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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>Accelerating locally-developed freshwater management practices across global growing regions through innovation ecosystems</p> <p>This project investigates co-operatives' role in supporting the accelerated adoption of freshwater management practices across globally dispersed growing regions. Previous work indicates that co-operatives can coordinate the search for and implement innovative solutions for sustainable development by shifting innovation from an isolated to a collective effort. Farmers' accelerated adoption is essential to improving freshwater management practices and mitigating the anticipated effects of climate change. How key stakeholders can assist local producers towards adoption while maintaining viable businesses in global value chains is crucial. Comparative analysis of Chilean, Italian, and New Zealand kiwifruit regions visualises any existing direct and indirect linkages in the global innovation ecosystem that accelerate innovation across globally dispersed growing regions.</p>	New Zealand	University of Auckland	United Kingdom	University of Glasgow	6
<p>Cost-effective controls for mitigating agricultural soil N₂O emissions: Opportunities and uncertainties</p> <p>The aim of this research is to investigate the cost-effective control strategies to mitigate agricultural soil nitrous oxide (N₂O) emission at least cost by considering the spatiotemporal heterogeneity and uncertainties in N₂O estimation methods. Agricultural soil N₂O emissions accounted for nearly 90% of the global anthropogenic emission increase since 1980, implying a huge GHG mitigation potential in agriculture sector while providing food, fiber and fuel. The mitigation targets can be achieved with least economic costs and divergent effort priorities among countries. This research will identify and quantify the cost-effective N₂O mitigation options by combining process-based model-ensemble estimations, an integrated modelling tool (GAINS, developed by the International Institute for Applied System Analysis-IIASA) and global database of crop nitrogen budget.</p>	China (Work country: USA)	Iowa State University	Austria	International Institute for Applied System Analysis-IIASA	16

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<p>Developing a mountain peatland restoration manual: combining lessons from the UK and the USA</p> <p>The degradation of ecosystems undermines the well-being of 3.2 billion people and costs about 10% of the global gross domestic product. Ecosystem restoration is fundamental to reversing those losses and achieving global sustainability goals. Peatlands contain a disproportionate amount of earth's soil carbon, but this carbon is easily degraded. Mountain peatlands are numerous but experience many disturbances. However, there is little information available to practitioners to restore mountain peatlands because most peatland restoration projects have occurred in flat boreal regions and these techniques do not transfer to steep mountain peatlands. I aim to develop a mountain peatland restoration manual by using my experience and incorporating knowledge from other scientists across Europe and the UK.</p>	USA	Michigan Technological University	United Kingdom	University of Highlands and Islands, Environmental Research Institute	26
<p><u>Ecological rhizosphere management for enhanced nutrient efficiency, stress resilience and biodiversity in sustainable agro(ecosystems)</u></p> <p>Nutrient acquisition in plant communities is mediated by a complex interplay between species-specific processes in the rhizosphere governing the chemical speciation of sparingly available element forms in concert with element fluxes between intermingling meta-rhizospheres. Since 6000 BC, agriculturalists rely on these root-mediated processes, which form the basis for mixed-cultures and crop rotation practices to reduce reliance on one set of nutrients and sustain soil fertility. However, at the current time, mechanistic knowledge on the effects of these cropping systems on the whole spectrum of plant nutrients, including beneficial elements and the ecological consequences on the plants' stress resistance, is very scarce, but if proven, this would have major implications for the development of sustainable cropping systems in the face of climate change and finite fertilizer (phosphorus) resources. In the proposed project, this hypothesis will be rigorously tested by combining two greenhouse experiments with a field experiment to explore novel mixtures and rotation practices based on data on rhizosphere chemistry, interspecific root interactions, and molecular stress resilience processes. This includes a trait-based plant screening of selected cultivars/genotypes of six agricultural relevant legume species, cereal and bioenergy crops regarding their root morphology, the release of element solubilising metabolites, and the plants' responses to different combinations of stress (drought, nutrient deficiency) in presence or absence of silicon. The most promising species will be tested in the</p>	Germany	TU Bergakademie Freiberg	France	Institut Polytechnique, AGHYLE, UniLaSalle	26

