

CO-OPERATIVE RESEARCH PROGRAMME FELLOWSHIPS AWARDED FOR 2018

(N.B.: for confidentiality reasons, no names of individuals are given in this list)

Proposed Studies	Research Fellow's Nationality	Home Institution	Destination Country	Host Laboratory	Duration of Fellowship (weeks)
Theme 1 : Managing Natural Capital for the Future					
<p>Achieving productivity growth and protection of natural capital: innovative approaches for translating scientific knowledge</p> <p>The aim of this fellowship is to evaluate innovative ways of translating scientific knowledge into credible and relevant information for farmers to support productivity growth and protect natural capital. The researchers will analyse current and emerging collaborative translation approaches and corresponding policy and governance processes from two contrasting contexts, both of which have a long tradition of supporting farmer decision making and adaptation with robust scientific evidence. The results will help inform EU and UK academic and policy development in agricultural innovation and research, where interest in research translation is becoming more focused on responding to users' needs.</p>	United Kingdom	University of Gloucestershire	Australia	University of Queensland	12
<p>Assessing the use of regulated deficit irrigation techniques in water scarce areas</p> <p>The aim of this fellowship is to investigate the use of a computer model, developed by Castilla-La Mancha University, for developing a more profitable, efficient and sustainable use of irrigation water for the US Southern Great Plains and to assess the economic viability of using regulated deficit irrigation with the model simulation scenarios. Both regions have similar problems in terms of low water availability and high irrigation requirements in semi-arid regions which have a considerable impact on the productivity of the agricultural sector and the regional economies. Sharing solutions and methodologies for facing these problems will be of mutual benefit for both regions.</p> <p>Manuscripts: 1. Schwartz R., A. Dominguez et al. (2019), "A crop coefficient –based water use model with non-uniform root distribution", <i>Agricultural Water Management</i>, Ed. Elsevier, Vol. 228; https://doi.org/10.1016/j.agwat.2019.105892</p> <p>2. Lélis B.C., A. Martínez-Romero, R.C. Schwartz, J.J. Pardo, J.M. Tarjuelo and A. Domínguez (2022), Effect of the optimized regulated deficit irrigation methodology on water use in garlic, <i>Agricultural Water Management</i>, Ed. Elsevier, Vol. 260; https://doi.org/10.1016/j.agwat.2021.107280</p>	Spain	University of Castilla-La Mancha	USA	United States Department of Agriculture (USDA)	6

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<p>3. Dominguez A., R. Schwartz et al. (2022), "Center pivot irrigation capacity effects on maize yield and profitability in the Texas High Plains", <i>Agricultural Water Management</i>, Ed. Elsevier, Vol. 261; https://doi.org/10.1016/j.agwat.2021.107335</p>					
<p><u>Do earthworms compromise the ecological integrity of forested riparian buffer strips?</u></p> <p>This fellowship will assess how forested riparian buffer strips affect earthworm populations and their environmental impacts, with an ultimate aim of providing recommendations for the design of forested riparian buffer zones that would optimise their net GHG balance. The study will look at whether specific vegetation types favour specific earthworm life habits and so whether these earthworm habits have different impacts on soil GHG emissions and soil C sequestration.</p>	Canada	Université de Sherbrooke	Czech Republic	Soil Biology Institute - Czech Academy of Sciences	14
<p><u>Evaluating the contributions of birds as pollinators and pest control agents in forest ecosystems</u></p> <p>Plant pollination and insect pest control provided by birds and arthropods are among the most economically and ecologically important ecological services. Estimates of the value of pollination for food crops by native and introduced pollinators worldwide are in the billions of USD. Likewise, insectivorous birds have been shown to depress insect pest populations and thereby contribute to increased productivity of both native wild plants and agricultural crops. Moreover, a growing list of native wild plants have been shown to decline when bird pollination services are reduced or disappear completely. Healthy bird populations often require some amount of native or less intensively cultivated habitats to support parts of their life cycle. The maintenance of native habitat patches can increase local productivity of adjoining agricultural commodities through the services described above. This project will investigate the role of birds as pollinators and pest control agents within a matrix of intensively cultivated land, planted forest, and native forest.</p> <p>Manuscript: Flaspohler D. and S. J. Smail (2019), "Sodium-rich clay soil geophagy by common redpoll (<i>Carduelis flammea</i>) in New Zealand", <i>Notornis</i>, Vol. 66:98-102.</p>	USA	Michigan Technological University	New Zealand	SCION and University of Canterbury	20

