

## CO-OPERATIVE RESEARCH PROGRAMME FELLOWSHIPS AWARDED FOR 2016

(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)
<b>Theme 1 : The National Resources Challenge</b>					
<p><a href="#"><u>Appropriate combination of forest management options for the mitigation and adaptation to climate change</u></a></p> <p>This project will use “Bayesian methods” for identifying forest management scenarios for Finland and Japan that are appropriate for mitigation and adaptation to climate change. Highly modern computing methodology will be applied and the work will focus on calculating carbon fluxes.</p>	JPN	Forestry and Forest Products Research Institute (FFPRI)	FIN	Natural Resources Institute Finland	16
<p><a href="#"><u>Conserving multifunctional landscapes: trends in grazing and habitat conservation in New Zealand</u></a></p> <p>This project will study how the changes in the arrangement of property ownership and governance, ecological changes and economic pressures affect pastoral agriculture and the habitat of species in need of protection in New Zealand.</p>	USA	University of Wisconsin-Madison	NZL	Lincoln University	10
<p><a href="#"><u>Developing a unique integrated approach to predicting fisheries recruitment</u></a></p> <p>This project will develop a predictive tool based on information of the biology of lobster and remote sensing data to be used for recruitment of the eastern Australian lobster fishery. The tool will be directly relevant for fisheries management and, although focusing on Australian lobster, the methodology has potential applications elsewhere. The project will be carried out in close contact with the end-users of the tool which will, if the work is successful, allow the rapid transfer of the tool into practice.</p>	NZL	University of Auckland	AUS	University of New South Wales, and Sydney Institute of Marine Science	12
<p><a href="#"><u>Developing prescription maps from synthetic aperture radar imagery for variable rate irrigation</u></a></p> <p>This project will study and develop methods for using Synthetic Aperture Radar (SAR) satellites data to produce variable rate irrigation (VRI) maps to improve water use efficiency to help farmers know when and at what rate water should be applied to their crops, by bringing together the two technological innovations of SAR and VRI.</p>	CAN	Agriculture and Agri-Food Canada	CHL	Instituto de Investigaciones Agropecuarias (INIA) de Chile	12

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<p><a href="#"><u>Development of indicators of forest management sustainability based on remote sensing and image processing</u></a></p> <p>The aim of this study is to develop indicators on the status of the Chilean forests based on remote sensing data and to transfer them into national forest monitoring programmes. Although the indicators are developed for Chilean forests, both the indicators and the methodology developed for deriving the indicators could have wider use in other OECD countries.</p>	CHL	Universidad de Chile	USA	University of California, Berkeley	16
<p><a href="#"><u>Forest management system for enhancing adaptation to climate change among small-scale forest owners</u></a></p> <p>The aim of this study is to provide a scientific basis for the design of an effective forest management system to enhance adaptation of SSFOs to climate change. More specifically, key factors and conditions required for an effective management system will be identified through a comparative socio-empirical study of the German and Japanese forest management systems.</p>	JPN	Forestry and Forest Products Research Institute	DEU	Forest Research Institute Baden-Wuerttemberg	19
<p><a href="#"><u>Improving models for describing phosphorus cycling in manure-amended soils</u></a></p> <p>The overall objective of this project is to modify Erosion-Productivity Impact Calculator (EPIC) to account for P cycling in manure-amended soils and to use it as a tool for optimising P fertilisation and reducing P leaching into waters.</p>	USA	USDA-ARS	SWE	Swedish University of Agricultural Sciences	8
<p><a href="#"><u>Measurement and modelling of fruit vascular functioning for optimization of irrigation during fruit production</u></a></p> <p>The aim of this project is to study the physiological response mechanisms during the development of kiwi fruit under different irrigation regimes, to understand better how reductions in irrigation water affect fruit development, size and quality. The results should be useful for developing guidelines for growers on irrigation best practice and to minimise over-irrigation and nutrient loss. The results can also be more widely applied to understanding the responses of plants to water availability.</p>	ITA	University of Basilicata	NZL	School of Science - University of Waikato	12