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<p>greenhouse and the field to compare element-fluxes and stress resilience processes of mixed-cultures and cropping sequences with the monocultures. The comparison of growth parameters, yield, nutrient efficiency, and stress responses between monocultures and the different plant mixtures will form the basis for developing novel nutrient-efficient and stress-resilient cropping systems for food and bioenergy production in the face of climate change and finite nutrient resources.</p> <p>Manuscript: Wiche O. and O. Pourret (2023), “The role of root carboxylate release on rare earth element (hyper)accumulation in plants – a biogeochemical perspective on rhizosphere chemistry”, <i>Plant Soil</i> 485, pp. 247–257; doi.org/10.1007/s11104-023-06177-2</p>					
<p><u>Environmental monitoring using honey bee colonies and a novel sampling tool</u></p> <p>A challenge of current agriculture is to balance the use of agrochemicals for increased productivity with the need to protect pollinator and environmental health. Monitoring for environmental contamination is therefore crucial to guide stakeholders and inform policy decisions towards increasing food security and environmental sustainability. The European honey bee, <i>Apis mellifera</i> has proven to be an effective bio-sampler as it brings contaminants to the hive where they can be detected. This proposal aims to develop an intercontinental collaboration for knowledge exchange and technology transfer on bee-mediated monitoring. It will support a Canadian fellow at the University of Almería, Spain to examine a new tool, the APIStrip, which allows for non-invasive sampling of contaminants in beehives. It will include training on how the tool is prepared and utilised, as well as planning its use in Canada. This proposal also includes a comparative analysis of existing data from Canada and Europe. The fellowship will encourage networking, and data sharing, with researchers of other OECD member countries involved in bee-mediated monitoring of pesticides and other pollutants.</p>	Canada	Government of Canada	Spain	University of Almeria	8

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<p><u>Land tenure models for carbon positive land use: comparative case studies between Scotland and New Zealand</u></p> <p>This project aims to explore the implications of the growing carbon market on property regimes and land governance in Scotland and New Zealand, to share knowledge between research and policy in both countries, and to identify (and ideally co-develop) a framework of land tenure solutions to mitigate the environmental and social risks of land use change for carbon, whilst maximising opportunities. This project is fundamentally about mitigation and adaptation to a changing climate through land use and land governance change. It seeks to identify possible and optimal land tenure options for sustainable land use (e.g. food production that contributes positively to both reduce carbon and protect biodiversity).</p>	United Kingdom	The James Hutton Institute	New Zealand	Centre for Sustainability, University of Otago	6
<p>Near-Real time irrigation scheduling and crop biomass estimation through remote sensing images with high spatial and temporal resolution</p> <p>Precision irrigation faces important challenges in arid and semiarid areas where the lack of water resources for irrigation is a relevant determinant for agricultural production. The US Great Plains and the Southeast of Spain have similar problems on how to manage irrigated agricultural systems aimed at sustainability and raising profitability levels. Decision-making for timely irrigation scheduling and, at the same time, to predict the crop biomass/yield properly, using remote sensing-based multispectral imageries, are two high critical issues at many irrigated areas. To improve irrigation scheduling, a dense series of multispectral imagery, at a spatial resolution high enough and with timely delivered imagery, is required. Although many commercial sensors with the desired characteristics display increasing capabilities for precision irrigation, several improvements are needed. Thus, the main objectives of this proposal are: a) to develop for maize crop improved basal crop coefficient-vegetation index (Kcb-VI) and fraction of the crop intercepted photosynthetic active radiation-vegetation index (fPAR-VI) relationships; b) to generate for the same maize crop smooth-continuous curves over time for Kcb and fPAR derived from interpolation methods; c) to estimate the biomass for maize crop from remote sensing imageries and the combined effect of potential transpiration and fPAR; d) to evaluate this technology with respect to near-real field time irrigation scheduling and the actual crop characteristic(s).</p>	Spain	Instituto Técnico Agronómico Provincial (ITAP, S.A.U.)	USA	Colorado State University	12