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<p><u>Exploring agri-food-water policy transfer opportunities for improved human health protection under a changing climate</u></p> <p>This fellowship will look at agri-food-water policies designed to reduce environmental exposure to manure-borne pathogens via contaminated irrigation water, private drinking water supplies and recreational waters. The aim is to facilitate knowledge exchange and build resilience to future health challenges under a changing climate while maintaining sustainable and safe catchment-wide agricultural practices and food production.</p>	United Kingdom	University of Stirling	USA	USDA Agricultural Research Service	8
<p><u>“Greening” the pastures: Can New Zealand’s experience with agricultural intensification guide Brazil’s pathway?</u></p> <p>The aim of this fellowship is to help improve agricultural management and expansion practices. The fellow will conduct comparative analyses of the drivers and outcomes of agricultural intensification in New Zealand with a case study previously done of the Brazilian Amazon region. The fellow will conduct a literature review and interviews with all the relevant players in New Zealand. Using this comparative method, the researcher is looking to find the most efficient and sustainable way forward to agricultural intensification to reconcile food production, forest conservation and climate change whilst avoiding unintended environmental and social consequences.</p> <p>Manuscript: Thales A.P. West, K. Gibbs et al. (2020), “Promotion of afforestation in New Zealand’s marginal agricultural lands through payments for environmental services, <i>Ecosystem Services</i>, Vol. 46, 101212, ISSN 2212-0416; https://doi.org/10.1016/j.ecoser.2020.101212</p>	USA	University of Wisconsin-Madison	New Zealand	Motu and University of Victoria	19

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<p><u>Investigating relationships between pasture, soil and management on the North Wyke Farm Platform: implications for sustainable pasture management</u></p> <p>This fellowship aims to develop sustainable pasture management practices and inform future policy in New Zealand, the UK and internationally. New Zealand and the UK rely on resilient pastoral landscapes for economic prosperity. These landscapes are threatened by extreme climatic events and agricultural intensification, leading to degradation of soil and water quality. The research undertaken during this fellowship is needed to understand the interactions between production and the environment better to help develop practices and policy that enhance productivity while protecting the environment.</p>	Australia	AgResearch	United Kingdom	North Wyke, Rothamsted Research	11
<p><u>Mega- and meso-fauna diversity and abundance, and microbial biomass in field-margins and adjacent agricultural grasslands</u></p> <p>This fellowship will investigate the effect of different land uses on soil fauna diversity, abundance and microbial biomass, which are biological indicators of soil quality and ecosystem services. The effect of field-margins adjacent to agricultural grasslands on these indicators and on ecosystems services will be studied to see if their impact is detectable in the grasslands and the relationship of soil biodiversity loss on ecosystem services and intensified agriculture. The research will have implications for agriculture and grassland soil conservation, as soil degradation is continuously increasing due to land use change, increased agricultural activity and global warming.</p> <p>Manuscript: Brevik E., C. Gedeon et al. (2019), "Shelter, clothing, and fuel: Often overlooked links between soils, ecosystem services, and human health", <i>Elsevier, Science of The Total Environment</i>, Vol. 651, Part 1, pp. 134-142; doi.org/10.1016/j.scitotenv.2018.09.158</p> <p>Book: Pereg L., J.J. Steffan, C. Gedeon C. et al (2021), "Medical Geology of Soil Ecology", In: Siegel M., O. Selinus, R. Finkelman (eds), <i>Practical Applications of Medical Geology</i>, Springer International Publishing, Cham, pp. 343-401; https://link.springer.com/chapter/10.1007/978-3-030-53893-4_12</p>	Hungary	ISSAC CAR HAS	USA	Dickinson State University	19

