Wider Impacts Beyond Food Safety Risk Assessment (2024)

Wider Impacts Beyond Food Safety Risk Assessment (2024)

Background to the project

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Consumers and civil society are increasingly concerned about a range of factors beyond safety when making food choices. The Food Standards Act (1999) makes provision for the Food Standards Agency (FSA), in exercising its powers, to take into consideration several factors not directly related to food safety. Such considerations, when applicable, are secondary to the goal that “people can trust that the food they buy and eat is safe and what it says it is”.

The scope of this project encompassed broader risks and benefits as well as the term **“other legitimate factors”** used in international trade and regulatory language (for background reading, see Annex 1). It included consideration of broad consequences, positive and negative, intentional and unintentional, associated with regulated and unregulated food products. The Working Group was asked to examine the evidence base for these wider impact considerations and to recommend principles for application in risk management and policymaking. Advice on the selection of specific risk management or policy options is not included. The special case of wider impacts in the context of food crisis

management was not discussed. The terms of reference of the project specifically excluded discussion of the regulatory framework for food safety evaluation and risk assessment**.** Such considerations are currently evaluated by FSA and are not considered to be **“wider impacts**”. There may be safety and risk considerations in a broader context, however (e.g., diet and/or environment). The scope of the project also excluded the risk assessment process and methodology, policy, and food law.

Wider Impacts Beyond Food Safety Risk Assessment (2024)

Methodology

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A Pilot Expert Working Group was convened in the form of an *ad hoc* or “mock” Scientific Advisory Committee. Experts invited to participate were identified by the Science Council to complement the existing expertise of the Council and to bring in perspectives from diverse disciplines and business experience (Annex 2). Experts provided feedback on the draft discussion papers and participated in a one-day workshop (Annex 3) designed to share perspectives on wider impacts viewed through the lens of three selected case studies. Case studies were selected to promote discussion of wider impacts; the goal was not to produce detailed reports on the case studies. The three case studies used were:

Aspartame: initially conceived to illustrate evidence evaluation where nutrition is a key wider impact.

Seaweed: initially conceived to illustrate evidence evaluation where environmental impact is a key wider impact.

Nitrite/Nitrate: initially conceived to illustrate evidence evaluation where there are both chemical and microbiological risks involved.

Wider Impacts Beyond Food Safety Risk Assessment (2024)

Recommendations

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The need for broad integrated impact assessments is compelling, notably in the context of health and environmental impacts and the growing attention to such assessments in government policies, the expectations of consumers and civil society and in the private sector.

The Science Council concluded that the evaluation of wider impacts aligned with FSA regulatory food safety risk assessment is scientifically feasible but is currently limited by the absence of protocols, guidelines, experience and the legislative remit for such evaluations. Based on the scale of impacts, the most important priorities in the context of the food system are those of environmental and potential wider health impacts. Ideally, outcome-based approaches are preferrable when possible; these will require means of monitoring significant wider impacts. The following recommendations address the above impact areas and the need to build a science base around the assessment process.

Recommendation 1. Update FSA internal processes to identify how, where (relative to food and feed safety regulatory assessment) and by whom wider impacts are identified and assessed. Transparency is especially important when considering wider impacts beyond traditional risk assessment to ensure trust in risk management and policy.

Recommendation 2. Develop an up-to-date map of government policies impacting the food system and dietary patterns and quality, to identify ownership, guide evaluation of wider impacts beyond food safety risk assessment across government and ensure policy coherence.

Recommendation 3. It is not currently possible to rank or easily compare evidence for wider impacts. The FSA should collaborate with other government departments and agencies to develop guidelines for structured evidence evaluation across impact areas, including evidence sources and quality, use of comparator products and benchmarks, and comparison of options/alternatives.

Recommendation 4. Develop in collaboration with other government departments a set of criteria for selection of impacts for inclusion in FSA risk management considerations.

Recommendation 5. Environmental sustainability of production systems for any food product should be viewed as context dependent. Any assessment of sustainability should take appropriate account of waste products, water (use and contamination of fresh and sea water), greenhouse and malodorous gas emissions, soil health, biodiversity and changes in land and marine use and how these might be influenced by the widespread consumption of the food product. Although methodologies for environmental impact assessment, and international and UK environmental standards exist, new metrics and means of applying existing assessments and standards to food standards will be required.

Recommendation 6. Explore the thorough exploitation of all available data including National Diet and Nutrition Survey (NDNS), and other appropriate data sources to gain better insights into potential nutritional consequences of changing dietary patterns associated with new categories of product, food preparation and cooking practices, retail and media trends.

Recommendation 7. Use existing data sources to develop a predictive tool (with input from other government departments) with which to better assess the impact of product reformulation on food properties (e.g., to elaborate more nuanced data on food matrix changes and stability; breakdown calorie data from fat, sugar, etc) and unintended impacts on nutrition and health.

Recommendation 8. Improve application of existing data on how consumer perception of benefit and risk drives eating behaviour, to assist consumer choices in an increasingly complex food environment. It is desirable as a prerequisite to agree working definitions of terms such as “ethical”, “natural”, “processed”, etc.

General Considerations: Wider impacts beyond food safety risk assessment

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1. The FSA's mission to ensure that "people can trust that the food they buy and eat is safe and what it says it is, and food is healthier and more sustainable" raises consumer interests that are wider than food safety. In 2022 the FSA published research on the 'wider interests' that consumers want to be protected on their behalf (Conners *et al.*, 2022). The research showed that, when making food decisions, as well as needing access to safe, affordable food, the UK public have deep concerns about health and nutrition, ethics and the environment. There is also an abundance of interest in wider impacts in the private sector reflected in investor demands and the growth of environmental, social and governance (ESG) standards. Demands on the food system are growing, resulting in greater complexity. Cons

umers and civil society stakeholders are demanding a more sustainable and more resilient food system. The COVID-19 pandemic and, more recently, conflict in Ukraine had big impacts on food systems in different ways. Decarbonisation, food security and a growing public health crisis associated with poor diets and lifestyles are also likely to grow in importance.

2. Price and the cost of living lead many consumers to make uncomfortable compromises around the ‘wider interests’ in food that they care about. Industry responds to consumer concerns – recognising price imperatives, and also seeking to differentiate their products through focussing on marketing how their product meets perceived consumer interests around the themes of healthy eating, nutrition, environmental sustainability, and ethics.

3. In addition to broad consumer interests beyond food safety, the FSA has to take account of other factors: government policy, public health agrifood system impacts including economic feasibility, environmental sustainability, broader environmental impacts and trade (FSA Board Paper 19-03-08).

4. Table 1 builds on existing FSA and Codex Alimentarius documents on wider impacts/other legitimate factors and, while not designed to be an exhaustive attempt to capture impacts, it highlights the broad scope of wider impacts, necessitating criteria to identify major impacts. It is noteworthy, that the availability of standard or recognised measures is patchy for many of the proposed impacts. However, this is changing rapidly.

5. Food packaging is of significance because of direct environmental impacts and also because of its importance in protecting food from spoilage and contamination. Packaging has an important role to play in the management of food safety, food quality, shelf life and waste. The three case studies selected did not link directly with considerations of food packaging. However, in consideration of the impacts listed in Table 1, it was agreed that food packaging is a major cross-cutting issue for which wider impacts should be considered.

Table 1. Proposed List of Wider Impact† Areas and Sub-Topics of Relevance in Food Regulatory Assessment

Impact Area	Topic	Measures/Standards (if any)	Comments

Public Health	Nutrition	Impact on intake of nutrients of public health importance. NDNS and other survey data	Concern about intakes of saturated fat, energy, sugar and salt is well founded and backed by strong evidence. The quality and quantity of protein in the diet. The bioavailability of macro and micronutrients in the diet (for novel products, these impacts would likely be captured in the pre-market approval or flagged for later verification/assurance).
Self-care		Support for consumers seeking dietary support for health conditions/special needs.	
Emotional and mental health		Consumer wellbeing and quality of life. Public trust in food.	
Food and nutrient security	NDNS and other survey data		

Agrifood System	Technical/organisational feasibility of options		Technical capability and capacity to implement risk management options and ability to enforce controls.
Economics*		Cost of implementing risk management options and distribution of costs. Impact on domestic and local production. The viability of elements of the food system may impact future food security, prices, quality and environmental sustainability. Business sustainability.	