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<p>Using co-operative arrangements for learning from indigenous agricultural systems to enhance sustainability</p> <p>This project aims to create a series of management simulation models to understand and forecast disease emergence risk for the disease Kauri dieback. This emergent disease impacts <i>Agathis australis</i> a unique endemic tree species of northern New Zealand which has a central place in the indigenous worldview of the region. The project will use spatial and temporal data from tree to stand scales to adapt an existing spatially explicit epidemiological model for forest pathogens to Kauri dieback. Existing datasets will be used to empirically estimate realistic pathogen spread and disease emergence rates and combine these in a simulation of risk factors and management mitigation approaches for this disease. One goal of this modelling effort is to integrate the unique approaches and values of indigenous communities as reflected in management actions. This will be integrated into a series of realistic and culturally appropriate counterfactual model management experiments. The work also aims to develop a network of members of the indigenous community for the purpose of fostering exchange with the indigenous peoples of northern California, who are facing the emergent disease sudden oak death and threats to <i>Notholithocarpus densiflorus</i>, a similarly unique endemic species with a central place in the regional indigenous world view.</p>	Egypt (work country: United Kingdom)	Northumbria University	New Zealand	University of Auckland	8

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Theme 2: Managing Risks in a Connected World					
<p>Analysing the economic impact of sustainable dietary diversification on consumer choices in the MED countries using nudging strategies</p> <p>Among the European countries, Spain and Italy rank amongst the countries with the highest prevalence of overweight and obesity in the European Union. What we choose to eat plays a large role in determining our risk of gaining too much weight. But our choices are shaped by the complex world in which we live-by the kinds of food our parents make available at home, by how far we live from the nearest supermarket or fast food restaurant, even by the ways that governments support farmers. In this context the exploration of effective weight loss strategies and improve eating habits is essential. Nudges are currently advancing approaches that represent a new and better method for changing the behaviours of people. This project explores diversification opportunities in sustainable diets along the food chain in Mediterranean countries and postulates the central hypothesis that diversification of sustainable diets jointly nudges strategies leads to more healthy and improves the food safety in terms of “obesogenic” food environment. The current research aims at describing a framework of food security, safety and diversification diets in Med countries in a broader sense by identifying underlying factors, focus also on psychological ones, to drive consumers to change their diet towards sustainable healthy diet by the improvement of food safety and food environment using nudging strategies. To achieve this aim, we will adopt different economic methodologies, including choice experiments to evaluate the willingness to pay for diversified sustainable food products. Hence, we will combine an economic experiment with different behavioural strategies (nudges and positive messages) by altering the food environment to assess the impact on consumer purchasing decision-making.</p>	Italy (Work country: Spain)	Centro de Investigación y Tecnología Agroalimentaria de Aragón	Italy	University of Naples Federico II - UNINA, Department of Political Sciences Agricultural Science	26

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<p>Cost-effective diagnostic tests for a sustainable control of fasciolosis in ruminants and humans</p> <p>Internal worm parasites have a major impact on livestock production causing >55% of all farm livestock diseases globally. Infection of domestic ruminants with <i>Fasciola spp.</i> causes major economic losses global (>USD3 billion p.a.) livestock production. On the other hand, human fasciolosis is amongst the most important food-borne neglected tropical diseases. Triclabendazole is the most effective drug against <i>Fasciola spp.</i> Unfortunately, anthelmintic resistance to this drug has spread throughout Europe, Asia and Australia. It has left farmers with inadequate means to combat disease. Under this context, the main objective is to develop cost-effective diagnostic methods that allow: i) a more sustainable use of anthelmintic drugs, enabling the treatment of animals and/or humans only when necessary; ii) the detection of anthelmintic resistance.</p>	Spain	University of León	Ireland	University of Galway	6
<p>Developing a potent kairomone for the European grapevine moth, <i>Lobesia botrana</i></p> <p>The European grapevine moth, <i>Lobesia botrana</i> is a major pest in vineyards. With the growth in global trade and climate change, this invasive species is expanding its habitats and regularly makes incursions worldwide. It has been recently reported in Chile and other countries in South America. Currently, this pest does not occur in several OECD countries including New Zealand, Australia, USA and Canada. With the increase in global trade, this pest can arrive in any of these countries at any time, this can have a significant impact on the wine industry in these countries. In the Mediterranean basin, the EGVM is the major pest of grapes. Damage by this pest is caused by larval feeding on grape clusters, which renders them susceptible to necrotrophic fungus in mid-season, leading to rots at harvest. Recently, we have identified kairomone from infested host plants that attract both males and females. This project aims at the identity and testing of further the herbivore-induced plant volatiles (HIPVs) from flowers and berries of the two main EGVM hosts plants (<i>Vitis vinifera</i> and <i>Daphne gnidium</i>), to improve the efficacy of our recently discovered kairomone. In turn, the development of this tool will result in a more reliable system for monitoring, detecting, controlling and eradicating this invasive pest.</p>	New Zealand	Plant and Food Research	Sweden	Linnaeus University	26