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<p><u>Sustaining biodiversity and ecosystem services in rural agricultural landscapes in a tropical region</u></p> <p>This fellowship will investigate the status of biodiversity and ecosystem services in a specific tropical region and then compare the results with those from other regions. It is anticipated that the research will arrive at a generalised value of biodiversity and ecosystem services through this comparison and thus to an understanding of the common social threats to biodiversity to be shared for facilitating cross-scale and cross-sectoral planning useful for both scientists and policy makers.</p>	Japan	National Institute for Environmental Studies	USA	Stanford University	19
<p><u>Using gender perspectives in small-scale fisheries research to improve policy</u></p> <p>This fellowship will show how the sustainability of European and Japanese small-scale fisheries and fishing communities can be enhanced through the use of a women and gender perspective. The role that women play in small-scale fisheries is often overlooked in small-scale fisheries research and practice. Understanding women's contribution is important for improving governance and the future of small-scale fisheries. The research results from this fellowship will have direct policy implications.</p>	Japan	National Fisheries University	Denmark	Aalborg University	18
Theme 2: Managing Risks in a Connected World					
<p><u>A global assessment of the impacts and risk-based management of farmed exotic fish escapes on marine ecosystems</u></p> <p>This fellowship aims to conduct a global assessment of socio-economic and ecological impacts of fish escapes from aquaculture fisheries on marine ecosystems and to identify opportunities for improved management of aquaculture fisheries. The researchers intend to produce a global map of the vulnerability of marine ecosystems to the impact of exotic fish escapes aquaculture. Exotic fish escapes from aquaculture fisheries are a major threat to marine ecosystems and wild fisheries. Significant</p>	New Zealand	Cawthron Institute	Spain	Universidad de Alicante	18

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<p>escape events are increasingly common, giving rise to economic losses, but there is a lack of knowledge on the interactions between fish escapes and the environment – such as genetic interactions, transfer of pathogens, predation and habitat alteration – and effective mitigation measures. The results of this fellowship will help identify efficient management practices that minimise the risks from exotic fish escapes.</p> <p>Manuscript: Atalah J. and P. Sanchez-Jerez (2019), “Global assessment of ecological risks associated with farmed fish escapes”, <i>Global Ecology and Conservation</i>, Vol. 21; doi.org/10.1016/j.gecco.2019.e00842</p>					
<p><u>Alternative models for biosecurity surveillance and monitoring</u></p> <p>This fellowship will look at developing phytosanitary surveillance models to address strategic questions about biosecurity risks to help prevent invasions of non-native plant pests. Given the costs of dealing with the damage caused by non-native invasive species, effective surveillance at borders and ports of entry is critical to slowing the spread of such pests. Currently, most phytosanitary surveillance consists of 600 random examples from an individual consignment being selected and inspected for biosecurity risk material (BRM). The research undertaken aims to develop conceptual and analytical models to address strategic questions about BRM on entire pathways beyond individual consignments. The outcomes will provide more cost-effective and information-rewarding surveillance practices that could be deployed internationally, as well as supporting ongoing discussions about improvements to the International Plant Protection Convention (IPPC) International Standards for Phytosanitary Measures (ISPMs).</p>	USA	University of New Hampshire	Australia	Centre of Excellence for Biosecurity Risk Analysis, University of Melbourne	8