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<p><a href="#"><u>Now you see it and now you don't: developing multidimensional models of soil salinity and water status</u></a></p> <p>Salinity is a global threat to agricultural productivity. The fellow and the host collaborator propose developing the models needed for producing 2-3-4 dimensional electromagnetic conductivity images that can be calibrated to map salinity and soil water which can be used to monitor impacts of irrigation and rainfall and indicate where improvements can be made to mitigate salinity, maximise soil water availability and minimise soil erosion and off-site water contamination which are problematic in irrigated areas of Spain.</p>	AUS	The University of New South Wales	ESP	IFAPA, Centro Las Torres-Tomejil	18
<p><a href="#"><u>Potential impact of climate change on toxin producing pathogens <i>Fusarium graminearum</i> and <i>F. pseudograminearum</i> challenging our food security</u></a></p> <p>This collaboration will analyse the effects of climate change on the vitality of <i>Fusarium graminearum</i> and <i>F. pseudograminearum</i> on <i>fusarium</i> head blight and crown rot, which are serious plant diseases damaging wheat. This will be important strategic research in a narrow scientific field which potentially has significant practical and economic applications.</p>	CAN	University of Manitoba	AUS	University of Southern Queensland	24
<p><a href="#"><u>Scaling Coupled Carbon, Nitrogen and Phosphorus Transport in Agricultural Watersheds</u></a></p> <p>This project addresses a critical issue in agricultural landscape sustainability through an improved process-based understanding of soil-water interactions that will allow for more appropriate management of land use and water quality at the catchment scale and will be used to improve modeling. It will determine the Carbon:Nitrogen:Phosphorus ratios in soils and waterbodies and algorithms will be developed to update the widely used Soil and Water Assessment Tool (SWAT) model. The results will be used for evaluating the potential to influence water quality, contributing to solving water pollution problems and to more efficient use of fertilizers and soil resources.</p>	USA	USDA-ARS	GBR	Centre for Ecology and Hydrology	8
<p><a href="#"><u>The use of straw and litter mulch to control soil and water losses. Laboratory approach</u></a></p> <p>This research will test the applicability of straw and litter mulch to reduce erosion losses from Mediterranean soils by doing laboratory simulations during the visit to the host laboratory. Erosion is a key environmental issue and this research will contribute to its mitigation by developing new methodologies and guidelines.</p>	ESP	University of Valencia	NLD	University of Wageningen	16

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<b>Theme 2: Sustainability in Practice</b>					
<p><a href="#"><u>Holistic grazing management as regenerative agriculture – a Falkland Islands case study</u></a></p> <p>This research will add a Falklands case study to ongoing work in Australia and Canada about holistic grazing management as an adaptive practice, for native vegetation restoration, farm production and resilience to climate uncertainty. Holistic management (HM) is an approach to grazing decision-making based on explicit goal-setting and careful monitoring, often characterised by native pastures and high-intensity but short-duration rotational grazing. Science is divided on its utility. To date, farmer perceptions have been neglected, but also untested in appropriate ways. We will run qualitative interviews as farm tours – stratified by grazing practice – to reveal producer perceptions of their landscape and climate, how these drive management decision-making, and how they align with land cover, farm outcomes and scientific evidence.</p>	CAN	Dalhousie University	GBR	South Atlantic Environmental Research Institute	4
<p><a href="#"><u>Integrated Pest Management of New Invasive Pests</u></a></p> <p>The aims of this fellowship are to establish collaboration on invasive pests such as <i>Drosophila suzukii</i>, which is established in California and Spain, <i>Halyomorpha halys</i>, which is rapidly establishing in California but not present in Spain, and <i>Tuta absoluta</i>, present in Spain and expected to invade California. The applicant also anticipates contact with members of the "UC IPM Program" to study how innovative control solutions for pests and diseases that may be a threat for Spanish and European agriculture are implemented in practice (e.g. for <i>Xylella fastidiosa</i>, the huanglongbing disease and their vectors). Invasive alien species are a major cause of biodiversity loss worldwide and produce serious damage to crops. The economic losses associated to these damages and the lack of sustainable strategies to manage the pest often leads to an increase in pesticide usage. This, in turn, causes distortion in the already established IPM programs and clearly damages the biodiversity associated with agricultural landscapes (farmland biodiversity).</p>	ESP	IRTA	USA	University of California, Davis	12

