

Institution: Anglia Ruskin University
Unit of Assessment: 14
Title of case study: Embedding Food System Sustainability into business, regional, national and international policy
Period when the underpinning research was undertaken: March 2011-December 2020
Details of staff conducting the underpinning research from the submitting unit:
<p>Name(s): Professor Aled Jones Dr Zareen Bharucha Dr Roberto Pasqualino Dr Davide Natalini</p> <p>Role(s) (e.g. job title): Director of GSI Senior Research Fellow Research Fellow Senior Research Fellow</p> <p>Period(s) employed by submitting HEI: 03/2011 - present 10/2016 - present 10/2016 - 10/2019 08/2016 - present</p>
Period when the claimed impact occurred: January 2015 to July 2020
Is this case study continued from a case study submitted in 2014? N
<p>1. Summary of the impact</p> <p>Our food systems research explores the practices of individuals within the food system from farmers, through market decision-makers, to government officials, and has had significant impact on public and private decision-making processes, through both a risk and opportunity lens, including the following:</p> <p>Risk focus</p> <ul style="list-style-type: none"> Underpinned the establishment of a new partnership on climate change risk assessment between the UK and China, and the policy outputs of a UK-US Taskforce on food system risk. Led to the inclusion of food risk in the US National Defense Authorization Act. Brought food shocks into the risk decision-making processes of underwriters operating in the Lloyd's of London market. <p>Opportunity focus</p> <ul style="list-style-type: none"> Contributed to the development of the Food and Agriculture Organization of the United Nations (FAO)'s Sustainable Food and Agriculture Framework. Supported the roll-out of sustainable intensification farming practices to support local farmers in and beyond Andhra Pradesh, India. <p>This focus on embedding a better understanding of risks and developing new opportunities within the decision-making of the food system will lead to a more resilient global food chain which is able to withstand shocks.</p>

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2. Underpinning research

The Global Sustainability Institute (GSI) at ARU has been using its policy and knowledge practice research to explore the dynamics involved in responses associated with the management of food systems. Our research specifically explores the practices of individuals within the food system from farmers, through market decision-makers, to government officials. Our research is split into two specific approaches – a risk focus (markets and national or international governments) and an opportunity focus (farmers, communities and local governments). Through a risk focus, we have developed a better understanding of why, and which, decisions (such as export or import restrictions or changes in subsidy levels) are taken within international organisations, national governments and the market, when a shock occurs within the global food system. With an opportunity focus, we have explored policy and knowledge practices enabling the sustainable intensification of rural agricultural systems in the global south.

Through our risk focus research (2011-present), Professor Jones led the expert elicitation of business and policy stakeholders from across the world to better understand and model the probable responses to future food system shocks such as export bans, subsidy changes or other market interventions. Dr Natalini gathered data on the dynamics of civil unrest and conflict related to food system pressures to enable a more quantitative approach to mapping food conflict [1]. We blend these data with our interdisciplinary approach using methods from across social and physical/biological sciences. These understandings were then explored within the wider market and economic systems – in particular, Professor Jones leads our work on how the finance sector (investment and insurance) is materially impacted by short-term, but large-scale, events [2]. This research is used to develop systems dynamics [3], led by Dr Pasqualino, and agent-based [1], led by Dr Natalini, models which are able to explore the impacts of physical or price shocks in food systems.

Our opportunity focus research (2016-present), led by Dr Bharucha, provided the first available analysis of a pioneering programme of sustainable intensification [4, 5] from the state of Andhra Pradesh, where the government has invested heavily in a roll-out of sustainable intensification across thousands of small farms, as well as climate adaptation practices [6]. This work is a collaboration with the University of Essex who provide the ecosystems and agriculture expertise alongside Dr Bharucha's social practices research. 80% of India's farmers have less than 2 hectares of land, and face a triple burden of chronic poverty, declining yields and global environmental change. Conventional techniques and policies designed to intensify production have bypassed these farmers in favour of richer landowners, those with better access to credit and those from socially elite groups (e.g. higher castes). Sustainable intensification on small farms therefore remains an urgent requirement, but there has so far been no coordinated mechanism to achieve this at scale, with a particular need to improve policy incentives and knowledge access. Our research included a global synthesis of available evidence showing that smallholders across the global south are successfully achieving sustainable intensification at scale [4, 5]. Our research has further used novel collaborative mechanisms to explore the growth of rural social capital within specific territories.

