

## Impact case study (REF3)

<b>Institution:</b> University of Leeds		
<b>Unit of Assessment:</b> UOA5 Biological Sciences		
<b>Title of case study:</b> Changing policy and industry strategy on food security		
<b>Period when the underpinning research was undertaken:</b> 2005 - present		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Professor T Benton	Professor of Population Ecology	2005 – present
Dr S Sait	Leeds University Research Fellow Reader in Ecology	2002 - 2008 2008 - present
Professor W Kunin	Lecturer/ Senior Lecturer/Reader Professor of Ecology	1996 to 2009 2009 - present
<b>Period when the claimed impact occurred:</b> 1 <sup>st</sup> August 2013 - 31 <sup>st</sup> July 2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<p><b>1. Summary of the impact</b> (indicative maximum 100 words)</p> <p>The global challenge of ensuring food security in the face of climate change requires new ways of thinking about complex interactions between multiple factors, including land and water use, biodiversity and the food system. Research at Leeds on complex systems has underpinned a range of impacts:</p> <p><b>1:</b> changing the conceptual approach and influencing the UK's trajectory towards zero net carbon land use.</p> <p><b>2:</b> influencing EU policy including the Common Agricultural Policy mid-term review to EU Parliament (2016) and Food2030, aligning thinking on food issues across directorates generals.</p> <p><b>3:</b> a major UK supermarket changing their (fresh) product sourcing strategy to one that places strong emphasis on local suppliers and a supermarket supply-chain company making several million pounds worth of business changes to their supply chain systems, increasing efficiency and reliability.</p>		
<p><b>2. Underpinning research</b> (indicative maximum 500 words)</p> <p><b>Context:</b> Complex systems – especially socio-ecological ones, like food and agriculture – cannot solely be studied from a reductionist perspective, because systems outcomes are shaped by a host of direct and indirect feedbacks and non-linear processes. This has become increasingly clear in the last two decades. Leeds is a pioneering institution working on agri-food systems since 2005. Our expertise was initially focused on population and evolutionary processes in ecological systems (<b>R1</b>), but over the last 15 years, there has been an increasing application of systems approaches to agricultural systems (focusing on land use) and more recently food systems (incorporating demand-supply dynamics). For example, in funding primarily from the Rural Economy and Land Use programme (2007-2011), a body of work was co-developed (with other collaborators) by <b>Benton, Sait and Kunin</b>, that helped take thinking on sustainable agriculture from simplistic prescriptions of “management protocols” to a more systemic understanding of how farming practice influences biodiversity at field, farm and landscape scale and how this might be influenced socially (<b>R2, R3</b>).</p> <p>Further work (<b>R5</b>) has focused on understanding the complexity of interactions from which agricultural sustainability might arise at the farm scale, and the failure of many attempts to stimulate sustainable agriculture through policy (<b>R4</b>). This work, and the far-reaching implications of reframing what “sustainable agriculture” means, led to high-level engagement in policy and business communities in trying to design transformative pathways to deliver better social outcomes (<b>R6</b>).</p> <p>The delivery of activities leading to the impact of the Leeds research has been led by Professor Benton, and arises primarily from him being a leading thinker on food systems and sustainability. In particular, his standing arises from (a) having published on complex systems and the relationship between events and outcomes – from a theoretical and empirical perspective (including the relationship between systemic properties and resilience), and (b) being an inter-</p>		

disciplinary researcher publishing across domains (ecology, food production, social science, climate change).

These research outputs grant Benton the credibility of being a cutting-edge researcher, with well recognised high-level expertise, and from this profile the impact arises through being appointed to several high-profile roles– including secondment to the UK Government cross Research Council role as Champion for the Global Food Security program. These roles have enabled Prof Benton to influence and change the thinking and approaches of a wide range of government organisations, policy-makers and businesses.