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<p><a href="#"><u>Optimising the delivery of crop pollination ecosystem services in apple orchards</u></a></p> <p>Worldwide, nectar-feeding insects contribute to biodiversity as well as the provision of ecosystem services within agriculture, such as pollination. While many growers rely solely on honeybees for pollination, both wild bees and naturally occurring "non-bee" pollinators (i.e. flies, beetles, moths, butterflies, wasps and ants) are increasingly being recognised as effective pollinators of food crops globally. Non-bee pollinators do not have the critical mass of scientific study to underpin the importance of their role despite their demonstrable contribution to crop production in a few systems (Rader <i>et al.</i> 2009). Indeed, wild pollinators can perform equally well or better than honeybees in some crops. This project will investigate knowledge gaps concerning the diversity and level of specialisation of pollinators in apple orchards and, the use of suction traps to identify changes in the phenology and abundance of non-bee pollinators.</p>	AUS	School of Environment and Rural Science, University of New England	GBR	Rothamsted Research	6
<p><b>Towards more Effective and Efficient Agri-Environmental Schemes - An Empirical Analysis for Norway</b></p> <p>This research project aims to measure and enhance the effectiveness and efficiency of agri-environmental schemes in OECD countries. Using the example of Norway the focus is on a country with a very unique agricultural structure and a specific policy framework. Based on quantitative statistical and econometric modelling applied to sound microeconomic behavioural models, farm level and additional environmental data will be used to shed empirical light on farmers' production and land management behaviour as a response to agri-environmental measures aiming to increase sustainability. Policy recommendations will be drawn for agri-environmental policy schemes in other OECD member countries with a similar agricultural setting.</p>	DEU	Technical University of Munich	NOR	University of Bergen	17
<p><a href="#"><u>Understanding the role of land tenure in producing sustainable outcomes: comparative case studies from Scotland and Norway</u></a></p> <p>Sustainable land management takes place within a context of ownership models. Private land ownership is the dominant model within much of the neoliberal global north, not least in Scotland and Norway. This research project questions how land tenure determines outcomes for sustainable land management, using historic case studies from Scotland and Norway, and is highly relevant for policy in investigating the relationship of land ownership to sustainability.</p>	GBR	The James Hutton Institute	NOR	The Centre for Rural Research, Norwegian University of Science and Technology	9

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<b>Theme 3: The Food Chain</b>					
<p><a href="#"><u><b>Ancient ovine DNA: telling the past to assess the impact of domestication</b></u></a></p> <p>This fellowship will investigate the impact of domestication on sheep and goats by obtaining and comparing whole genome sequences of ancient and present-day animals. The data will then be used to investigate the evolution of genomic regions involved in adaptation to environmental conditions. In the face of climatic change effects over wild and livestock populations, the results obtained will allow new selection criteria to be established for sheep populations to identify more robust animals, better adapted to future adverse conditions (harsh climate, scarce feeding resources, etc.), and the genetic ability of wild species to cope with new environmental challenges to be determined.</p>	ESP	INIA	ITA	Parco Tecnologico Padano	6
<p><a href="#"><u><b>Evaluation and characterisation of multi-pathogen resistances promoted by wheat WRKY45 gene to develop novel disease control in wheat</b></u></a></p> <p>Wheat is an important crop in many areas across the world, and the stable and increased production of wheat continues to be pivotal for global food security. To minimize yield loss, effective disease control is essential and urgent. This fellowship focused on the use of the gene for transcription factor, TaWRKY45, which can promote the multi-pathogen resistances in wheat. The knowledge gained from this study will be crucial in developing new crop varieties with improved stress tolerance and yield potential, which will provide economical ways for wheat production, as an alternative control that has a potential to substitute chemicals.</p>	JPN	National Institute of Agrobiological Sciences	AUS	CSIRO Agriculture	10