Good Agricultural and good manufacturing practices	Public and private standards (e.g., Defra COGAP for Reducing Ammonia Emissions; Red tractor producer standards; BRCGS Global Food Safety Standard)	Good practice standards give assurances that appropriate procedures, training, measures and verification are in place to safeguard the health and interests of consumers from harm. In the absence of such practices, end-product testing cannot provide an acceptable level of certainty.

Animal health and welfare	e.g., guidelines from WOAH; RSPCA, etc e.g., WOAH Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials	British consumers have been among the most vocal about concerns for animal welfare. Historical examples include the size of battery hen cages, veal crates, and facility for animals to graze and feed naturally. AMR in pathogens of human clinical significance is a growing public health concern associated, *inter alia*, with use of antimicrobial veterinary drugs.
Food/ingredient availability/ security; equity		Food availability, security/affordability is always paramount and ultimately will determine the level of risk tolerance at several levels, including at domestic level. It can also be a driver of food fraud. Are risks, benefits and costs shared equitably?

Sustainability	UN sustainable development goals; MSC seafood standards	Sustainability is a broad term with several dimensions. Suitable metrics for sustainable food systems are being developed.
Worker Safety and Welfare	Public standards (e.g., ISO 34101 for cocoa; ISO 26000:2010; ILO Labour Standards). Private Certification (e.g., Fairtrade ; BRCGS ETRS ; ETI base code)	-

Wider Consumer Interests	Labelling and Informed Choice	FSA Research FSA Food & You data	Consumers have a right to information on topics that can have an impact on choice and health. A necessary pre-requisite is the ability to understand the information provided and to derive a benefit from it. Regulators may use a warning label as a means of ensuring consumers make an informed choice for example when sub-groups of consumers may be at risk or where there is developing concern but no evidence of risk. Such approaches are framed by wider government policy.
Taste, Convenience, variety, durability	Waste, value for money	Eating pleasure, consumer satisfaction, affordability and health.	
Cultural and religious requirements	e.g., Halal and Kosher regulations	-	

Trust	FSA Research FSA Food & You data	Misleading, false or conflicting information may lead to consumer mistrust and be harmful to the goals of achieving a safe, affordable, healthy and sustainable diet. Information that could disrupt the marketplace or lead to increased prices may not be in the interests of consumers.

Perceived risks	FSA Research FSA Food & You data	Many factors can contribute to risk perception among consumers. Perceived risk is not necessarily the same as scientifically measured risk but is “real” for consumers. The factors contributing to perceived risk are many and may be subjective in nature. For example, ethnic background and belief systems; religious belief; media attention. Perceived risk may be important, even dominant, in driving consumer expectations, but unfounded perceptions could also be harmful if it drives unhealthy or unaffordable behaviours.

Trade	Harmonisation and non-technical barriers to trade	WTO Rules (e.g., SPS measures)	Trade is covered by WTO rules including the GATT which evolves over time. WTO encourages members to base standards on three recognised international standard-setting bodies: the Codex Alimentarius Commission for food safety; the IPPC for plant health; and the WOAH for animal health and welfare and zoonoses.
Environment	Carbon dioxide	e.g., ISO 14040 series and other standards Private certification bodies (e.g., RSPO; Rainforest Alliance))	Including deforestation (terrestrial and marine); land use; Life-cycle analysis; food losses and waste.
Water	e.g., ISO 14046 FAO best practice recommendations	Water footprints and efficiency of use; local water resource impacts.	

Biodiversity, wildlife and risks to wider environment	e.g., OECD Policy papers/ test protocols; Nagoya Protocol	Impact on natural environments; pollinator health, water quality and availability; plant health. Introduction and impact of non-native species (risks and benefits).
Other emissions	e.g., Defra COGAP for Reducing Ammonia Emissions	For example, methane and greenhouse gases (other than CO2); toxic and malodourous gases (e.g., ammonia); water discharges of nitrogen, phosphorus; microorganisms; covering both environmental damage and “amenity” impacts for citizens.

†This list includes the impacts already identified by the FSA (FSA Board Paper 19-03-08) and the other legitimate factors identified by the Codex Alimentarius Commission (FAO and WHO, 2022; FAO and WHO, 2023b). Codex Alimentarius is mainly focused on fair trade considerations and labelling.

*Economics connects all proposed impact areas as a means of measuring and comparing impacts. Thus, the disciplines of health, food, environmental, public finance economics, etc may all be involved.

Abbreviations

AMR: Antimicrobial Resistance; BRCGS ETRS (BRCGS Ethical Trade and Responsible Sourcing Standard; Defra COGAP: Department for Environment, Food & Rural Affairs Code of Good Agricultural Practice; ETI : Ethical Trading Initiative; GATT: General Agreement on Tariffs and Trade; ILO: International Labour Organisation; IPCC: International Plant Protection Convention; ISO: International Standards Organisation; MSC: Marine Stewardship Council; NDNS: National Diet and Nutrition Survey; OECD: Organisation for Economic Co-operation and Development; RSPCA: Royal Society for the Prevention of Cruelty to Animals; SPS measures: Sanitary and Phytosanitary Measures; WOAH: World Organisation for Animal Health (formerly known as OIE, *Office International des Epizooties*); WTO: World Trade Organisation.

Definitions

Sustainability: The FAO (FAO, 2018) defines a sustainable food system as delivering “food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised. This means that it is profitable throughout; it has broad-based benefits to society; and it has a positive or neutral impact on the natural environment”.

Food Security: There are many definitions of food security within different contexts (House of Commons, 2023). The FAO (see FAO.org) definition states “food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”.

6. The objectives of this project were:

1. to identify potential wider impacts beyond food safety risks;
2. assess the availability of evidence on such impacts; and
3. propose ways in which such impacts can be evaluated systematically.

7. This paper provides a background to the general considerations for addressing wider impacts beyond risk assessment, as captured in existing FSA processes and other government documents.

Legislation and government guidance

8. Section 23 of the Food Standards Act (1999) provides for “consideration of objectives, risks, costs and benefits, etc” within the general provisions relating to the functions of the FSA. This entails taking into account “the nature and

magnitude of any risks to public health, or other risks, which are relevant to the decision (including uncertainty as to the adequacy or reliability of the available information) (Subsection a) and the likely costs and benefits of the exercise or non-exercise of the power or its exercise in any manner which the agency is considering (Subsection b)".

9. Several government documents provide guidance on evaluation and appraisal. They include HM Treasury publications the Green Book (2022) and the Magenta Book (2020). These are guidance documents pointing to best practice in applying a range of methodologies but do not have statutory authority and are not legally binding.

10, In line with government policy on decarbonisation, a supplementary green book guidance document is available on the valuation of energy use and greenhouse gas emissions (Department for Energy Security and Net Zero, 2023). A growing number of documents are becoming available on the evaluation of environmental impacts (e.g., Enabling a Natural Capital Approach Guidance (ENCA), Defra, 2023a; Environmental Principles Policy Statement, Defra, 2023b). While the expertise to conduct evaluation of environmental impacts does not reside within the FSA, the criteria for performing and overseeing such evaluations are becoming clearer and should facilitate a consistent methodological approach.

11. The Better Regulation Framework (2023) (BRF) is also a guidance document. The BRF is primarily aimed at regulatory provisions made by government ministers. However, independent regulators are recommended to follow the framework where possible. Regulatory provisions for operational, day-to-day conduct of regulators, including authorisations of regulatory products, are excluded; the main focus being on new legislation and new policy. The purpose of the BRF is "to ensure that government regulation is proportionate and is used only where alternative, non-regulatory approaches, will either not achieve the desired policy outcomes or will achieve them at disproportionate cost".