### 3. References to the research (indicative maximum of six references)

Quality of underpinning research demonstrated through citation data, prestigious journals and evidence of research funding. All WoS citations as of 05/11/2020

1. Ozgul, A., Tuljapurkar, S., **Benton, T.G.**, Pemberton, J.M., Clutton-Brock, T.H., Coulson, T.M. (2009) The Dynamics of Phenotypic Change and the Shrinking Sheep of St. Kilda. *Science* **325**, 464-467. DOI: 10.1126/science.1173668. [WoS: 205]
2. Sutherland, LA; Gabriel, D; Hathaway-Jenkins, L; Pascual, U; Schmutz, U; Rigby, D; Godwin, R; **Sait, SM**; Sakrabani, R; **Kunin, WE**; **Benton, TG**; Stagl, S (2012) The 'Neighbourhood Effect': A multidisciplinary assessment of the case for farmer co-ordination in agri-environmental programmes. *LAND USE POLICY* **29**(3): 502-512. DOI: 10.1016/j.landusepol.2011.09.003. [WoS: 40]
3. Gabriel, D; **Sait, SM**; **Kunin, WE**; **Benton, TG**. (2013) Food production vs. biodiversity: comparing organic and conventional agriculture *JOURNAL OF APPLIED ECOLOGY* **50**(2): 355-364. DOI: 10.1111/1365-2664.12035. [WoS:106]
4. Pe'er, G; Dicks, LV; Visconti, P; Arlettaz, R; Baldi, A; **Benton, TG**; Dieterich, M; Gregory, RD; Hartig, F; Henle, K; Hobson, PR; Kleijn, D; Neumann, RK; Robijns, T; Schmidt, J; Shwartz, A; Sutherland, WJ; Turbe, A; Wulf, F; Scott, AV. (2014) Agriculture Policy: EU agricultural reform fails on biodiversity. *Science* **344**(6188): 1090-1092. DOI: 10.1126/science.1253425. [WoS: 287]
5. German, RN; **Thompson, CE**; **Benton, TG**. (2017) Relationships among multiple aspects of agriculture's environmental impact and productivity: a meta-analysis to guide sustainable agriculture. *Biological Reviews* **92**(2): 716-738. DOI: 10.1111/brv.12251. [WoS: 35]
6. Pretty, J., **Benton, T.G.**, Bharucha, Z.P., Dicks, L.V., Flora, C.B., Godfray, H.C.J., Goulson, D., Hartley, S., Lampkin, N., Morris, C., Pierzynski, G.,Vara Prasad, P. V., Reganold, J., Rockström, J., Smith, P., Thorne, P. & Wratten, S. (2018) Global assessment of agricultural system redesign for sustainable intensification. *Nature Sustainability* **1**, 441-446. DOI: 10.1038/s41893-018-0114-0 [WoS: 91]

#### Key reports which form part of the pathway to impact:

(7) Global Food Security initiative Synthesis Report (2012) Severe weather and UK food chain resilience. Detailed Appendix to Synthesis Report, Benton T., et al (October 2012)

<https://www.foodsecurity.ac.uk/publications/severe-weather-uk-food-chain-resilience-detailed-appendix-synthesis-report.pdf>

(8) Report (FCO version)

<http://www.csap.cam.ac.uk/projects/climate-change-risk-assessment/> (Press release <https://www.gov.uk/government/news/uk-us-china-and-india-experts-release-independent-climate-change-risk-assessment>)

Report (GFS version 2015): <https://www.foodsecurity.ac.uk/publications/extreme-weather-resilience-global-food-system.pdf>

(9) UK Climate Change Risk Assessment

<https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-7-International-dimensions.pdf>

(10) [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_15\\_5842](https://ec.europa.eu/commission/presscorner/detail/en/IP_15_5842)

(11) report to UK supermarket on their fresh product sourcing strategy: press release