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3. References to the research

1. **Natalini, D.**, Bravo, G., **Jones A.**, & Phillips, A., 2019, 'Global food security and food riots - an agent based modelling approach', Food Security, 11 (5), 1153-1173, <https://link.springer.com/article/10.1007/s12571-017-0693-z> (submitted in REF2)
2. Lunt, T., **Jones, A.**, Mulhern, W., le Zaks, D. & Jahn, M., 2016, 'Vulnerabilities to Agricultural Production Shocks: An extreme, plausible scenario for assessment of risk for the insurance sector', Climate Risk Management, 13, 1-9, <https://doi.org/10.1016/j.crm.2016.05.001>
3. **Pasqualino, R. & Jones, A.**, 2020, 'Resources, Financial Risk and the Dynamics of Growth: Systems and Society', Routledge, London, UK, ISBN 9781138187351 (submitted in REF2)
4. Pretty, J and **Bharucha Z.**, 2014, 'Sustainable Intensification in Agricultural Systems'. Annals of Botany. 114 (8), 1571–1596, <https://doi.org/10.1093/aob/mcu205> (submitted in REF2)
5. Pretty, J., Benton, T.G., **Bharucha, Z.**, Dicks, L.V., Flora, C.B., Godfray, C., Goulson, D., Hartley, S., Lampkin, N., Morris, C., Pierzynski, G., Prasad, P.V.V., Reganold, J., Rockström, J., Smith, P., Thorne, P. & Wratten, S., 2018. 'Global Assessment of Agricultural System Redesign', Nature Sustainability, 1, 441-446, <https://www.nature.com/articles/s41893-018-0114-0>
6. **Bharucha, Z.P.**, Mitjans, S.B. and Pretty, J., 2020. Towards redesign at scale through zero budget natural farming in Andhra Pradesh, India. International Journal of Agricultural Sustainability, 18(1), pp.1-20. <https://doi.org/10.1080/14735903.2019.1694465> (submitted in REF2).

These illustrative references relate to a portfolio of ARU research projects on food systems, including:

- Dawe Charitable Trust: **Global Resource Observatory** (PI: Prof Jones; £600,000; 2011-2016)
- ESRC: **Centre for the Understanding of Sustainable Prosperity** (Col: Prof Jones; Led by the University of Surrey; £6 million total; ARU receives £321,698; 2016-2020)
- NERC India-UK Water Centre (IUKWC): **Stakeholder engagement in climate services** (PI: Dr Bharucha; £15,000; 2017)
- Lloyds of London: **Food System Risk** (PI: Prof Jones; £10,000; 2015)
- ESRC Nexus Network: **Nexus Shock Network** (Col: Prof Jones; £18,990; 2015)
- UK Foreign & Commonwealth Office (in partnership with BBSRC & Global Food Security): **Expert elicitation of food shock responses** (PI: Prof Jones; £24,000; 2015)

4. Details of the impact

Our food systems research has led to a number of impacts including a policy development partnership between the UK and China, US government budget allocation, supported international and state-level (in Andhra Pradesh, India) policy frameworks on sustainable intensification, and strengthened the debate on food system risk within insurance markets. It has also had significant public engagement through press coverage with one article in the *Independent* being shared over 16,000 times (REF1). More recently our research has led to Professor Jones being invited as a member to the UKRI Working Group: Covid-19 and the impact on global food systems to help inform future funding calls from across the UK Research Councils.

New UK-US and UK-China Taskforces

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Building on our risk focus work our research led to Professor Jones being a key member of the UK-US Taskforce on Extreme Weather and Global Food Resilience, on behalf of the UK Foreign and Commonwealth Office (FCO), including meetings in Chicago in 2014 and London in 2015. The FCO Taskforce brought together academics, business leaders and government officials to write an externally facing policy document, for which Professor Jones was a coordinating lead author (REF3), with GSI academics as lead authors on two of the three appendices. Our work involved leading on data gathering from financial markets as well as running expert elicitation with policy makers and food system experts from around the world to gather knowledge on how various countries and organisations might respond to future food system shocks. Content from our reports from the UK-US Taskforce was included in 'Climate Change: A Risk Assessment' published jointly by UK, US, Chinese and Indian experts in 2015, which was the UK government's primary means of engagement on climate change risk with those countries in the run-up to the Paris Agreement (REF2). This work also supported the establishment of a strong bilateral partnership between the UK and Chinese governments on climate change risk assessment. In particular, our work has influenced the perception of senior Chinese officials as to the overall scale of climate risks to the food system (REF2) following a joint workshop in Beijing in January 2016, and subsequent online workshops, publication of a joint report and other engagement activities.

US defence budget allocation

Our research provided the policy practice expertise in partnership with Professor Molly Jahn (then Chief Scientist at Oakridge National Laboratory, a US national laboratory sponsored by the Department of Energy, and a member of the Global Resource Observatory project advisory group for the GSI). Professor Jahn provided the physical agriculture and climate modelling expertise as well as a direct link into the US Government. The GSI provided the social science expertise and in particular the knowledge and models of how markets and governments respond in times of food system shock. This partnership co-convened events with a global group of academics, policy makers and business leaders, starting with an initial workshop at the Tallberg Forum, hosted by the Tallberg Foundation, in 2013 (see REF4 for attendee list). These meetings, jointly chaired by Professor Jones and Professor Jahn, and subsequent research, led to the inclusion of food risk in the US National Defense Authorization Act for Fiscal Year 2018 (NDAA – REF5). This Act sets out the budget for the US Department of Defence and included a commitment that they should produce a report on global food system vulnerabilities for congressional defence committees.