12. Guidance on practices that may mislead the consumer (previously covered by an Office of Fair-Trading report; OFT, 2008) has recently been updated by the Digital Markets, Consumers and Competition Act 2024. The Act provides definitions of unfair practices and describes misleading actions, as well as misleading omissions. According to the Act a misleading action occurs when a practice involves the provision of false or misleading information relating to a product, or there is an overall presentation that is likely to deceive the average consumer about the product, or any marketing which creates confusion, or is likely to create confusion. Misleading information includes reference to

information which, although true, is presented in a misleading way. Material omissions occur when information is omitted that the average consumer needs to take an informed decision. The Act lists practices that are considered unfair in all circumstances, including falsely claiming that a product complies with or has been approved or authorised by a public or private body; publishing consumer reviews in a misleading way (or reviews that are fake); and falsely claiming that a product is able to- prevent or treat disease; restore, correct or modify a physiological function, or modify a person's appearance. Enforcement of the Act is the duty of local authorities and the Competitions and Markets Authority. Advertising claims are dealt with by the Advertising Standards Authority. Information on labels is regulated by the Department for Environment, Food and Rural Affairs (Defra). Additional references to the consideration of wider impacts are available in international trade agreements, in retained EU Law and in the scientific literature (Annex 1).

Current FSA Approach

13. The term generally applied by regulatory agencies in consideration of wider impacts beyond risk assessment is "other legitimate factors". The FSA has several internal risk analysis documents that allow other legitimate factors to be taken into account in the delivery of proportionate protection to consumers. The categories of other legitimate factors documented in 2019 FSA Board paper (19-03-08), are divided into those currently handled by the FSA (economic impact; wider consumer interests; consumer habits, perceptions, acceptability and preferences; impact on trade (partial); cost of carbon emissions and food waste) and factors where expertise is not available internally (nutrition; impact on emotional and mental health; technical and feasibility considerations; impact on trade, including impact on public confidence in UK food; animal welfare; broader environmental implications).

14. More useful is the FSA classification of core and issue-specific factors. Core factors are classified as public health, safety and wellbeing; wider consumer interests; consumer habits, perceptions, acceptability and preference; economic impact; and technical/feasibility. Issue-specific factors are: potential of non-legislative approaches; political change in trading partners; socio-economic factors; animal welfare; impact on trade; environmental impact.

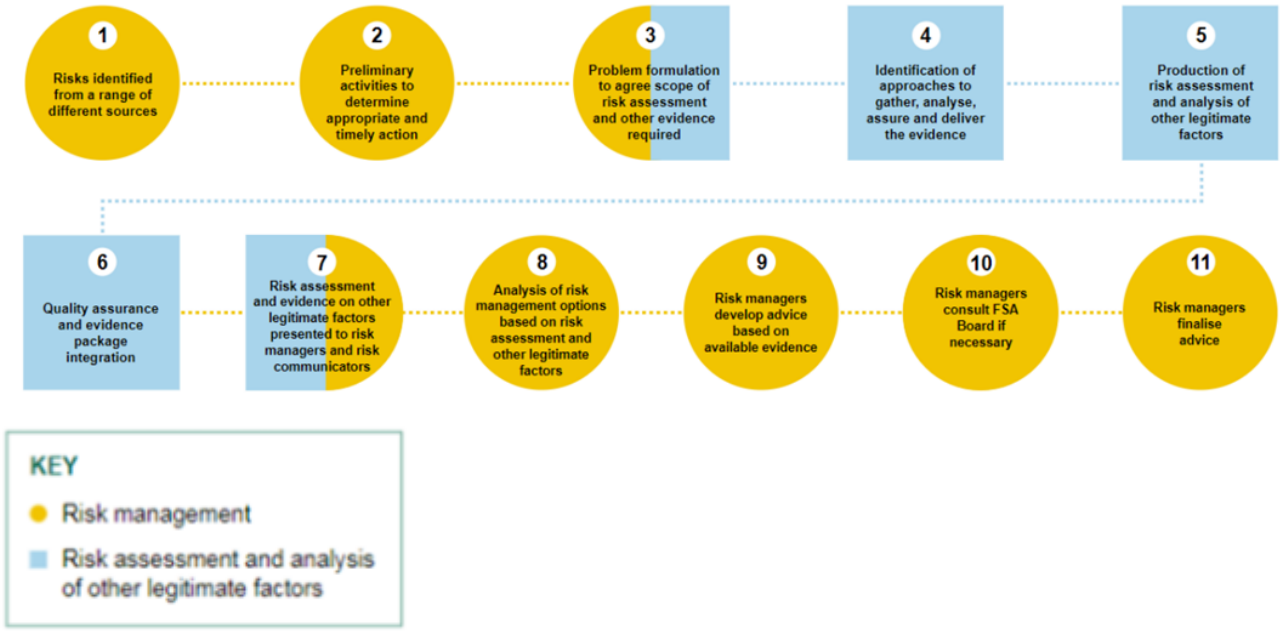
15. Evidence on other legitimate factors (FSA Board paper, 19-03-08) may be gathered as part of the risk analysis process prior to decisions on risk management (Fig.1). As consideration of health risks would always have primacy in risk analysis, the assembly of evidence for wider impacts is secondary to

assuring consumer health is protected.

16. The FSA recognizes that other legitimate factors depend on context and there may be a need to take account of the UK as a whole, as well as issues that may relate to individual home nations.

17. While these documents outline the need to consider other legitimate factors, there is no internal FSA guidance on their evaluation.

Figure 1: Food Standards Agency Risk Analysis Process



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Annex 1- Other sources of published guidance

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Annex 1. Other sources of published guidance

International Context

1. The working principles for risk analysis published by The Codex Alimentarius Commission (CAC) (FAO and WHO, 2023a) allows for the consideration of “other legitimate factors relevant for the health protection of consumers and for the promotion of fair practices in food trade”. However, the Commission also specifies that “unjustified differences in the level of consumer health protection to address similar risks in different situations should be avoided”. There do not appear to be any precedents for the consideration of wider impacts beyond risk assessment in Codex decision-making. The 46th Meeting of CAC in 2023 stated that “there is a need for further clarity around other legitimate factors with particular relevance to other factors which can be accepted on a worldwide basis” (FAO and WHO, 2023b). The same meeting also debated whether consideration of environmental concerns fell within the scope and expertise available to Codex.

2. The Technical Barriers to Trade (TBT) Agreement (World Trade Organisation) requires members of the World Trade Organisation to avoid unnecessary technical obstacles to international trade. The rules recognise the challenges presented by the proliferation of technical regulations and standards and the demands and interests of consumers. The categories of legitimate factors given by the TBT Agreement are broad: national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment. The use of agreed international standards, e.g., Codex standards, is likely to provide a better route forward to trade agreements than the setting of bespoke standards by individual partners.

Regulated Products: Food Additives, Enzymes and Flavourings

3. Current Retained EU Law on the authorization of food additives, food enzymes and food flavourings (EC, 2008) is clear that consideration of factors other than product safety are required in the approval process. The use of additives and food enzymes should always be technologically justified. Article 7 requires applicants to explain why the technological effect cannot be achieved by other economically and technologically practicable means. There is also a statutory requirement that

products do not mislead the consumer. Applicants are required to provide an explanation that the intended uses do not mislead the consumer and, in the case of a food additive, the advantages and benefits for the consumer.

Non-Regulated and Regulated Products: Contaminants

4. The approach to food contaminants is somewhat different. Contaminants are not intentionally added to food and arise from a diverse number of sources that may include the environment, packaging, processing and cooking, mould growth, etc. Contaminants in regulated products (e.g., novel foods, food additives, etc), may be evaluated and risk management options put in place prior to marketing. Several regulations are applicable to contaminants (e.g., EC, 2006). These contain general principles for risk management which specify that contaminant levels should be kept as low as can reasonably be achieved. Regulations may also specify maximum levels in specific products or commodities. The principle of minimising contaminant levels and compliance with mandatory maximum levels, where applicable, would apply simultaneously.

