

Exploring methods of measuring and collecting data relating to imported food production standards

Maes o ddiddordeb ymchwil: [Emerging challenges and opportunities](#)

Cwblhau arfaethedig: 28 Ebrill 2023

Statws y prosiect: Wedi'i gwblhau

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Awduron: RSK ADAS Limited

Cynhaliwyd gan: Food Standards Agency and RSK ADAS Ltd

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As global trade markets have expanded, there has been an increasing volume of agricultural commodities and food products imported to, and exported from, the United Kingdom (UK). In response to these market and political changes, standards for imported foods are being implemented to control the trade of goods and services.

Alongside the development and implementation of standards for imported foods, there has been a growing public desire to understand where the food we eat comes from, and increasingly, to understand not just the safety of food, but the inter-country variation in the sustainability of food production practices. For example, is a product sourced from one country comparable to another country in terms of animal welfare, environmental sustainability (for example, greenhouse gas emissions, deforestation, biodiversity etc.) and nutritional composition.

To inform future research needs, the Food Standards Agency required a detailed understanding of the current data and literature landscape regarding imported food standards, with a particular focus on data availability around three themes: animal welfare, environmental sustainability, and

nutritional composition. Data on food safety was not considered as part of the review as this has been well documented in previous research by the Food Standards Agency.

To achieve the research needs, a review was undertaken to explore and assess measurable metrics, which could be used to measure and monitor the consistency or differences of imported food production standards across the three themes. The assessment of each theme was coupled with parameters relevant to imported food products consumed in the UK. In addition, the research aimed to inform data gaps and requirements.

The information outlined in this report provides an independent assessment of how the three themes are currently considered within international imported food standards and trade agreements. The outputs will inform the Food Standard Agency's 2023 Annual Review of Food Standards across the UK.

The research reviewed a large range of materials, from scientific literature, international trade agreements, country import standards, as well as voluntary sustainability assurance schemes. Whilst a range of imported food production standards were reviewed, free trade agreements (FTAs) were found to be the main source of data and information, although this was largely limited and high-level in scope. For example, whilst some FTAs include chapters on animal welfare (for example, UK and New Zealand FTA, and UK and Australia FTA), and environmental sustainability (for example, UK and New Zealand FTA, and European Union and New Zealand FTA), there was limited scope in the data and literature relating to specific metrics that could be readily extracted for use by the Food Standards Agency.

Additionally, food assurance schemes were identified as a useful source of potential data and farm metrics, although these tended to be broad in geographic scope and sit below country-to-country agreements. For example, there are metrics being developed in assurance schemes and programs, such as the global farm metric, which offer the opportunity to function as a proxy to promote high standards of production for imported food through requirements to meet specific compliance criteria. Assurance schemes provide one mechanism to support the baseline inter-country alignment of food quality metrics relating to animal welfare, environmental sustainability, and nutritional composition.

In conclusion, this research demonstrated that data availability and metrics for measuring the three themes is limited and not readily available within imported food production standards, particularly when considering data and information that would enable measurement and comparability to UK production practices. However, opportunities for data collection needs to support this research area in the future have been identified.

Data which would be of value to collect and analyse, with the potential for conversion into measurable metrics, for each theme include:

Animal Welfare: non-binding governance (for example, best practice code), mortality and pain relief metrics, national / regional quality assurance schemes, global quality assurance schemes, welfare dashboard, carcass assessments, Closed Circuit Television in Slaughterhouses, animal protection index and World Organisation for Animal Health global standards.

Environmental sustainability: biodiversity indices (which provide tangible, mathematical measures of diversity), targets for fertiliser and pesticide usage reductions (as stated in the European Union green deal), soil sampling analysis (to prescribed depths and across multiple sampling locations to provide thorough and representative data on contamination or carbon content), water sampling analysis (this is the systematic sampling of water courses to check contamination levels and sources of contamination to assess water quality), and greenhouse gas emissions per kilogram of production (for example, metrics that quantify the climate impact resulting from the production of a kilogram of an agricultural food stuff).

Nutritional composition: Whilst no existing data sources were identified in this research from which to collect information, data which would be of value to collect and analyse for nutritional composition include rear of pack labelling standards, front of pack labelling standards, nutrient testing schemes, and product formulation uniformity.