<https://www.morrisons-corporate.com/media-centre/corporate-news/nations-local-foodmakers/>; report: [http://www.leeds.ac.uk/download/481/british\\_food\\_makers\\_report](http://www.leeds.ac.uk/download/481/british_food_makers_report)

**Selected research funding:**

1. Carver S, Kunin W, Sait S, Benton T. (PI) 2007-2011, An integrated analysis of scale effects in alternative agricultural systems (SCALE project) ESRC – RELU (Rural Economy and Land Use programme) Value: £417,905
2. Benton TG (PI), Kunin W, Urwin P, Sait S, Kepinski S, Field K. 2017- present GCRF AFRICAP Agriculture and Food System Resilience: Increasing Capacity BB/P027784/1 – BBSRC Value (100%): £9,212,647
3. Benton TG, Thompson, CE. 2013 – present. Mack Multiples/Fresca. Series of grants £495,627 in total

**4. Details of the impact** (indicative maximum 750 words)**How the body of research underpins the impact:**

The body of work has been led by Benton and is exemplified by the references in Section 3, but includes many other research publications by Benton (together with collaborators at Leeds and other institutions). This body of research is founded in investigating complex, ecological systems, particularly the way eco-evolutionary dynamics are driven by environmental variation (**R1** and Proc. R. Soc. B (2008) 275, 47–53). Using agriculture-environment interactions as an ecological case study, Benton and colleagues conducted a range of studies on the relationship between agricultural systems and their effects at the landscape level on the environment (**R3**) and farmer livelihoods and incomes (**R2**). These analyses both underpin some of the direct impacts of the research, but also, indirectly, raised Benton's external profile for tackling food and farming systems as complex systems with impacts in multiple dimensions and at multiple spatial scales. Further research (**R5, R6**) continues to give credence to systems' level of analyses as a route to dealing with complex socio-ecological agri-food systems. Analysis of reasons for the failure of many attempts to stimulate sustainable agriculture through policy (**R4**) provides insight into alternative approaches to inform policy in this area. The body of work's wider impact has been in embodying "systems thinking" - thinking about complex systems as applied to agriculture and food security – in the policy environment.

**Impact 1: Production of evidence assessments for policy.** As a result of the body of research, described above, Benton has been appointed to provide both assessments of the literature and/or conceptual advances in the area. For example, he contributed an assessment of the risks on the UK economy from climate change, particularly through a lack of resilience of the food system through contributing to the technical chapter on International dimensions for the UK Government's *Climate Change Risk Assessment (CCRA) Evidence Report* (2016) [**Source A**]. This report builds on a succession of earlier reports by Benton, pre-dating the REF2021 period, initially commissioned by the Government's Chief Science Advisor, based on Benton's understanding of both food systems and resilience. The CCRA report formally feeds into the UK Government's National Adaptation Programme [**Source A**]. Similarly, Benton was lead author for the chapter on Food Security in the IPCC's Special Report on Food, Climate Change and Land (published August 2019 [**Source B**]). This report includes discussion of research evidence, including references to Benton's research on land sparing vs land sharing, sustainable intensification and climate risks. The IPCC's reports are highly influential in setting policy and business agendas globally. The food systems' approach adopted for the IPCC report is novel, as highlighted in: *Nature Food* volume 1, pages 94–97 (2020). The report stimulated the development and planning of the UN's first World Food System's Summit, to be held in 2021 [**Source B**: <https://www.un.org/en/food-systems-summit>].

**Impact 2: direct influence on changing policy at national and supra-national EU policy infrastructure.**

- A. In 2014 and 2015, Benton was the lead author of reports from an EC-appointed expert group focusing on the EU's role in addressing food security concerns, locally and globally [**Source C**]. He was appointed from a pool of 500 European Experts based on his research outputs and expertise in sustainable agriculture. These reports were presented to, and discussed with, EU Commissioners. One recommendation arising from these reports was to ensure better policy alignment and to take a "food systems approach". As a result, the Commission developed the cross-commission institution Food2030 (launched 2016), to align thinking on

food issues across directorates generals, and avoid it being siloed [Source D]. Furthermore, Benton was invited to present the opening keynote at the EU Agri Research Conference (Feb 2018) on “systems approaches to agri-food research” and has worked with commission staff to develop concepts for incentivizing, through funding research calls, work in this area.