5. Given the primacy of the management of risks, there is no basis for adjustment of tolerable contaminant exposures based on wider impacts. However, the evaluation of what “can reasonably be achieved” does depend on the context which would necessarily involve an evaluation of risk and wider impacts including costs, benefits, consumer interests, etc. Because precaution is an essential pillar of food risk analysis, consideration of wider impacts would be secondary to assuring protection from identified risks.

Published technical guidance in the scientific literature

6. A number of papers are available on benefit-risk analysis in the context of food (EFSA, 2010, Boobis *et al*., 2013). These papers advocate a tiered approach and, where possible, the comparison of risks/benefits with comparable health metrics (Tier 3). Boobis *et al*. (2013) provide guidance on the evaluation of quality of evidence from different sources.

7. In addition to the BRAFO papers (e.g., Boobis *et al*., 2013), several papers have been published addressing food risk-benefit analysis including seafoods, micronutrients and packaging. It is possible to apply learnings from such examples to develop a framework for future evaluation of risks and benefits in different settings.

8. Renn (2006), provides a useful analysis of risk in a broader context including the challenges associated with risk communication in complex risk settings.

9. Whether in the context of regulated products or whole foods, a key consideration is that risks and wider impacts are not static. New food safety risks are emerging constantly, and wider impacts may change qualitatively and quantitatively depending on the context (for example, food security, economics or a variety of crisis situations). Therefore, any guidance on the consideration of wider impacts beyond risk assessment must allow for change, proportionality and adaptation (see PAGIT framework report; Tait *et al*., 2017). Responses to wider impacts should still be evidence based and the quality of evidence evaluated as a separate step.

Annex 2- Declarations of Interest

In this guide

The Wider Impact Working Group members were asked to declare all relevant interests within the past 5 years as a default and also to consider whether there were any other interests dating to before this which could be relevant, and if so, declare these.

The external experts were selected to participate in this project because of their backgrounds, however Science Council were responsible for managing the project and preparing the report. The interests of the external experts were not considered by Science Council to represent conflicts that would affect the

conclusions of this report.

FSA Science Council

Prof. John O’Brien (Chair)

Updated: 13 June 2024

Personal Interests:

Direct employment:

- The Food Observatory, Founder and Director (2018-present).
- Nestlé SA, Head of Food Safety & Integrity Research Programme (until 2018).

Consultancies and other fee-paid work:

- Scientific Advisory Board, Danone Food Safety Centre, Utrecht, Netherlands (2018-present).
- Elsevier Ltd, Editor, Trends in Food Science & Technology (2021-present).
- Yakult Honsha Co. Ltd - Consultancy on probiotic products (Oct 2024-Oct 2025).
- Book Reviewer. Johns Hopkins University Press, Baltimore, USA (up to 2019).
- ThermoFisher Scientific Inc. USA (2018-2022).

- Crème Global, Dublin, Ireland, Consultancy project on food factory risk management (up to 2019).

- Arthur D. Little, Consultancy on Food Quality Management (up to 2021).

Shareholdings:

- None

Clubs and other organisations:

- Member, External Affairs Advisory Committee, IFST (UK).

- Chair, External Advisory Board, Nutrition Innovation Centre for Diet and Health (NICHE), University of Ulster.

Other personal interests:

- Spouse worked for Johnson & Johnson Inc. (up to 2020).

Non-personal Interests:

Fellowships:

- Royal Society of Chemistry, FRSC, Institute of Food Science and Technology (UK), FIFST

- Society of Toxicology.

- Institute of Food Technologists.

- Society for Risk Analysis.
- Society of Chemical Industry.
- Association of Official Analytical Chemists.
- International Association for Food Protection.
- Non-Executive Board Member and Deputy Chair, Campden BRI.

Non-industrial funding:

- None

Indirect support:

- None

Trusteeships:

- Institute of Food Science & Technology, UK (2020-2023).

Land and property:

- None

Other public appointments

- None

Other non-personal interests:

- Strategic Advisory Committee, Need For Nutrition Education/Innovation Programme (NNEDPRO), Cambridge, UK.

Others:

- Work experience (industry and government) prior to 2016 regarding safety aspects of aspartame and other sweeteners and the use of nitrite and nitrate as additives in meat products.

Prof. Peter Borriello CB

Updated: 11 March 2024

Personal Interests:

Direct employment:

- Chief Executive of the Veterinary Medicines Directorate (Retired)

Consultancies and other fee-paid work:

- Chair of the RUMA independent scientific group.

- World Organisation on Animal Health (WOAH on AMR).

- World Bank on AMR.

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- Trustee of Safe Medicines for Animals (SMArt), but no income from industry.

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Prof. Emily Burton

Updated: 11 March 2024

Personal Interests:

Direct employment:

- Nottingham Trent University.

- Member, FSA Advisory Committee on Animal Feedstuffs.

- Member, FSA Science Committee.

Consultancies and other fee-paid work:

- PhD examiner for UK universities in the fields of animal nutrition, animal production, animal health and aquaculture.

- Reviewer for Polish Governmental Grant funding board in field of animal health.

Shareholdings:

- Shareholdings in Si Active Ltd - Company number 06932163.

Clubs and other organisations:

- World’s Poultry Science Association (WPSA) European Working Group on Poultry Nutrition: UK representative.

- WPSA UK branch member.
- Women’s Institute member.
- Egg and Poultry Industry Conference committee member.

Other personal interests:

- Husband (Gordon Burton) is chair of governors for Bleasby Primary School.
- Director: Egg and Poultry Industry Conference Ltd.
- Director: British Poultry Science Ltd.

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- Perry Foundation (Charity) funding of a PhD in poultry production.
- BBSRC funding of PhDs in poultry production.

Indirect support:

- Leadership of a research group that, through commissioning of research or other work or through providing advice, receives funding from the following companies: Alltech, AB Vista, AB Agri, ForFarmers, Kemin, Avara, Two Sisters

Food Group, Danisco, Deep Branch Biotech, Clonbiotech, Fluidquip Technologies, Green Plains Bioethanol, Entec, Flybox, Premier Nutrition.

Trusteeships:

- Trustee: Gordon Memorial Trust Trustee: British Poultry Science Trust.

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Others:

- Husband (Gordon Burton) sometimes professionally advises UK Sport and / or National Governing Bodies of sports on their strategy or more granular advice on improving athlete performance.

- Husband (Gordon Burton) is a lay member of the FSA Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT).

- Regularly invited to speak at conferences and meetings by the NFU and other industry and charitable agri-sector organisations.

- Applied (unsuccessfully) for EU funding bids in collaboration with Celtic Sea Minerals.

Prof. Peter Gregory

Updated: 19 January 2024

Personal Interests:

Direct employment:

- None

Consultancies and other fee-paid work:

- Chair, Agriculture and Horticulture Development Board (AHDB) Recommended List Board.

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- Honorary Fellow National Institute of Agricultural Botany (NIAB).

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- Partner Alreside Meadow LLP.

Other public appointments:

- None

Other non-personal interests:

- None

Jaqueline Healing

Updated: 12 March 2024

Personal Interests:

Direct employment:

- None

Consultancies and other fee-paid work:

- Working as a freelance consultant in Food Safety and Quality.

Shareholdings:

- Shareholder in J Sainsbury.

Clubs and other organisations:

- Board member of the Society of Food Hygiene and technology.

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Others:

- I am a volunteer at the Citizens Advice Bureau on the Isle of Wight.

Claire Nicholson

Updated: 11 March 2024

Personal Interests:

Direct employment:

- From 2013-2020 Lay member of the Advisory Committee on Novel Foods and Processes.

- From 2014-2020 Independent Director of consumer Interests at Red Tractor Assured Farm Standards.

