products and improving existing products for retailers, foodservice companies and Kerry own brand products. Some of the work I completed involved reducing the sodium content to meet FSA recommendations or developing a new flavour from concept to launch. This required me to develop formulations and complete line trials without adversely affecting the flavour or overall quality of the product. Throughout this experience I developed both product development knowledge and business knowledge. Additionally I learnt about lean processing and how to apply it to every day work within the factory and each individual project. I am really grateful for the experience I got as I discovered a job which I thoroughly enjoy and would greatly recommend taking a year experience to anyone.

Graduate employment - In March 2014 I secured a graduate job with Kerry Foods as part of a two year programme in the UK & Ireland in a RD&A role. I am currently based in Charleville, Co. Cork working within cheese development for both own label and branded products. I am currently working with both processed cheese and natural cheese developing new products and improving existing ones. Throughout the graduate programme I take part in 6 three day long modules with 35 other graduates from a variety of roles learning about the business itself and other roles in the company such as finance, quality and commercial. One module down and I am thoroughly enjoying it.

Process involved - In gaining this position I had to fill out an application form, undertake online psychometric tests and a situational judgement test followed by a telephone interview to determine whether I was a good fit for the company. Finally I had to participate in a two day assessment. This consisted of taking part in group work, carrying out a presentation and taking part in a formal interview before being offered the job. It was a long 6 months but worth it in the end.

Future plans - Continue on the graduate programme and build up as much knowledge and experience as I can. After that who knows!

Work experience - I completed a 16 week placement with M Keys Farms, one of Ireland's top pig producers. My role as Assistant Farm Manager was somewhat varied and challenging as no two days were ever the same. I was responsible for the unit farrowing rooms, stock movement permits and recording and presenting weekly performance to the group Farm Manager. This placement allowed me to hone my practical pig husbandry skills whilst developing my farm business acumen.

Graduate employment - I was successful in securing a Graduate Trainee position with Devenish Nutrition, initially based in Belfast. Once my training was completed, my time was split between extensive on-farm R&D work in both Ireland and England. Now the majority of my time is spent in England as a Commercial Pig Nutritionist.

Process involved - The Devenish recruitment process involved compiling a detailed cover letter and CV of experience and qualifications that I had relevant to a position in animal nutrition. This was followed by an interview and a presentation to senior staff members on an area within pig production and the role of nutrition in that.

Future plans - I aim to continue working as a Commercial Pig Nutritionist, applying the latest research to the commercial environment to drive efficiency of production within the industry



Mark Williams

BSc Agricultural Technology

Invasive Species – can we predict their impacts?

Invasive non-native species continue to cost \$Billions to the world economy and have negative impacts on biodiversity in all major habitats. Locally, invasive shrimp threaten the food base of freshwater fisheries, introduced oysters impact on marine resources, while foreign squirrels and deer destroy trees and crops. A major research priority is thus to develop methods to predict which invaders will have such impacts and under what circumstances. A promising approach has been developed at QUB with other UK, Irish, Canadian, German and South African collaborators. We have taken a well-known ecological principle, that of the 'functional response' curves of organisms (the relationship between resource uptake rate and resource density) and applied this for the first time to predict the impacts of invasive species. Essentially, we have found that the most damaging invaders are characterized by higher functional responses than co-evolved native equivalent species. For example, invasive shrimp from the Ponto-Caspian decimate European zooplankton communities through predation, and this could have been predicted from the fact that their feeding rates can be 20 times higher than comparable native shrimp¹. We also tested the idea in South Africa, where one of the '100 World's Worst Invasive Species', the large-mouth bass, again showed much higher maximum feeding rates as compared to South African native fish². What is emerging is that damaging invaders appear to be quite predictable, an idea that until now had been almost abandoned, since all previous attempts to identify general predictors of invader impact had failed. We are currently extending the technique to other invaders, such as wasps and water weeds in South Africa, and testing the robustness of the patterns to context-dependencies, such as global warming and parasitism. Ultimately, we could be in a position to discriminate between damaging and more benign non-native species and thus help us target resources towards the worst existing, emerging and future invaders. As well as a range of publications, many in top British and American ecology journals (eg *Journal of Animal Ecology* and *Ecological Applications*), our 'comparative functional response' method has attracted funding from blue skies (eg NERC) to applied (eg Waterways Ireland) sources. Jaimie is off to Australia next year to transfer the methodology to the huge problem of invasive species there (eg cane toads that decimate native species) through his University of Sydney International Research Collaboration Award.

¹ Dick JTA et al. 2013 Ecological impacts of an invasive predator explained and predicted by comparative functional responses. *Biological Invasions* 15, 837–845

² Alexander ME et al. 2014 Existing and emerging high impact invasive species are characterized by higher functional responses than natives. *Biology Letters*, 10: 20130946



Invasive Species Fieldwork in South Africa: Post-doc Dr Mhairi Alexander, QUB and Centre for Invasion Biology, Stellenbosch, S. Africa; Prof Jaimie Dick, QUB; Profs Tony Ricciardi, McGill/ Hugh MacIsaac, Windsor. Funded by The Leverhulme Trust and NERC.

Dr Lisa Connolly and Dr Brian Green secure funding for new collaborative project

Dr Lisa Connolly and Dr Brian Green have been successful in a £1.34 million project application to Innovate UK's Crop and Livestock Disease Challenges competition along with Monaghan Mushrooms Ltd and the University of Lincoln.