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<p>Combining historical records and species distribution modelling to evaluate directionality on species introductions along the Atlantic Coasts (confidential report)</p> <p>The modern world is increasingly interconnected by human activities such as transportation of goods, agriculture or aquaculture. These activities are responsible for the intentional or unintentional introduction of non-indigenous species to distant regions around the globe. A number of these introduced species eventually become invasive and negatively impact local economies and ecosystems. Along coastal areas, marine non-indigenous species are often transported via shipping, impacting on biodiversity and resulting in substantial economic loss. This fellowship project assessed large-scale patterns of marine species introductions along the temperate coasts of the North Atlantic Ocean. The overall aim was bi-fold: to unravel their causality and to enhance the predictability of future introductions. The main objective of the project was to understand the current distribution of marine non-indigenous species and to predict future range shifts. The time period considered comprised the past 500 years and the focus was on all marine taxa. We used a combination of methods that included the most detailed literature review to date of the study region, and the use of all available occurrence data to run species distribution modelling analyses. The results showed a marked directionality in species introductions along the Atlantic coastline, leading to an asymmetry in the number of species introduced on both sides of the Atlantic. Despite centuries of intense shipping traffic across the Atlantic, certain regions remain significantly less invaded than others. In addition, our modelling approach indicated that for several non-indigenous species (including some highly invasive taxa) suitable geographic areas remain invasion free. Thus, these areas have been identified as potential regions where these particular species may be introduced in the near future. This research project has provided a diagnostic framework that permits both an understanding of the spatiotemporal patterns of species introductions of a particular region, as well as an evaluation of the regional knowledge of the magnitude of species introductions. Our approach is versatile and can be applied to other geographic regions and ecosystems, both to drastically improve the regional understanding of species introductions and to predict future changes in the distribution of nonindigenous species. This research has advanced fundamental knowledge in invasion science and has the potential to benefit local / regional stakeholders interested in marine biosecurity and the management of natural resources.</p>	United Kingdom	University of Southampton	United States	Marine Invasions Research Laboratory, Smithsonian Environmental Research Centre	9

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<p><u>Functional genomics of <i>Tetranychus urticae</i> host adaptation</u></p> <p>The <i>Tetranychus urticae</i> (TSSM) is the two-spotted spider mite, a highly significant agricultural pest which feeds on over 1 100 plant species including more than 150 crops worldwide. TSSM outbreaks and crop damage are increased under high temperatures and drought stress – which climate change will exacerbate – will cause the host range and the geographical area of economic damage to be widened. TSSM is also highly resistant to pesticides, making its control extremely difficult. This fellowship will use genetic and genomic methods to identify the genes associated with TSSM host adaptation. This information will be an invaluable resource for developing new targets for mite control. It will also demonstrate how the genetic and genomic methods can be applied to the vast array of other important pests that will develop because of climate change.</p>	Canada	University of Western Ontario	Spain	CNAG, centre nacional d'anàlisi genòmica	19
<p><u>Sustainable food and nutrition: Policies and practice to reduce risks to food security by enhancing food system resilience</u></p> <p>This fellowship will undertake a comparative analysis of agricultural, food and natural resource management policies and practices in Australia and the UK to enhance food system resilience. Risks to agricultural and other food system activities are rapidly increasing due to changes in climate and associated weather extremes, demography, diets, trade arrangements and geopolitics. These risks threaten to undermine food and nutrition security. The researchers will take a food systems approach to analyse and compare Australian and UK agriculture, food and natural resource management policies and practices with the aim of enhancing food systems so as to deliver nutrition security outcomes in a more resilient and sustainable way.</p>	United Kingdom	University of Oxford	Australia	Global Change Institute, The University of Queensland	16

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<p>The economic impact of climate change on agriculture: a meta-analysis taking adaptation into account (<i>Confidential report</i>)</p> <p>Current changes of temperature and precipitation already impact agricultural land use and productivity with major consequences for food security. Climate change and climate variability pose significant risks to the sustainability of farming globally. Numerous crop modeling studies estimate the (economic) impact on agriculture. In addition, meta-analyses of climate impact on crop yields have been made. Unfortunately, crop modelling only takes the direct effect of climate on individual crops into account and not how climate affects the climate-sensitive choices of farmers. The Ricardian method, estimating a long-run relationship between agricultural land value and climate, does consider the adaptation of farmers. Globally, over 30 Ricardian studies have been performed and 32 studies (covering 53 nations) were identified where the marginal impact of temperature can be compared (% impact on land value or net revenues of 1°C increase). A data-table to support a meta-analysis has been developed.</p>	Belgium	University of Antwerp	Canada	University of Waterloo	10
<p><u>Translational research in response to international emerging cereal rust disease threats</u></p> <p>This fellowship is expected to deliver genetic resources that could be used to mitigate the international risk of the emerging Ug99 threat to wheat. Ug99 is a virulent stem rust pathogen to which the majority of commercial wheat varieties worldwide are vulnerable. Not only is it spreading rapidly across Africa and the Middle East, but it is also evolving and becoming more virulent even against those commercial varieties of wheat that were formerly resistant to it. It is thus becoming an imminent threat to wheat production areas in South Asia and Europe. The researchers will be examining how to link blocks of Ug99 resistance genes that could be used in wheat breeding to develop wheat varieties with multigenic and better resistance. They will expect to deliver resistance gene deployment guidelines for variety release committees, the seed industry, crop scientist and international and government policy makers to help the effective management of emerging crop disease risks.</p>	USA	USDA-ARS	Australia	University of Sydney	10