Insurance stress test

This research also led to the publication of the 2015 Food System Shock report by Lloyd's of London, which outlines a set of plausible scenarios that could be used to demonstrate the materiality of climate change risk for the insurance sector. Professor Jahn again provided the physical agriculture and climate modelling, alongside the GSI's policy practice research. The GSI's research explored the likely responses of governments and insurance companies, and market impacts, to specific food system shocks. In particular, our research highlighted significant plausible and material financial impacts on asset valuations and a number of insurance products as a result of a set of physical (weather) related shocks in the food system. The plausible scenarios were published (REF6) to support underwriters in the Lloyd's of London market to identify previously unconsidered food security impacts on insurance and risk. This research strengthened the debate within the insurance market around insurance product risk management (REF7) and led to Professor Jones being part of the Academic Expert Group, convened and chaired by Professor Rapley (UCL), which provided feedback to the Bank of England's Prudential Regulation Authority (PRA) on the upcoming 2021 Insurance Stress Test on Climate Change. The GSI's contribution focussed on the transmission of physical climate events through government responses into market impacts, which resulted in the PRA reconsidering the level of the severity of impacts from a scenario in which the climate warmed by

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4°C. The Lloyd's report was also cited as a key piece of work in the UK Government's 2nd Climate Change Risk Assessment (CCRA2) published in 2017. Professor Jones is now a contributing author to the UK's 3rd Climate Change Risk Assessment (CCRA3) which will be published in 2022.

FAO framework

Our research, in collaboration with Professor Jules Pretty at the University of Essex, exploring sustainable intensification of agriculture, led to an invitation to contribute to the development of the United Nations' Food and Agriculture Organisation's (FAO) Sustainable Food and Agriculture Framework. This invitation enabled us to provide strong supporting evidence in 2018 for the efficacy of farmer-led models of sustainable intensification already being adopted at pace across the Global South (REF8). This was carried out through a direct engagement including collaborative writing with the lead author of the framework. The potential for sustainable intensification to contribute to yield improvements while improving environmental and social outcomes was also cited in the recent United Nations Intergovernmental Panel on Climate Change's (IPCC) Special Report on Climate Change and Land (SRCCL) published in 2019.

Andhra Pradesh policy roll-out

Our research supported the roll-out of sustainable intensification policies in the Indian state of Andhra Pradesh (population 50 million). Bringing together researchers from the UK and India, we conducted the first analysis of the impacts of a rural development initiative in Andhra Pradesh which used sustainable intensification and established a close working relationship with the State Government of Andhra Pradesh, project implementers, and an extended network of policy contacts in New Delhi. Zero Budget Natural Farming (ZBNF) is a globally significant example of the sustainable intensification of agriculture at scale. In Andhra Pradesh, some 165,000 farmers have adopted it since 2016. We provided a briefing note on our key findings of the impact of ZBNF and hosted a webinar in March 2019 for policy makers and stakeholders which included key speakers from the Government of Andhra Pradesh such as the State Advisor on agriculture, the Senior Consultant for Health and Nutrition at Department of Agriculture and the President of WWF International (REF9). Direct benefits from the project include clarifying to project implementers the types and breadth of benefits observed, and recommendations on future roll-out strategies. In particular, our research has been used (REF10) by Indian civil society, and state government actors to counter a pesticides lobby attack on these improved methods. We provided evidence that these farming methods do result in higher yields and incomes to counter the claims of pesticide companies. Without this, it is likely that existing state policies to roll out sustainable intensification farming techniques would have been curtailed or diluted.

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5. Sources to corroborate the impact

1. Society will collapse by 2040 due to catastrophic food shortages, *Independent*, 22 June 2015. Article with over 16k shares to highlight wider societal impact of the global food risk research
2. Letter of support from Head of International Climate Change Strategy, Department for Business, Energy and Industrial Strategy showing impact on the UK and China food system policy processes
3. 'Extreme weather and resilience of the global food system: Synthesis report', UK Foreign and Commonwealth Office showing the output report published by the UK FCO to influence its international work on food system risk
4. Tallberg agenda and attendee list highlighting the significance of the attendees and their reach into national and international food policy arenas
5. National Defense Authorization Act for Fiscal Year 2018, US Government showing the additional focus on food system risk
6. 'Food system shock: the insurance impacts of acute disruption to global food supply', 2015, Lloyds of London showing the final publication distributed to Lloyds of London members of the importance of considering food system shocks in capital management
7. Letter from Head of Innovation, Lloyd's of London, summarising the impact and importance of the report and work undertaken
8. Letter from United Nations Food and Agriculture Organisation (FAO) summarising the impact of the work on their policy positioning
9. Attendee list for ZBNF webinar summarising the level of engagement with key policy makers during our research programme
10. Email from Founder & CEO, GIST Advisory, outlining the need to present our research to counter a pesticide lobby in Andhra Pradesh