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- My husband, Robert Toms is partner at Smedvig Ventures a small private equity company with direct investments in early-stage tech companies primarily in Northern Europe, and indirect investments via buy-out funds globally. Smedvig Ventures has a portfolio of direct investments mainly in technology/software businesses. The full list can be viewed at https://smedvig.vc/portfolio/. Robert currently leads on 8 of the portfolio companies. None of the companies where my husband takes the lead have any food related activities.

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- I am a trustee of Reading Foundation, a small educational charity associated with Reading School.

Land and property:

- None

Other public appointments:

- I have recently been appointed to be the lay member for the British Pharmacopoeia Commission.

Other non-personal interests:

- None

Others:

- My son Kieran Toms is a Medical Doctor, (formerly at Barts NHS healthcare trust) currently undertaking a PhD at Institut Pasteur in Paris. His research is about the host and bacterial factors involved in Listeria monocytogenes invasion of the central nervous system.

Prof. Tom Oliver

Updated: 5 December 2023

Personal Interests:

Direct employment:

- University of Reading (Research Dean for Environment).

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None.

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- Research Funding from UKRI (recent grants): UKRI – INCAF- Integrating Nature-Climate Scenarios & Analytics for Financial Decision-Making (Jan 2023-Apr 2026).

- NERC International - EMPOWER- Empowering citizen and community adaptation to systemic risks from climate change (2021).

- NERC- Drivers of UK Insect Declines. UKRI SysRisk - Systemic environmental risk analysis for threats to UK recovery from COVID-19.

- Green Finance Institute funding- Nature-Climate Risks to Finance (Apr 2023-Dec 2023).

- VKRF foundation- Catalyst for biocentric governance and awareness (Oct 2024-Oct 2026).

Indirect support:

- None

Trusteeships:

- Trustee for Wild about Wallingford charity.

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Others:

- Defra secondment: 2019-2021 Defra Senior Fellowship —Defra Systems Research Programme ‘design authority’.

- Go-Science secondment: Mar 2022-Oct 2023 – Specialist methods advisor

- Office for Environmental Protection (OEP): 25 YEP monitoring report draft (26.11.21- 03.12.21)- Peer Review Dr. Dave Hughes, I interacted with Dr. Hughes during his role at Defra.

- Author of popular science book with publisher W&N, “The Self Delusion: The Surprising Science of Our Connection to Each Other and the Natural World” (Jan 2023).

Prof. Simon Pearson

Updated: 29 February 2024

Personal Interests:

Direct employment:

- Director Lincoln Institute of Agri Food Technology, The University of Lincoln.

- Member FSA Science Council.

- Director Freiston Associates Ltd.

- Director Fruitcast.AI Ltd.

Consultancies and other fee-paid work:

- Advisor to Xihelm Ltd (non-fee paying).

Shareholdings:

- Fruitcast.AI.

- Frieston Associates Ltd.

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- Honorary Fellow of the Royal Agricultural Society of England (RASE).
- Fellow of the Royal Society of Biology (FRSB).
- Fellow of the Institution of Agricultural Engineers (FIAgrE).

Non-industry funding:

- BBSRC, EPSRC, IUK, Research England, NERC, STFC, H2020.

Indirect support:

- None

Trusteeships:

- Trustee Douglas Bomford Trust.

Land and property:

- House in Lincolnshire.

Other public appointments:

- Member BBSRC SAF SAP (to April 2024).

- Chair IUK-Bridge AI Advisory Group.

Other non-personal interests:

- None

Others:

- My wife is Director of CERES Agri-Tech at the University of Cambridge, Board Member of Horticulture Crop Protection Ltd and Freiston Associates Ltd.

- I am former interim CEO of Agaricus Robotics Ltd.

- Ongoing Innovate UK projects with Dogtooth Robotics, Wootsano, Xihelm, Agaricus Robotics, Muddy Machines, Moy Park, Nissan UK, British Aerospace, Meggitt, Leonardo, Househams, ARWAC, Oxdrive, Berry Gardens, Eyre Trailers, APS Produce.

- Former CoChair Defra Robotics and Automation Review with SoS.

- Former food manufacturing lead for Made Smarter Review.

Prof. Richard Smith

Updated: 28 February 2024.

Personal Interests:

Direct employment:

- Professor of Public Health Economics and Deputy Pro Vice Chancellor for the Faculty of Health and Life Sciences at the University of Exeter.

Consultancies and other fee-paid work:

- No consultancies for industry – only for FSA itself and organizations such as the World Bank. Other than FSA no consultancy would be related to food.

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- Non-Executive Director, South West Academic Health Science Network – current.

- Non-Executive Director, Royal Cornwall Hospitals Trust, Truro, Jan 2019-May 2022.

Other non-personal interests:

- None

Prof. Michael Tildesley

Updated: 29 February 2024

Personal Interests:

Direct employment:

- Professor in the Zeeman Institute for Systems Biology and Infectious Disease Epidemiology Research at the University of Warwick.

Consultancies and other fee-paid work:

- Consultancy for the Animal and Plant Health Agency on spread of highly pathogenic avian influenza work (2022-23).

- Expert Witness work regarding COVID-19 transmission (2022-23).

Shareholdings:

- None

Clubs and other organisations:

- Member of the Scientific Pandemic Influenza Modelling Operational Group during the COVID-19 pandemic.

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Prof. Jonathan Wastling

Updated: 13 June 2024

Personal Interests:

Direct employment:

- Deputy Vice-Chancellor at Brunel University (2023-), London, Keele University (2015 - 2023).

Consultancies and other fee-paid work:

- UKRI (Selection panel work) (Ongoing); Cambridge University - Press editor of Parasitology (Ongoing).

Shareholdings:

- BP (<£1000).

Clubs and other organisations:

- Governor - Oswestry School, Shropshire.

Other personal interests:

- Spouse is an employee of Liverpool University.

- Parents-in-law run a farming business in Cheshire.

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- Songbird Survival Trust.

Land and property:

- Family farms: 400 acres mixed arable/livestock in Cheshire and Shropshire.

Other public appointments:

- None

Other non-personal interests:

- None

External Experts

Kate Burns

Updated: 11 March 2024

Personal Interests:

Direct employment:

- CEO Islander Rathlin Kelp

Consultancies and other fee-paid work:

- None

Shareholdings:

- Major shareholder in Islander Kelp Ltd.

Clubs and other organisations:

- Director Causeway Coast Maritime Heritage Ltd.

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- Trustee and Chairperson, the Leslie Foundation.

- Trustee Belfast Met Charitable Trust.

Land and property:

- None

Other public appointments:

- Board member the Marine Institute (Ireland).

- Board member the Northern Ireland Fishery Harbour Authority.

Other non-personal interests:

- None

Dr Alison Cave

Updated: 13 March 2024

Personal Interests:

Direct employment:

- Chief Safety Officer, Medicines and Healthcare products Regulatory Agency (MHRA).

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Dr Eliza Capuzzo

Updated: 14 March 2024

Personal Interests:

Direct employment:

- Senior Marine Ecosystem Scientist, Centre for Environment, Fisheries and Aquaculture Science (CEFAS).

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Prof. Julian Cooper

Updated: 5 March 2024

Personal Interests:

Direct employment:

- 1980 – 2015 British Sugar/AB Sugar. Retired (2015), Pension: Associated British Foods.

Consultancies and other fee-paid work:

- (2015 – Present) 342 Consulting Ltd – Owner/Director, Consultancy to the food industry: Client projects on reformulation, sugar chemistry, food science and technology.

- Sugar Workshops for World Sugar Research Organisation, Sugar Workshops for ABF Companies.

- Review of projects for beet seed companies – KWS and Sesvanderhave.

Shareholdings:

- Shares in BP, Shell & Aviva.

- Landlord for 3 properties (shareholding in management companies).

Clubs and other organisations:

- Fellow Institute of Food Science and Technology (IFST), Fellow Royal Society of Chemistry, Chartered Chemist, Chartered Scientist.