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Theme 3: Transformational Technologies and Innovation					
<p><u>De novo genome assembly and comparative genomics of somatic variants adaptable to climate change for cultivar innovation in grapevine</u></p> <p>Grapevines are an economically significant crop for a lot of OECD countries, but the sustainability of viticulture is threatened by climate change more than many other crops, and rising temperatures and drought episodes in traditional winegrowing regions have already begun to alter grapevine physiology, often leading to a decline in wine quality. This research project aims to identify for the first time the genetic mutations that lead to climate change adaptable features so the beneficial natural grapevine genetic resources can be exploited to adapt appreciated traditional cultivars to more extreme future conditions using sustainable agro-ecosystems.</p>	Spain	Consejo Superior de Investigaciones Científicas (CSIC9)	Germany	Max-Planck-gesellschaft zur forderung der wissenschaften	19
<p>Novel development of in vitro bioassays for testing and optimisation of unique interventions to mitigate complex diseases in honey bees (<i>Confidential report</i>)</p> <p>Continued decline of bee health coupled with a paucity of host-derived cell lines points to a need for development of new, and expansion of existing, <i>in vitro</i> systems composed of bee (host) cells. Establishment of these systems can form the basis for testing novel therapeutics against complex pathogens such as viruses and parasites frequently found at high levels in bee colonies. This need served as the impetus for the establishment of a long-term collaboration between the fellow (USA) and host institution (Ireland). A method for long-term culture of bee cells will be replicated at the host institution (Athlone Institute of Technology; AIT). <i>In vitro</i> culture of bee cells will then be used in bioassay development for testing bioactive compounds against bee pathogens using host-derived cells. The collaboration will positively influence sustainability in agriculture and ecosystem service management through increased pollinator health.</p>	USA	University of Minnesota	Ireland	Athlone Institute of Technology	14

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<p><u>Reconstruction of plant antiviral DICER functions in cell-free extracts and in the heterologous system <i>Saccharomyces cerevisiae</i></u></p> <p>This fellowship aims to identify and disclose the mechanisms of activity of plant core proteins (DICERs) that convert double stranded RNA of viral origin into viral silencing RNAs (siRNAs) – the main antiviral RNA molecules in plants. The researchers will go on to develop optimal systems that could be translated into applications for the massive and cost-effective production of natural antiviral molecules to be used for sustainable plant protection measures in agriculture. This will help countries reduce their reliance on pesticides for crop protection.</p> <p>Manuscript: “Highly efficacious antiviral protection of plants by small interfering RNAs identified in vitro”, <i>Nucleic Acids Research</i>, doi.org/10.1093/nar/gkz678</p> <p>Article in <i>Science</i>: New “medicine” could vaccinate plants against devastating viruses</p>	Italy	Institute for Sustainable Plant Protection	Germany	Institute of Biochemistry and Biotechnology-Section Microbial Biotechnology-Martin Luther University Halle-Wittenberg	8
<p><u>Using bio-economic modelling and circular economy in optimising agri-food waste reuse</u> (<i>Confidential report</i>)</p> <p>This fellowship aims to identify and develop a prototype computer mode for optimising waste reutilisation in agri-food sectors for eco-efficiency and bioeconomy, by using bioeconomic modelling and circular economy strategies. The agri-food sector will be evaluated for its environmental footprints and waste generation to determine the measure to avoid inefficient operations. Waste characterisation will be done to identify the circular economy strategy options to use. The fellowship project will focus in particular on the bioenergy and biochemical production potential and biomass efficiency with bioeconomic modelling, which will be modified for systems modelling to determine the appropriate measures to mainstream the reuse strategies in the agri-food sector.</p>	Canada	University of Queensland	United Kingdom	Exeter University	12