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<p><a href="#">Focus on zinc function in oocyte development to improve reproductive performance in dairy cattle</a></p> <p>Dairy cow fertility is a priority for economical sustainability of modern dairy farming in Europe and worldwide. One of the main factor that limit the reproductive outcomes is the poor quality of the oocytes together with the inability of current in vitro culture systems to support oocyte development. These findings suggest that defining the factors and mechanisms that contribute to oocyte quality is essential for improving female fertility. The proposed research will consider the zinc as one of the essential players in the process of oocyte competence acquisition. Although a relationship between zinc deficiency and infertility in dairy cows has been known from many years the molecular basis of this relationship are still unknown and zinc modulation during oocyte in vitro culture has not been yet optimized. The present project will define the importance of oocyte zinc modulation in the establishment of the oocyte epigenome in bovine, during a critical step of the oocyte growth, i.e when its developmental programme is determined.</p>	ITA	University of Milan	CAN	Université Laval	16
<p><a href="#">Increasing sustainable production of safe and abundant wheat through cytoplasmic engineering</a></p> <p>The long-term goal of this research project is to develop wheat lines with substantially improved stress tolerance and increased yield to feed a growing population under changing environmental conditions. The research team will take advantage of the vast collection of wheat alloplasmic lines (lines with alien cytoplasm) and genomics tools to identify cytoplasmic genomes and interacting nuclear genes that greatly increase biotic stress tolerance and yield potential; investigate the molecular mechanism(s) underlying this change; and initiate introgression of critical cytoplasm into modern wheat cultivars.</p> <p><b>Manuscript:</b> "Optimization and Comparative Analysis of Plant Organellar DNA Enrichment Methods Suitable for Next-generation Sequencing", <i>Journal of Visualized Experiments</i> (125), e55528; <a href="https://doi:10.3791/55528">https://doi:10.3791/55528</a></p>	USA	USDA-ARS	JPN	Kobe University	4
<p><a href="#">Investigations on the potential role of pigs in Ebola virus outbreaks</a></p> <p>This project is aimed at completing earlier studies on the susceptibility of pigs to various Ebola virus strains. This research area is very relevant, given the important implications that Ebola outbreaks have in human health. While Ebola has not had a significant direct impact on agriculture, the ability of livestock to act as carriers of the virus, and even suffer from the disease, constitutes an important aspect that needs to be addressed. The work will support a risk assessment for Ebola virus disease in Ugandan pigs by serological analysis.</p>	DEU	Friederich-Loeffler-Institut	CAN	National Centre for Foreign Animal Disease, Canadian Food Inspection Agency	12

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<p><a href="#"><u>Maximising oocyte developmental potential in cattle: The contribution of progesterone regulation</u></a></p> <p>This project focuses on the role of progesterone and progesterone receptors on follicle development and oocyte maturation in cattle. The research may lead to increased efficiency in animal production and to the improvement of tools for the preservation of endangered animals.</p>	IRL	University College Dublin	ITA	University of Milan	26
<p><a href="#"><u>Mixed infections of plant viruses: relationships among pathogens, vectors and hosts</u></a></p> <p>This proposal aims to identify previously unnoticed effects on the genetic resistance traits against viruses, or on the dissemination parameters, during mixed infections. The project will study plants infected simultaneously by two different viral pathogens to learn how the mixed infections can influence the virus dissemination parameters, and the resistance/susceptibility responses of the plants. The presence of multiple viruses might affect host plants more than each pathogen individually, but the current knowledge about relationships between viruses, vector organisms and host plants is quite limited. Benefits for the agricultural production and food security can be envisaged in the long term by considering the results in the design of control strategies against severe disease infections.</p>	ESP	CRAG	USA	The Pennsylvania State University, Centre for Infectious Disease Dynamics	26
<p><a href="#"><u>Molecular dissection of viroid pathogenesis in tomato by comparative high-throughput degradome analyses to develop innovative protection strategies</u></a></p> <p>Plant diseases caused by viroids are an important threat for which much research is needed. This project aims at identifying effects of viroid infection on host RNAs by a genome-wide approach (degradome analysis). The data obtained can be exploited to develop novel defense strategies against potato spindle tuber viroid (PSTVd), which is a quarantine pathogen that may cause relevant economic losses in potato and tomato crops, and to identify novel tolerant or resistant plants to be used directly in the field or as genetic source for breeding programmes.</p>	ITA	Consiglio Nazionale delle Ricerche	ESP	Instituto de Biologia Molecular y Celular de Plantas (UPV-CSIC)	12