Key messages

The presence of existing data sources to assess the quality of imported food and its production standards is limited given the scarcity and lack of consistency in data.

Assurance schemes offer the opportunity to function as a proxy to promote high standards of production for imported food through listed compliance criteria requirements.

Data related to imported food production standards: Introduction

Background

As global trade markets have expanded, there has been an increasing volume of agricultural commodities and food products imported to, and exported from, the United Kingdom (UK). The UK's exit (Brexit) from the European Union (EU) resulted in changes to UK trade policy. In response to the market and political changes, trade agreements and import/export standards are being implemented between the UK and other countries. These trade agreements function to control the trade of goods and services, whilst minimising the financial barriers (for example, tariffs) where possible. However, such agreements can support variation across the minimum standards of production between different sourcing locations.

Consumer demands from food products has expanded from seeking food, which is not just safe, but also of suitable nutritional quality (for example, healthy and providing key nutrients), ethical (for example, demonstrating high animal welfare standards throughout livestock production) and sustainable (for example, having minimal detrimental impacts on the environment). Consumer interest in purchasing and consuming food products derived from sustainable and ethical production practices is becoming more important, with consumers actively wanting to make more informed choices on the foods they purchase and consume.

Reducing trade barriers and promoting trade liberalisation increases ease of tradability between the UK and other nations and may offer consumers access to lower priced goods. Imported food may, however, differ from domestically produced food in terms of nutritional quality, animal welfare standards and environmental standards. To date, free trade agreements (FTAs) between the UK and other countries do not set out clear guidance and requirements around levels of animal welfare, environmental protection, and nutritional composition.

Mechanisms to control and monitor the quality and impact of food is through imported food production standards include sustainability standards, import and export standards or agreements, such as FTAs. For example, FTAs detail terms of trading, commerce, investment, and transit of commodities between two or more cooperating countries or state territories and are being negotiated following Brexit.

Food import and export standards

Economic globalisation and the expansion of global food trade has presented various opportunities and challenges. A primary challenge is how nations can compare the quality and consistency of imported agricultural commodities, to that of domestically produced food. Inconsistencies across food quality for imported agricultural commodities promotes public discourse regarding food safety and quality of the imported food products. Food import and export standards were initially developed to support the prevention of foodborne hazards and deceptive food marketing practices (for example, correct species identification for meat products) and include inspection procedures and certification authorisation systems which are fundamental in the regulatory management of food control practices. The public's perception towards the robustness of import and export food control protocols is dependent on consumer confidence in the governing standards implemented.

[Gereffi and Joonkoo \(2009\)](#) highlighted characteristic requirements of food import controls to include the following consistency requirements for domestic food production:

- Good manufacturing practice standards
- Defined legislation
- Transparent standard operating procedures (SOPs)
- Recognition by the importation country of the exportation country's food safety protocols
- Uniformity of implementation on a national level
- Established responsibilities for assessment authorities.

Food import and export standards fall into two categories, public standards (for example, established by governments through laws and legislation) and voluntary standards (for example, set by private organisations, industry bodies and non-governmental organisations). The purpose of public food import and export standards is to establish a baseline control mechanism which governs the safety and quality of food consumed from international food supply chains. Public standards support to protect public health and the environmental health of importing countries from infiltration of external agricultural pests, weeds, and diseases. Additionally, public standards function as a verification system to promote product conformity of imported agricultural commodities against an established framework of requirements. Public food import and export standards legislation authorises compliance officers to inspect products, verify documentation, sample for examination via analytical laboratory assessment, implement judicial measures, request product recall, reconditioning or re-exportation and, where necessary, confiscate, detain, reject, or destroy any consignment of a foodstuff which fails the importation inspection protocols as detailed by [Gereffi and Joonkoo \(2009\)](#).

Voluntary food import and export standards are of increasing importance and impact across global agri-food chains. Voluntary standards can detail elements regarding food provenance, animal welfare and environmental sustainability conditions for consideration by producers, over and above those required in public standards. Voluntary standards can function at multiple levels including international, within the territorial boundaries of a country, or within the collective boundary of a group of countries such as the EU. Due to the fluidity in operational capacities across both a national and an international level, voluntary standards can have considerable impact on international trade through private industry associations and/or non-governmental organisation associations.