- Council member of British Society of Sugar Technologists, Friend of Campden.

Other personal interests:

- Visiting Professor University of Reading.

- Visiting Lecturer University of Surrey.

- Research Board member Supplant, Cambridge.

- Assessor for Innovate UK.

- Member of Expert Panel EU.

- Licence Reviewer Science Council.

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Sue Davies

Updated: 12 April 2024

Personal Interests:

Direct employment:

- Which? (salary).

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- Member of Food and Drink Sector Council.

Other non-personal interests:

- None

Suzanne Eckford

Updated: 2 April 2024

Personal Interests:

Direct employment:

- Head of International Office at UK Veterinary Medicines Directorate (VMD).

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Dr Stephen French

Updated: 11 March 2024

Personal Interests:

Direct employment:

- Scientific Policy Director, Institute of Food Science and Technology.

Consultancies and other fee-paid work:

- My wife and I are directors in my company, Scientific Intelligence Ltd., and consult for Food and Health businesses on various science and nutrition topics.

Shareholdings:

- None

Clubs and other organisations:

- Visiting Senior Research Fellow, School of Psychology, Faculty of Medicine and Health, University of Leeds, UK.

- Adjunct Associate Professor, Indiana University School of Public Health-Bloomington, USA.

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Others:

- Governor, The Nottingham High School.

Prof. Joanne Harrold

Updated: 14 March 2024

Personal Interests:

Direct employment:

- Dean of Psychology, University of Liverpool.

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- Co-ordinator on a grant from the European Commission (paid to the University of Liverpool) for the Horizon 2020 project SWEET (Sweeteners and sweetness enhancers: impact on health, diet, safety and sustainability).

Indirect support:

- PI on funding (paid to the University of Liverpool) from the American Beverage Association for the SWITCH study examining Effects of non-nutritive sweetened beverages on appetite during active weight loss.

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Prof. Anthony Heyes

Updated: 28 March 2024

Personal Interests:

Direct employment:

- Professor of Environmental Economics, University of Birmingham.

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Julie Hill

Updated: 13 June 2024

Personal:

Direct employment:

- Non-Executive Board Member, Office for Environmental Protection.

Consultancies and other fee-paid work:

- None regular.

Shareholdings:

- Husband has managed portfolio of shares.

Clubs and other organisations:

- Belong to a number of gardening, heritage and arts organisations.

Other personal interests:

- Fellow and Chair of Institution of Environmental Sciences.

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- Private rented income.

Other public appointments:

- None

Other non-personal interests:

- None

Dr Greg Jones

Updated: 6 March 2024

Personal Interests:

Direct employment:

- Microbiologist, Campden BRI.

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Alec Kyriakides

Updated: 29 February 2024

Personal Interests:

Direct employment:

- Independent Food Safety Consultant, Director – Campden BRI.
- Former Head of Technical Operations – Sainsbury’s.

Consultancies and other fee-paid work:

- Chair – BRCGS International Advisory Board.
- Chair / Member – Safe to Trade Technical Standards Committee / Independent Governance Board.
- Food safety consultant to various food manufacturers and retailers in the UK, Europe and globally.

Shareholdings:

- J Sainsbury plc.

Clubs and other organisations:

- Member of the International Association of Food Protection.
- Honorary Fellow of the Society of Food Hygiene.

Other personal interests:

- Honorary Lecturer – Queen’s University Belfast

Non-Personal Interests:

Fellowships:

- Fellow of the Institute of Food Science and Technology (IFST).

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- Trustee – Institute of Food Science and Technology.

Land and property:

- None

Other public appointments:

- Member – Advisory Committee on the Microbiological Safety of Food.

Other non-personal interests:

- None

Prof. John Mathers

Updated: 3 March 2024

Personal Interests:

Direct employment:

- Professor of Human Nutrition, Newcastle University.

Consultancies and other fee-paid work:

- Editor-in-Chief, British Journal of Nutrition.

- Member of Scientific Advisory Board for Migros (Estavayer Lait S.A., Switzerland). Ended in August 2019.

Shareholdings:

- None

Clubs and other organisations:

- Member of The Nutrition Society.

Other personal interests:

- None

Non-Personal Interests

Fellowships:

- None

Non-industry funding:

- Research grant from the World Cancer Research Fund.

Indirect support:

- None

Trusteeships:

- Trustee of the Rank Prize.

- Trustee of the British Nutrition Foundation.

Land and property:

- None

Other public appointments:

- Chair, Scientific Advisory Board, Healthy Diet, Healthy Life.

- Chair, World Cancer Research Fund International Grants Panel.

- Member, UKRI Future Leaders Fellowships Panel.

- Member, Strategic Advisory Board for NOVA Medical School, Lisbon, Portugal.

Other non-personal interests:

- None

Dr Emeir McSorley

Updated: 14 May 2024

Personal Interests:

Direct employment:

- Senior Lecturer in Human Nutrition, Ulster University.

Consultancies and other fee-paid work:

- Research grants received to investigate the health benefits of seaweeds and extracts from seaweed.

- Nutrition Society, UK (Jan 2018, £2500, study ”The effect of a dietary fibre (DF) extract from seaweed on post-prandial glucose absorption and satiety”).

- Dept. of Agriculture and Food FIRM, Ireland (Dec 2013, £191602, study “Seaweed as a source of non-digestible complex polysaccharide components for the development of novel prebiotic ingredients for the functional food industry (PI)”).

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Dr Kelly Parsons

Updated: 9 July 2024

Personal Interests:

Direct employment:

- Research Associate, MRC Epidemiology Unit, University of Cambridge.

Consultancies and other fee-paid work:

- None

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- None

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Dr Nicola Randall

Updated: 8 March 2024

Personal Interests:

Direct employment:

- Director of the Centre for Evidence Based Agriculture, Harper-Adams.

Consultancies and other fee-paid work:

- 2023/24- Paid consultant on a project entitled: “Review of foresight methods: Future risks and opportunities to the EU.” Novel foods are not a key part of this project but may be included (Funder- European Commission Joint Research Centre).

- 2021/2022. Principle Investigator on a funded project entitled: “Food and Feed Safety Vulnerabilities in Circular Economy – A Critical Review”. My employer was paid for my time spent on this project. As part of the project, we investigated potential risks associated with novel food and feed products. (Funder: European Food Safety Authority).

Shareholdings:

- None

Clubs and other organisations:

- None

Other personal interests:

- None

Non-Personal Interests:

Fellowships:

- None

Non-industry funding:

- 2023/2024- Advisor on a project that includes risk scenarios. Novel foods are not a key part but may be included. My employer has received funding for my time on this project entitled: “Science and Innovation Scenarios for the Natural Environment 2042.” (Funder Natural England).

Indirect support:

- None

Trusteeships:

- None

Land and property:

- None

Other public appointments:

- None

Other non-personal interests:

- None

Wider Impacts Beyond Food Safety Risk Assessment (2024)

Annex 3- Wider Impacts Considered in Case Study Workshop

In this guide

In this guide

1. Introduction

1. Three case studies (aspartame, seaweed, nitrite/nitrate) were used to convene discussions among experts on possible wider impacts. Discussions were focused on major impacts or impacts highlighted in published work. It was possible to identify several marginal impacts. However, compiling an exhaustive list of all possible impacts was not considered practical; each case therefore focused on a short list of impacts. The long list of potential impacts summarised in Table 1 was used to align discussions and it became clear, for the case studies examined, that the significant impacts were wider human health considerations and environmental sustainability. In addition, wider consumer interests and technical feasibility of options featured in some of the discussions notably aspartame and nitrite/nitrate.

2. It was evident from these discussions that, for some impacts, there is a lack of scientific consensus and newly published data is emerging continuously, meaning a constantly changing evidence base. Therefore, the weight of evidence may vary considerably.