- B. In December 2013, the European Union (EU) enacted the reformed Common Agricultural Policy (CAP) for 2014–2020, allocating almost 40% of the EU's budget and influencing management of half of its terrestrial area. Research analyzing the reforms (R4) concluded that the then new environmental prescriptions were so diluted that they are unlikely to benefit biodiversity. This research was highlighted in a mid-term review of the CAP to the EU Parliament in 2016 [Source E], and subsequently a number of the report's authors have been consulted by EC officials regarding the 2020 reform.
- C. UK agri-food policy. Benton has given evidence to a number of Parliamentary Select Committees on agriculture and food system analysis (e.g. House of Lords EU Committee, 2017; House of Commons Environmental Audit Committee, Jan 2019, [Source F]). These Select Committees make a case requiring government responses. Many of these submissions have concerned the need to take a more systems approach to food, integrating policy development across multiple areas of policy, further echoed in a report (Jan 2019) entitled “Food Politics and Policies in Post-Brexit Britain” which Benton co-authored with staff at Chatham House [Source F]. In December 2017, Benton had a two hour meeting with then Secretary of State to discuss these issues. The Secretary of State's vision for the future of farming, presented at the National Farmers Union (NFU) Conference in 2018, reflected many of the points raised [Source G] and these systems approaches were developed in the 2020 Agriculture Bill. Subsequently Benton has been an advisor to the development of the UK government's National Food Strategy, attending multiple meetings of the Strategy Group, and a member of HMG's Global Resource Initiative Taskforce (on sustainable supply chains), which has subsequently recommended (March 2020) how to achieve sustainable trade [Source G].

**Impact 3: Influencing supermarket sourcing practice.** Following publicity surrounding the publication of a report from a working group chaired by Benton, funded by the UK's Foreign Office (<https://www.foodsecurity.ac.uk/publications/extreme-weather-resilience-global-food-system.pdf>, including an op-ed in the New York Times <https://www.nytimes.com/2015/09/09/opinion/extreme-weather-and-food-shocks.html>), Benton was approached by the CEO of Wm. Morrison's Supermarkets to discuss the relationship between local supply and international trade in determining food system resilience. This led to Benton convening a working group to produce the “British Food” report [Source H] that was used by Morrison's to increase its support for, and reliance on, local production. The British Food report *“helped to galvanise the company into a big push to sell more food that is locally sourced. ... Since the start of the local food maker programme three years ago, we have sourced over 1,000 new items from more than 200 suppliers. ... Sales of these items were up more than 30% last year [2019]”* [Letter from Morrison's Public Relations Director, Source H]. The original working group arose from a commission from the then HMG's Chief Science Advisor, specifically building on Benton's expertise on resilience in ecological systems transferred to food system.

**Impact 4: Influencing food supply chain company.** Building on the fundamental research base of sustainability and resilience (R3, R5) Benton, with postdoc Thompson (CT), has been working with a supply chain company, Fresca, who supply fresh produce to major UK retailers. The research involved the development of business intelligence software to assess supply chain resilience and sustainability, which influences the company's sourcing strategy. The company has made significant investment (values confidential) in business intelligence and analytics. In the letter from Fresca [Source I]: “Over the last 7 years, [CT] has worked in close partnership with various members of Fresca's product technical and IT team to establish a data model and reporting mechanism. *This has been a valuable exercise in terms of gaining important insight into our supply chain, understanding data availability and quality and its commercial value... [the] work has showed us the importance that big data can play in our future, and we have invested significantly to create an in-house business intelligence and analytics function that allows us to stream commercial data alongside quality, and environmental metrics.*”