The project entitled: "Early detection and biocontrol of prevalent diseases of mushrooms and potatoes" will apply cutting edge research tools from the Advanced ASSET Centre at IGFS and will help to solve problems threatening the sustainability of the UK mushroom and potato industries. This industrial impact-led project demonstrates the value of the Institute for Global Food Security working collaboratively with local industry to stimulate and support business-led innovation

Omagh fundraiser for Dementia research

The 'Dazzle in Diamonds' Gala dinner was held in Omagh on October 4th to raise funds for dementia research. Organised by Mary Murnaghan it was attended by more than 133 members of the general public. Omagh solicitor Mary Murnaghan lost her mother to vascular dementia last year and has become fiercely committed to fundraising for research into the disease, and a future cure. Mary dedicated the 'Dazzle in Diamonds' event to Alzheimer's Research UK (ARUK) and well over £13,000 was raised on the night. Speaking at the event Dr Green, who is Chair of the ARUK Northern Ireland Network, said "There is not just a need to raise money for research, but also societal awareness must be increased. We are extremely grateful to ARUK for the funding that we have received. It is pro-active individuals such as Mary who make this possible".

Dr Green also described some of the world-leading research being undertaken within Queen's and IGFS which hopefully in the future will improve the lives of dementia sufferers.

Student and Staff News

Jodie Wilson, a current IGFS third year PhD student, was presented with an award for the best student presentation (second year) at the DARD Annual Postgraduate Seminar on 18th September 2014 (pictured to the right). Louise Warde Hunter, DARD Head of Central Policy Group, chaired the event and presented the award to Jodie. The seminar was held at Greenmount Conference Centre at the College of Agriculture, Food and Rural Enterprise. The audience included industry, government, education and research interests, all of whom added to question time and discussion. Jodie is carrying out her PhD studies under the supervision of Dr Lisa Connolly and on the topic of environmental endocrine disrupting chemicals and water quality

Dr Paul Williams has been awarded a 2014 Excellence in Review Award by Environmental Science & Technology. Paul was the only UK recipient of the award.

Paul has also recently been newly appointed as an Associate Editor for the Journal of Environmental Quality (JEQ) and has also joined the Editorial Board of the Journal of Agricultural Science, Cambridge.

Mary Harty is this year's winner of the Walsh Fellowships seminar and winner of the Royal Dublin Society (RDS) medal for her presentation on *Nitrogen fertiliser formulation: the impact on yield and gaseous emissions*. Mary is supervised by Dr Karl Richards and Dr Patrick Forrestal, Teagasc Johnstown Castle, Dr Catherine Watson and Dr Ronnie Laughlin of the Agri-Food and Biosciences Institute and Professor Chris Elliott.

The Walsh Fellowships is one of the largest postgraduate schemes in Ireland, providing research opportunities for significant numbers of high calibre graduates. The programme has grown in scale and significance since it was launched in Johnstown in 1995. Up to 2,000 postgraduate students have participated in the scheme over the past twenty years.



Above are Prizewinners & Judges at the DARD Postgraduate 2014 Seminar

LtoR Dr Ann McMahon (Judge/DARD Science Advisory Branch), Philip Robinson (Final Year PhD Student with his best final year presentation award), Jodie Wilson (2nd Year PhD Student with her best 2nd Yr presentation award), Dr Lance O'Brien (Judge/ Teagasc Head of Foresight & Strategy Development), Louise Warde Hunter DARD Head of Central Policy Group who chaired the event, Dr Paul Devine (Judge/DARD Science Advisory Branch) & Maria O'Kane (1st Yr PhD Student with her best poster award).

Dr Katerina Theodoridou has joined the Institute as a Lecturer in Farm Animal Nutrition. Katerina obtained her Ph.D. degree in Animal Science, with the specialization on Ruminant Nutrition and Feed Evaluation from National Institute for Agricultural Research (INRA), at Clermont-Ferrand, in France in 2010. Her MSc degree was completed at Wageningen University in the Animal Nutrition group. Previous to working at Queen's she has held Research Fellowship with the University of Saskatchewan at the Department of Animal and Poultry Science in Canada.

Katerina, an animal nutritionist, has research interests oriented around the evaluation of the animal feed nutritive value and animal digestion. Specific interests focus on the mechanisms by which bioactive compounds (i.e. polyphenols, tannins i) contribute to better protein use efficiency by the animal ii) improve quality of animal products (i.e. milk, meat) iii) reduce environmental impact (greenhouse gases). Moreover, research interests include the effect of feed processing and treatments (i.e. heat treatment) on their nutritive value and nutrient modelling by different feed evaluation systems. Some of the techniques and methods that Katerina uses in her research are the advanced synchrotron light based Fourier transfer microspectroscopy (SRFTIRM), the Fourier transform infrared spectroscopy (FTIR) as well as the method of nylon bag (rumen) and method mobile Dacron bag (intestine) for the in situ measurements on ruminants. Also, she uses the in vitro gas production

technique and the in vitro pepsin digestibility assay.

If you have an article, research announcement or staff/student news you would like to see featured in the next IGFS Newsletter then please email Michael Hills at m.hills@qub.ac.uk

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We would like to take this opportunity to wish you all a very Merry Christmas and a Happy New Year

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