Trade agreements

Various types of trade agreement exist which are dependent on predetermined concession conditions involving the participating countries. Trade agreements can be either bilateral (for example, involve two countries) or multilateral (for example, involve three or more countries). Trade agreements seek to reduce obstacles to commodity trading through the implementation of trade liberalisation infrastructure (for example, the reduction or complete removal of trade

restrictions and trade barriers relevant to product exchange between countries). Trade barriers and/or restrictions include trade tariffs, duties taxes, surcharges, volume quotas, prohibitions and applicable licensing rules which may impact trade exchanges.

Liberalising global trade through the implementation of trade agreements facilitates the expansion of transnational business opportunities for producers, manufacturers, and supply lines. Trade agreements are generally inclusive of clauses which define trade facilitation characteristics. These include intellectual property rights, investment, technical standards, government procurement, environmental provisions, sanitary and phytosanitary (SPS) requirements. The relaxation or removal of trade restrictions or trade barriers is considered a mechanism to stimulate or support the industrialisation of a country and promote economic growth.

The establishment of trade agreements and the uptake of trade liberalisation associated with them has the potential to influence the quality, nutrition and safety of agricultural commodity products entering the import country. These impact pathways are illustrated in Figure 1 which is adapted from the World health Organisation (WHO) [Trade and Health Report \(2015\)](#). Trade liberalisation measures have a ripple impact across the supply chain for food and agricultural commodities, influencing foodstuff availability, food safety, cost of food, marketing strategies, consumer buying behaviours, and diet. These factors can influence undernutrition, obesity, and foodborne disease prevalence, but also influence the nutritional intake and general health of a population through increasing accessibility to quality nutrition as highlighted in the World health Organisation (WHO) [Trade and Health Report \(2015\)](#).

Figure 1. Conceptual framework of the links between trade liberalisation and food related health. Source: World health Organisation (WHO) Trade and Health Report (2015).

Project rationale

The Food Standards Agency (FSA) commissioned RSK ADAS Limited to explore potential data sources and measurable metrics which could be used to assess the production standards of imported foods consumed in the UK.

Aim

The aim of the review was to understand whether there are data sources available that can be used to objectively measure key food production standards for animal welfare, environmental sustainability and nutritional composition of food imported to the UK, and compare those standards with those applied to food produced within the UK.

Objectives

The project aim was achieved through the following objectives:

1. Construct and refine an evaluation framework for the review.
2. Define search terms to use when conducting the review of literature.
3. Undertake rapid evidence literature search and screening relevant to the three themes: animal welfare, environmental sustainability, nutritional composition.
4. Evaluate evidence gathered.
5. Construct a final report assessing imported food standards in relation to the three themes.

Purpose

This report and the underlying research are intended to inform the FSA of data and metrics that are available for considering the animal welfare, environmental sustainability, and nutritional standards of imported and exported foods. This data was then considered alongside metrics used to assess UK production standards. The outputs will be used to inform the 2023 Annual Report on Food Standards across the UK.

Scope of works

Import and export standards

The research scope of this review was to consider how three themes (animal welfare, environmental sustainability, and nutritional standards) are considered across international trade and import standards. The working definitions of these themes were:

Animal welfare: Systems, processes and/or procedures which function to promote and safeguard animal health, minimise adverse impacts from disease, and to prevent an animal experiencing discomfort, pain, or suffering.

Environmental sustainability: Systems, processes and/or procedures which function to prevent or minimise the impacts of climate change, environmental contamination, pollution (air, water, and soil), deforestation, habitat destruction, biodiversity and negative impacts on soil health, soil quality and soil structure.

Nutritional composition: Systems, processes and/or procedures which function to ensure the quality of, and nutritional composition of food, as well as the accuracy and transparency in food quality reporting, labelling, and marketing.

Date and metrics in relation to food safety were not considered within the scope of works as this area is well understood and documented in previous research by the FSA.

Countries of focus

Imported food standards from or between any country was considered within scope. However, preference was given to imported food standards that were available in English. No translation of materials was undertaken in this research.