**5. Sources to corroborate the impact** (indicative maximum of 10 references)

**Source A:** the UK Government's *Climate Change Risk Assessment Evidence Report* (2017), Chapter 7 International Dimensions

<https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/ccra-chapters/international-dimensions/> and UK Government National Adaptation Programme 2018-2023

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)

**Source B:** IPCC special report on Climate Change and Land (2019). Full title "Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems". Benton is contributing author for Chapter 5: Food Security

[https://www.ipcc.ch/site/assets/uploads/sites/4/2021/02/08\\_Chapter-5\\_3.pdf](https://www.ipcc.ch/site/assets/uploads/sites/4/2021/02/08_Chapter-5_3.pdf)

contribution to development of UN's first World Food System's Summit, to be held in 2021

<https://www.un.org/en/food-systems-summit>

**Source C:** Reports for Expo 2015 by EC-appointed expert group (Benton contributed as Scientific Expert) on the role of EU in addressing food security concerns, locally and globally

[https://europa.eu/expo2015/sites/default/files/files/Recommendation%20Document\\_pre%20conference%20version-NS\(2\).pdf](https://europa.eu/expo2015/sites/default/files/files/Recommendation%20Document_pre%20conference%20version-NS(2).pdf) and [http://europa.eu/expo2015/sites/default/files/files/Expo-Document\\_1115\\_BD.pdf](http://europa.eu/expo2015/sites/default/files/files/Expo-Document_1115_BD.pdf).

**Source D:** The European Commission cross-commission institution Food2030, [https://ec.europa.eu/info/sites/info/files/conferences/food2030\\_2016/food2030\\_conference\\_background.pdf](https://ec.europa.eu/info/sites/info/files/conferences/food2030_2016/food2030_conference_background.pdf).

**Source E:** Common Agricultural Policy reform - mid-term review of the CAP to the EU Parliament in 2016

[http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/583842/EPRS\\_BRI\(2016\)583842\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/583842/EPRS_BRI(2016)583842_EN.pdf)

**Source F:** Influence of research on UK Government: presentations by Prof Benton to Parliamentary Select Committees on agriculture and food system analysis: House of Lords EU Committee, 2018, Impact of Brexit on food prices

<https://old.parliament.uk/business/committees/committees-a-z/lords-select/eu-energy-environment-subcommittee/news-parliament-2017/brexit-food-sec/> ; House of Commons Environmental Audit Committee, Jan 2019

<http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/planetary-health/written/95168.html>.

Benton co-authored a report with staff at Chatham House "Food Politics and Policies in Post-Brexit Britain" (Jan 2019) (<https://www.chathamhouse.org/sites/default/files/publications/research/2019-01-10-BentonFroggattWrightThompsonKing.pdf>).

**Source G:** The Secretary of State's vision for the future of farming, delivered at NFU conference in 2018 <https://www.gov.uk/government/speeches/a-brighter-future-for-farming> was informed by discussion with Benton; Benton has been an advisor to the development of the UK government's National Food Strategy <https://www.nationalfoodstrategy.org/who-we-have-met-2020/>

Recommendations (March 2020) on how to achieve sustainable trade were made in the Global Resource Initiative Final Report (March 2020), Benton was a member of the Taskforce Group [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/881395/global-resource-initiative.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/881395/global-resource-initiative.pdf).

**Source H:** Morrison's British Food Report – "What role should UK producers have in feeding the UK?" Published Feb 2017. Morrison's news article

<https://www.morrison's-corporate.com/media-centre/corporate-news/nations-local-foodmakers/> ; copy of report and Letter from Public Relations Director (received June 2020) confirming changes at Morrison's in response to Food Report.

**Source I:** Letter from Chief Information Officer, The Fresca Group Ltd (July 2020) confirming (a) TB's role in advising on ways to improve supply chain and (b) nature of business changes made.