3. The workshop highlighted a key challenge overall in moving from consideration of the narrow and immediate impact of a single product in the diet to a holistic assessment of the impact on diet and food systems overall. An additional, but

related, challenge was the need to combine the evaluation of different sources and types of evidence with different levels of weight and quality. Some peer-reviewed research may not be as trustworthy as in the past requiring additional assurance steps to ensure the quality of evidence. It was suggested that the process could be supported by the development of criteria for stratification of products and/or “at risk” groups.

4. In assessing the wider environmental/sustainability impact, it was noted that the evidence base is limited with some life cycle analyses and environmental impact assessments (EIA) in the USA and Europe. Moreover, the existing evidence has high context-dependency so that for a food such as seaweed, for example, existing evidence from very large-scale farms in Asia are unlikely to be applicable to lower intensity farming in UK and European waters (but still relevant to imports). Again, for seaweeds, EIAs carried out through the farm licensing process for territorial waters would not translate to deep sea farming in international waters (nor would the assessment indicate the cumulative impact of multiple farms).

5. Possible approaches to economic analysis were not discussed in the Workshop, but it was noted that economic data could be used once it was agreed that evidence indicated an impact (e.g., impacts of reductions in obesity on NHS costs, employers, etc).

6. Wider Impacts thinking cuts across sectors and national borders; there is need to avail of views and evidence from elsewhere in designing a best practice approach.

2. Public Health

2.1 Nutrition

7. The nutritional quality of diets is a major wider impact consideration. Beyond nutrients, diets contain many substances with demonstrated biological benefits (e.g., antioxidant phytochemicals, modulators of the gut microbiome). In addition, the development and availability of products that are lower in sugar, total and saturated fats and salt is a major route to better nutrition. The public health consequences of excess dietary sugars include overweight and obesity; diabetes; coronary heart disease; dental caries; and several other associated pathologies. Government food policy responses have included education, labelling, taxation (in the case of carbonated beverages), and the encouragement

of product reformulation by manufacturers.

8. While SACN (2023) did not consider wider impacts in relation to food processing and health, the report highlighted the limitations of the many current food classification systems, including relationship of classification systems and nutritional content, relationship with existing dietary recommendations and the use of subjective, poorly defined terms such as “natural”, “wholesome” etc. The SACN (2023) report recommended future research on potential adjustments to NDNS methodology, a classification system that could be reliably applied to foods consumed in the UK and a future risk assessment that would consider the full range of benefits and risks of food processing on the health of the UK population.

9. As the methodology and interpretation of the primary research data on the benefits of dietary low calorie artificial sweeteners is complex, evidence synthesis is heavily dependent on the consensus of professional bodies. The public health benefits are mainly nutritional and include the management of calorie intake and body weight as well as the reduction in post-prandial blood glucose levels, which is especially important in diabetes. As mentioned below, there are marked technical challenges in the replacement of sugars in solid foods compared with drinks.

10. The British Dietetic Association (2016) policy statement on the use of artificial sweeteners states that “adding an artificial sweetener to a food product instead of sugar enables food manufacturers to provide an alternative for consumers which can be a useful strategy for those individuals seeking to control their calorie intake and manage their weight”. The UK National Centre for Clinical Excellence (NICE, 2015), guideline on preventing excess weight gain recommended several evidence-based approaches including the avoidance of sugary drinks that contain free sugars and included products containing non-nutritive sweeteners in the list of alternative products. The WHO (2023) issued a guideline on the use of “non-sugar sweeteners” with a conditional recommendation that “non-sugar sweeteners not be used as a means of achieving weight control or reducing the risk of noncommunicable diseases”.

11. There is much interest in the use of seaweeds to alleviate metabolic risk factors such as hyperglycaemia, hypercholesterolemia and hyperlipidemia with candidate bioactive components being isolated, polysaccharides (alginate, fucoidan), proteins (phycobiliproteins), polyphenols (phlorotannins), carotenoids (fucoxanthin) and n-3 long-chain unsaturated fatty acids (eicosapentaenoic acid). Although there are some specific systematic reviews in some aspects of health

benefits/risks from seaweed consumption, evidence is generally lacking. Consumption of seaweeds might also replace some minerals usually obtained through consumption of red meat.

12. It would be expected that any evidence for human health benefits/risks would have high context-dependency varying with geographic location/season/seaweed species/harvesting technique/processing methods etc. and also be influenced by the method of food preparation adopted by the consumer.

13. Indirect human health impacts through livestock-fed seaweed have rarely been studied.

2.2 Consideration of population sub-groups including vulnerable consumers

14. It was noted that impacts may differ across population sub-groups. This may necessitate careful analysis of distributional impact, e.g., disease and health status, income, age, geography, etc. While an overall (or average) impact may be low, for some groups the evidence may be stronger and/or the impact may be significant. In the context of the three case studies, the only obvious example of a sub-group needing special consideration was consumers managing (pre)diabetes.

15. For consumers managing (pre)diabetes, blood glucose control is essential. The European Association for the Study of Diabetes (EASD, 2023) concluded that there was moderate evidence supporting the use of non-nutritive sweeteners in carbohydrate management in diabetes. The Diabetes UK (2018) Position Statement concluded that replacing free sugars with low calorie sweeteners can be a useful strategy in glucose management in diabetes.

2.3 Dental health

16. There is evidence for a benefit to dental health of sugar replacement with intense non-nutritive sweeteners. Non-fermentable, non-acidogenic substitutes pose a much lower risk than fermentable sugars (Gupta et al., 2013). The Workshop suggested that low sugar does not automatically mean an improvement in dental health as many factors, notably frequency of consumption, are involved.

2.4 Wider Food Safety Considerations

17. While the primary technological purpose of nitrite/nitrate containing products is the prevention of C. botulinum germination and growth, there may be a secondary benefit of growth inhibition of some other pathogens such as Listeria monocytogenes and E. coli O157:H7 (Fraqueza et al., 2021). A lack of quality data makes it difficult to weigh the evidence of wider impacts. Cases of botulism are now rare for a variety of reasons (not limited to the use of nitrite and nitrate in meat curing). Product quality is generally much higher than in the past.

18. Production of seaweeds in polluted inshore waters can lead to accumulation of heavy metals such as cadmium, lead and mercury. Regulation for seaweeds is patchy. There is an absence of Codex standards or guidelines for food safety aspects of seaweed production, processing and use.

19. Wild harvesting of seaweed for personal consumption from areas close to shore may raise health concerns if the local water is contaminated with sewage and/or heavy metals.

3. Wider Consumer Interests

20. The Workshop pointed to a need for more analysis of what could be considered “misleading” especially in the context of emerging claims and products perceived as more healthy. The Digital Markets, Competition and Consumers Act 2024 does not give specific food examples. Product comparisons should take care not to mislead the consumer or to denigrate products complying with current regulations. Greenwashing was highlighted as an area of concern at the Workshop. Currently the Green Claims code published by the Competitions and Markets Authority applies whenever a green claim is made by a business for a consumer. The Green Claims Code (UK Competition and Markets Authority, 2021) sets out the principle’s businesses need to know to ensure the environmental claims they make are accurate and not misleading.

21. Several publications have pointed to the provision of consumer choice and manufacturer options to formulate healthier products. Sweet taste is an integral part of the enjoyment of food. Removing or replacing sweetness in the diet can be very challenging. In response to continued consumer demand, and more recently also in response to sugar taxes introduced to combat obesity, producers of soft drinks have further reformulated products to reduce sugar substantially. It was underlined that the technical solutions applicable to soft drinks are not easily translated to sugar replacement in solid foods (see Technical Feasibility of Options).

22. The UK Soft Drinks Industry levy (UK Government, 2023) applies to ready-to-drink products and from diluted concentrates containing >5% w/v sugar. The levy is payable by the packagers. Without reformulation or product withdrawal, the added costs are borne by consumers and businesses. Non-sugar sweeteners enable the delivery of alternative products.

3.1 Labelling

23. The drive to produce “clean label” products coupled with consumer concern about some food additives and ingredients has driven innovation in recent years (e.g., “no added nitrite” claims). Research on effective alternatives to nitrite and nitrate has taken place for several decades.

