

Using statistical modelling to tackle global food insecurity

International Partnership Fund (IPF), 2015-16.

The Project

Access to a safe and affordable food supply is a basic human right under numerous covenants of international law, and yet many households in high income countries are unable to feed themselves or their families, or experience stress and anxiety about their ability to put sufficient and nutritionally adequate food on the table.

Dr Martine Barons' research uses statistical modelling to combine expert judgements together in a coherent and transparent way in order to support policy makers who focus on decision making in food security and pollination. She adopts an interdisciplinary approach, involving fields such as mathematics, social sciences, international development, complexity sciences and nutrition.

The work to develop the new statistical methods to allow this to be achieved was funded by Engineering and Physical Sciences Research Council (grant number EP/K007580/1). The applications to household food security and pollination put this cutting-edge research to work in the real world.

In 2014 the Department for Environment, Food and Rural Affairs (DEFRA) published a pollinator strategy to protect pollinating insects which support our food production and the diversity of our environment. If we don't have enough pollinators, we won't have enough plants, fruits and vegetables to feed ourselves.

Dr Barons has used the IPF to work with international experts to explore the possibility of designing a formal decision support system to help model pollinator abundance and consequently manage pollinator numbers.

Raising awareness and understanding of this work is fundamental in order to influence government policy. Dr Barons has been able to use the IPF to meet key stakeholders and collect evidence to draw comparisons between the government policies of America, Canada, Australia and the UK, analysing the impact on food security of national, international, local and household-level income, food supply and prices.

International partnerships

Building partnerships with experts in Australia is crucial for Dr Barons' research. The country's unique biodiversity protection laws means that it is the only place where bees are quarantined, therefore providing an excellent research sample base.

Prior to securing this funding, Dr Barons met with Professor Richard Huggins, deputy head of Melbourne University's school of Mathematics and Statistics, and they discussed the possibility of modelling pollinator abundance. Having both begun to explore this research area independently, via different approaches, the IPF has

enabled Dr Barons to visit Professor Huggins and further develop a partnership between the two departments. This has also led to contact between Warwick's Infectious Disease Epidemiology Research group (WIDER) and Melbourne's Centre of Excellence for Biosecurity Risk Analysis (CEBRA).

While in Australia, Dr Barons was able to reach out to a number of key strategic partners to deliver seminars and explore the potential for collaboration. She met Prof Mary Myerscough, a mathematician at University of Sydney to discuss research ideas about how mathematical modelling of pollinator abundance can support policymakers. Dr Barons also met Dr Danielle Gallegos, Queensland University of Technology and Dr Claire Palermo, Monash University who are experts in household food security, to discuss research ideas about how mathematicians and nutritionists can work together to tackle household food security problems. Dr Barons was also invited to deliver seminars about statistical decision support for food security at the University of Melbourne and the University of Auckland, New Zealand.

Dr Barons interviewed 18 experts in pollinators from the Australian and New Zealand governments, industry and academia including the Commonwealth Scientific and Industrial Research Organisation and Plant Health Australia. These meetings strengthened her research and helped with the refinement of a pollinator decision support system by providing insight into the pollinator system, husbandry and government policy options.

The visit catalysed the formation of a multi-disciplinary International Research Collaboration on Food Security in High Income Countries. So far, research from this group has been disseminated in 2 online seminars with more planned, and research insights are continually shared across nations through online meetings between participants.

The research into household food security also led to collaborations with Feeding Britain and Feeding Coventry, national and local charities in the UK, Warwickshire Food for Health group and the West Midlands Strategic Food Board. This has led to opportunities to showcase the research findings to those at the coal face of tackling household food security problems locally and nationally.

The Future

Funding from the International Partnership Fund was essential to the research, including laying the foundation for a second visit, gathering and analysis of data relating to household food security, which would result in the production of 8 research papers, 2 workshops and 5 video lectures. In addition, 3 exchange students came from Monash to work on the project.

This research has had significant benefits for students. Dr Barons has given seminar talks to the WIDER group and contributed research-led teaching to the MSc in Food Security and Global Sustainable Development BSc module on food systems: security, sovereignty & sustainability. Future plans include research with Warwick

Medical School, which will increase the potential of the research to influence UK Government policy.

Further funding was secured from Warwick's Food GRP and Behavioural Science GRP to bring an expert from CEBRA to Warwick for a structured expert elicitation workshop with UK pollination experts.

Dr Barons continues to raise awareness of the importance of this work and engage more stakeholders nationally and internationally. She appeared on BBC Radio 4's 'Farming Today', contributed to a news piece in the Stratford-upon-Avon Observer and produced an article for the local Bee-Keeper association

Martine Barons' views on the importance of funding international work:

"The support I received from the International Partnership Fund enabled me to build my research networks in Australia, New Zealand, the USA and Canada. It also supported my research with important consequences for policymaking in the UK and internationally. There are certain points in a researcher's career when important links are made with other researchers and research directions are set. For me, the IPF funding was key for making these links and directing a research trajectory."