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<p><a href="#"><u>Public perceptions of invasive species management for local products</u></a></p> <p>Invasive species in agriculture are a rising concern worldwide. This study focuses on public perception of measures to control invasive species and its relationship to the food chain in the context of local food systems. It involves measuring consumer valuation and consumer preferences of sustainable practices for the management of invasive species, and the results should shed light on market-based incentives to promote the adoption of sustainable strategies to manage invasive species, as well as highlighting additional environmental impacts of local food chains.</p>	USA	Cornell University	ESP	Centro de Investigación y Tecnología Agroalimentaria de Aragón	24
<p><a href="#"><u>Temporal co-regulation of pathogenesis in <i>Phytophthora</i></u></a></p> <p><i>Phytophthora infestans</i>, the causal agent of potato late blight, is believed to cause annual losses worldwide surpassing USD 6 billion, or approximately 15% of the overall production of potato. It also infects tomato, another globally economically important crop. This research project aims to gain insight into the mechanisms of pathogenicity of <i>P. infestans</i> using novel methodologies such as microarray analysis, and to provide the basis for the development of new technologies and strategies for detection, diagnosis, and treatment of plant diseases. Specifically, this project aims to provide potato and tomato growers, and agrichemical and agribiotechnology companies with much needed pre-competitive knowledge to develop novel approaches to curtailing the devastating effects of late blight and other diseases. With the availability of alternative methodologies to combat this crop disease, new policies can be implemented and food security can be enhanced. Most importantly, traditional control measures such as applications of existing fungicides and other pesticides can be decreased.</p>	USA	Lafayette College	GBR	The James Hutton Institute	16
<p><a href="#"><u>Uncovering the genetic basis of virulence in <i>Puccinia coronata</i> via an intercontinental comparative genomics approach</u></a></p> <p>This study looks at a common problem of oat – a prevalent pathogenic fungus that is the causal agent of oat crown rust disease – which impacts oat production severely around the world, with the goal of understanding the basis for the evolution of the virulence of the pathogen. The pathogen populations are highly genetically diverse and the mechanisms for generating and maintaining this diversity are unknown. The diversity presents problems for oat breeders since new resistance genes are rapidly rendered ineffective by pathogen evolution, and this erosion resistance leads to unacceptably high rates of fungicide use.</p>	USA	University of Minnesota	AUS	CSIRO-Agriculture	10

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<p><a href="#"><u>Unraveling root microbiome functions that sustainably stimulate plant growth and health</u></a></p> <p>In natural and agricultural ecosystems, the soil environment greatly influences plant health and productivity. In the soil, the root microbiome provides important services to the plant as they enhance root architecture, aid in nutrient uptake, alleviate abiotic stress symptoms, and provide protection against pests and diseases. The meaningful use of beneficial soil microbes presents a largely untapped resource that holds great promise to sustainably improve food security. This research project will elucidate biological mechanisms underlying plant-beneficial functions of the root microbiome and its outcomes will foster a detailed understanding of the intrinsic capacity of plants to maximise both growth-stimulating and disease-protective functions of the root microbiome, and provide novel tools for sustainable agriculture and resistance breeding of economically relevant crop species.</p>	NLD	Utrecht University	AUS	University of Queensland	18