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<p><u>Innovative approach to remove seafood pathogens along the seafood chain</u></p> <p>Seafood production is regularly overwhelmed by cross contamination caused by biofilms of pathogenic bacteria present on surfaces throughout the food chain. Due to the emergence of antimicrobial resistance, it is important to develop innovative techniques to combat biofilm in the food sector. Methods based on physical or biological treatment have emerged but could be more effective if combined with a natural bioactive disinfectant proteins such as ovotransferrin and phosphodiesterase. Ovotransferrin is naturally found in egg white that we already consume by the people and phosphodiesterase is naturally found in bovine spleen. Here, we will explore how these natural proteins coupled with biological and/or physical treatments can remove <i>Vibrio parahaemolyticus</i> and <i>Listeria monocytogenes</i> biofilms, both well-known pathogens threatening the seafood industry.</p>	France	French Agency for Food Environmental and Occupational Health & Safety	Canada and Australia	Agriculture and Agri-Food Canada - Institute for Nanoscale Science, Canada & Technology, Flinders University Adelaide, Australia	25
<p><u>Transcriptomic analysis of the <i>Vibrio vulnificus</i> pv. <i>piscis</i> exposed to fish mucus</u></p> <p>The fulminating pathogen <i>Vibrio vulnificus</i> pv. <i>piscis</i> is the causative agent for a range of diseases of marine animals including species of interest in aquaculture such as eels and shrimps. Our hypothesis is that upon being exposed to mucus of the marine animals, the pathogen differentially expresses genes involved in colonisation, persistence, survival, and thereby cause disease. A whole-genome transcriptome profiles of the pathogen in the presence or absence of the fish mucus or purified mucin will be compared and thereby the virulence genes expressed specifically and required for the infection of the marine animals will be identified. Selected virulence genes will be cloned and further characterised at the molecular levels to expand current understanding of the <i>V. vulnificus</i> pathogenesis and thereby provide novel strategies to control the pathogen.</p>	Korea	Seoul National University	Spain	University of Valencia	14

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Theme 3: Transformational Technologies and Innovation					
<p>Adapting crops to changing environments using related species and innovative pre-breeding approaches</p> <p>Our agricultural systems and hence food security are currently facing major challenges due to the increasing world population, the numerous impacts of climate change on crop production, and the need for a more environmentally friendly agriculture. This is notably the case for oilseed rape (3rd largest oilseed crop worldwide), which is used for human consumption, biofuel production and animal feed. This crop presents an extremely narrow genetic diversity, making difficult to maintain its production in changing environments. One avenue to cope with these constraints, while meeting the agroecology objectives, is to efficiently characterise the untapped genetic diversity existing in its parental species, and available in ex situ collections. The main aim of this project is to investigate the genetic diversity presents in the parental species of oilseed rape, and subsequently to explore other variation sources (e.g., epigenetic), as well as to use up-to-date phenomic selection tools to finely characterise this valuable material. We will also take advantage of an innovant method boosting recombination, which was recently identified by the applicant's group, to thereafter efficiently introgress this diversity (including traits of interest) in oilseed rape and create performant pre-breeding populations. Altogether, this fellowship will build a multi-institutional and international collaborative network enabling to collectively address the global challenges of oilseed rape production.</p>	France	INRAE (National Institute for Agriculture, Food and Environment)	Australia	CSIRO Agriculture and Food	26