24. A dietary shift involving significantly higher seaweed consumption may require additional regulatory measures (e.g., labelling) if, for example, some consumers were found to be at risk of excessive iodine consumption.

3.2 Risk and Benefit Perception

25.Some products may have a “halo” effect leading to a perception of healthiness that may lead to unintentional consequences e.g., overconsumption. It was noted that the communication of risks and benefits was complicated by information in the social media. There is an opportunity to draw out the different dimensions of consumer perception including the generation of evidence and its application in decision making. This implies a need to develop a deeper understanding of the relationship between perception and behaviour, i.e. the “why” of consumer decisions and not just the outcome.

26. A key factor in supporting consumer interests and health will be the provision of information on available options in making healthy dietary choices. Aspartame has received a great deal of media attention due to a number of controversial studies published in the scientific literature. Recent regulatory reviews of aspartame have been undertaken and offer reassurance that products containing the sweetener are safe.

27.For a variety of reasons, there is consumer perception that added nitrite salts in meat curing are potentially harmful. There is little publicly available data with which to compare alternatives. Generally, information available on websites and on social media makes stronger claims than can be used on labels. The association between processed meats and cancer is well established. A perception that some products are safer could drive higher consumption. The

promotion of products claiming benefits of dietary nitrate (e.g., for athletes) alongside the concerns raised about safety may contribute to consumer confusion.

4. Agrifood System

4.1 Technical Feasibility of Options

28.Workshop participants agreed that an understanding of technical options and alternatives is key. In the area of sugar replacement, the technical feasibility of the various options plays an important role in determining choice of sweeteners. Different high-intensity sweeteners have different technological applications and limitations. For example, the main application of aspartame in food formulation is in soft drinks where the sugar does not have a role as a bulking agent. In many solid foods, sugar may contribute to bulk, mouthfeel and other properties as well as sweetness. In many instances, technical solutions may need to identify an alternative non-sugar bulking agent to replace the sugar.

29. The processes for curing meats have grown more diverse in recent years. Data on efficacy of the various approaches for prevention of pathogen growth are not always publicly available. Based on the large volume of research to date, it would appear, at least for some applications, that published data are not available to support the replacement of nitrite in all preservation applications. Equally, it is not yet clear how much of a risk can be ascribed to nitrite and nitrate salts deliberately added in meat curing compared with naturally occurring nitrite and nitrate.

4.2 Other factors

30. Increased production of seaweeds in UK waters may contribute beneficially to local and UK economies but will result in a requirement for onshore processing facilities and disposal of waste.

31. Imported seaweed products may raise issues of the acceptability of labour protection and standards.

32. There is limited evidence and contradictory evidence on the effect of feeding seaweeds on greenhouse gas emissions from ruminant animals and limited and contradictory evidence for animal health/productivity outcomes. Source and production/processing method to produce animal feed can all be anticipated to

affect these.

5. Environmental impacts and sustainability

5.1 Food Waste

33. Impacts on product organoleptic quality associated with the designed technological purpose may lead to a reduction in food spoilage and help minimise waste. For example, nitrite improves the colour of processed meat products. Traditionally cured meat products are generally less susceptible to oxidation than uncured meats. It might be possible to elucidate whether such factors might impact food waste from available data (e.g., industry or WRAP, Waste and Resources Action Programme).

34. Manufacturing considerations may impact heavily on waste and emissions. For example, products with shorter shelf lives may necessitate shorter production runs with more frequent retail deliveries, higher costs and potentially the cost of less export opportunities. Most of the data relating to production costs are not in the public domain.

5.2 Carbon, Ecology and Biodiversity

35. The Workshop highlighted the growing availability of data on the environmental impact of manufacturing in particular carbon footprints. For example, an environmental life cycle assessment of aspartame indicated a reduction in global warming potential compared with an equivalent sweetness of sucrose (Suckling et al., 2023). However, there is considerable uncertainty in this analysis due to the shortage of publicly available data.

36. While growing seaweeds would contribute to carbon sequestration, processing (e.g., freezing/drying) and transport would also contribute to greenhouse gas emissions.

37. Several organisations are currently preparing guidance on minimising environmental damage resulting from seaweed aquaculture (e.g., The Nature Conservancy (2021). Other sources of evidence might arise from:

- Evidence mapping, further systematic reviews, expert elicitation (cognitive diversity), recognising context dependency of impacts. The process used for this is key – e.g., systematic mapping, PAS440 (responsible innovation),

Foresight approaches. Stratification of evidence by, for example, geographic location affects impacts.

- Adoption of hierarchical approaches – e.g., initial regulation against harmful production practices/potentially invasive species, followed by health and/or environmental impact assessment for individual farm plans. Note, the environmental impacts of imports are not captured in existing UK impact assessment frameworks.

38. Experimental approaches to evaluate and monitor impacts at scale (cf. action research) may also be required.

39. The increased prevalence of diseases and pests affecting aquaculture production worldwide is a major global concern. This issue is intensified by a reduction in genetic diversity associated with the domestication of wild seaweed species making crops more susceptible to abiotic stressors, disease and parasites. Cultivation sites will replace existing habitats with novel man-made habitats by virtue of physical and biological changes associated with suspended cultivation infrastructure. Habitats created may be characterised by: increased complexity including the physical presence of the structure itself; the addition of hard artificial substrate; pulses of seaweed growth consistent with growing cycles; and altered physical and chemical properties of the surrounding water.

40. Domestication of wild seaweed cultivars may be an unavoidable consequence of large-scale seaweed cultivation practices. Cultivated seaweeds would most likely be characterised by a human imposed shift in their reproductive strategy (e.g., from outcrossing to self-fertilizing and from sexual reproduction to vegetative reproduction) introducing genetic bottlenecks that may narrow the genetic diversity of cultivated stands potentially making them more susceptible to environmental changes and disease.

41. Sea-based farms may act as stepping stones for non-native species thereby spreading parasites and pathogens that can reduce the productivity of native species and/or obstacles for fauna. There is also the possibility that any introduced farmed species may become invasive and/or provide obstacles for native fauna. Competition for light is important in structuring aquatic algal communities, and this has been demonstrated in the changed algal communities occurring in shaded understoreys. Light intensity and its quality is directly altered by the water column itself, as well as indirectly by vegetation. Maerl beds and

seagrass communities should be avoided when considering possible sites.

42. Competition between cultivated algae and phytoplankton can be expected at times in the production cycle where algae growth is rapid and natural renewal of nitrogen resources is affected by altered water exchange. Where projects are large-scale and have high stocking densities, depletion of phytoplankton communities could have negative implications for some aquatic species in affected areas.

43. The removal of carbon dioxide by cultivated algae in an open, freely-moving water body is likely to have a negligible effect on pH and unlikely to lead to any other detrimental effects on water chemistry within cultivation sites and surrounding areas. When CO2 reacts with water it forms a balance of ionic and non-ionic chemical species including free carbon dioxide, carbonic acid, bicarbonate and carbonate, the ratio of which depend on many factors such as temperature and pH.

44. In an open, freely moving water body the effects of carbon removal from large scale cultivation is likely to have a negligible effect on pH. Seaweed farms require water flow to encourage growth and will absorb and deflect tidal and wave energy altering flow conditions in connected habitats (including local geomorphology at large scales). How cultivation structures alter coastal hydrology is an important factor in determining the ecological implications at different scales.

45. The largest proportion of artificial material added to the marine environment will likely consist of a mixture of synthetic polymer rope (e.g., polypropylene). These materials are typically designed to be highly resistant to degradation in the marine environment. Pollution caused by discarded or lost components may contribute to marine pollution if seaweed farms are improperly managed. Once lost from the farm, debris may contribute to existing environmental pollution issues such as increasing levels of plastics in marine food webs or social concerns such as the reduction in coastal amenities due to drifting debris. These negative impacts should be mitigated through best practice guidance and regulation.

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