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<p><u>Advanced breeding tools for meeting sustainable production and resilience: from satellites to genes</u></p> <p>Agriculture sits at the nexus of almost all of humanities grand challenges, including food security, climate change, and global poverty. Specifically, plant breeding has historically had a fundamental role in shaping agricultural practices and can therefore have a large impact in the development of a more sustainable and resilient agriculture. The goal of this fellowship is to push the boundaries of plant breeding by deploying state of the art tools from satellites to genomics to breed for sustainable agricultural systems using cereals as an example. Specifically, we will provide new designs for large genomic evaluations of breeding programs as well as improved genomic prediction methods with additional layers of phenomics and environomics to breed for emerging ecosystem services traits.</p>	Sweden (Work country: USA)	University of Wisconsin - Madison	Sweden	Swedish University of Agricultural Sciences	22
<p>Dairy farms' optimal nutrient allocation to maximise profitability and minimise environmental impacts</p> <p>By applying transformational digital technologies, we seek optimising nutrient allocation on dairy farms towards maximum profitability at the minimum environmental impact in the face of a growing world population under food insecurity and climate change challenges. Improved data acquisition procedures, better computer systems, and superior algorithms efficiently applied to dairy production systems can become a pillar for building a resilient and sustainable food production system. We will develop a novel, user-friendly, farm-specific, online application to concurrently support multiyear crop planning, feed ingredient purchase, minimum nutrient emissions, and optimal diets formulation by applying the latest scientific knowledge. Demonstration analyses with Italian and Wisconsin dairy farms will be published in the Journal of <i>Dairy Science</i> and trade magazines.</p>	USA	University of Wisconsin-Madison	Italy	Catholic University of the Sacred Heart in Piacenza	26

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<p>Innovative eco-friendly Bio-basEd processes to recover BioactivE compoundS from agri-food wasTe (BE BEST)</p> <p>Food processing generates high waste and byproducts, causing a negative environmental impact and significant disposal expenses. Many of these biomaterials, including citrus wastes, are a source of valuable compounds that could be used in various commercial sectors, including food industries. Several techniques have been used to recover polyphenols from food byproducts, but most are expensive and unsafe for human health and the environment. In recent times, several “green” novel extraction techniques have been used to optimise the extraction of bioactive compounds. Natural deep eutectic solvents (NaDES) have become an exciting candidate. Considering the extraction recovery of bioactive compounds, the type of solvent and the chemical form in which food bioactives are bound to the food matrix must be considered. This Project will investigate the possible and synergic application of combined hydrolytic enzymes (pectinase, cellulase, and protease) and NaDES for polyphenols recovery from orange fruit byproducts (peel). This will enhance the value of agri-food waste, fitting the challenge of the theme identified by the CRP research fellowship.</p>	Italy	University of Milan	Spain	Universitat de Valencia, Dep. of preventive medicine and public health, food sciences, toxicology and forensic medicine	14
<p><u>Smart farming technologies and transformation in the work of farmers and advisers: Implications for technology adoption and policy</u></p> <p>The impacts of Smart Farming Technologies (SFTs) on the nature of farming work and the work of agricultural advisory services has received less attention from the scientific community. This research aims to examine the trends and changes in farm and advisory work related to SFT implementation in the UK and Australia, countries which share similar challenges in smart farming. The research will involve qualitative social research with interviews and workshops with farmers, advisers, SFT providers and policy makers in both countries. Focusing on the farmers and advisers implementing SFTs, the research is an important addition and departure from studies examining “non-adopters”, to draw from the real-world experience of farmers and advisers and the change to their work. Through this novel approach, the research will contribute to anticipating the knowledge, skills and technology governance arrangements required to underpin the capacity of farmers and the service sector to realize the benefits from SFTs and improve how work impacts are factored in to interventions and policies in supporting value and benefit from SFTs. The research seeks to contribute to training and education curricula; assist farmers and advisers anticipate work changes from SFT implementation and make recommendations for the intersecting policy arenas of agricultural innovation, agricultural education and agricultural employment.</p>	Australia	University of Melbourne	United Kingdom	Countryside and Community Research Institute, University of Gloucestershire	6