Materials considered in the review

The focus of our search was on imported food production standards. This included a range of materials, including import standards, export standards, trade agreements (for example, FTAs and mutual recognition agreements), voluntary sustainability standards and assurance schemes, and any other import or export specifications that defined animal welfare, environmental sustainability, or nutritional standards for food production.

Data related to imported food production standards: Method

To identify available sources of data and metrics for assessing imported food production standards, a methodical review of published and grey literature was undertaken. The review broadly followed an REA analytical structure but with a flexible approach that considered both academic and grey literature to ensure a wide range of relevant literature was captured. Grey literature is a complex and extensive source of information, produced from various entities that sit outside the white peer reviewed academic literature found in journal papers. Maintaining a flexible approach provided wider exploration opportunities. This ensured that there was a suitable range of information captured on the availability of data and metrics related to food production standards.

Defining a framework

Initially, a framework was defined to undertake the evaluation. The framework functioned to collate a body of literature which considered animal welfare, environmental sustainability, or nutritional composition standards across imported food production.

Defining search terms

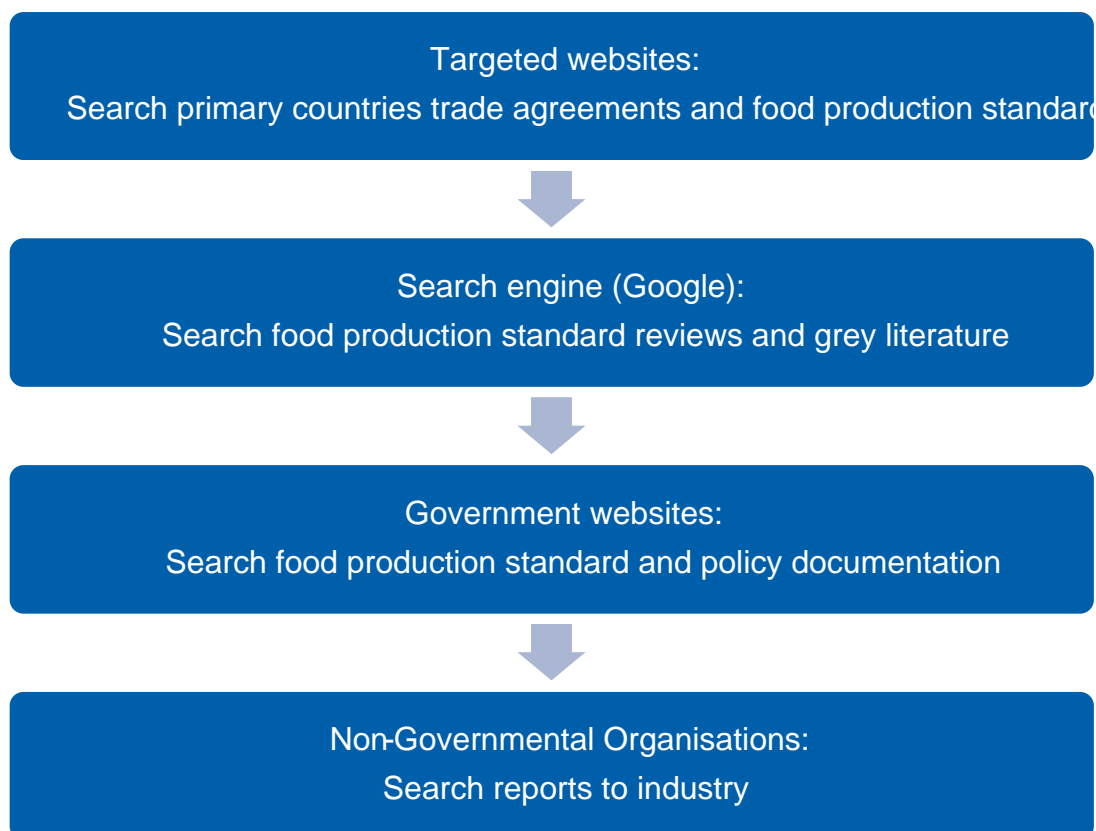
The review aimed to minimise the risk of omitting relevant information sources from the search. Search terms were defined (Appendix 1) for each imported food production theme; animal welfare, environmental sustainability, and nutritional composition as initial guidance to structure the search. The search terms were produced based on a pre-agreed set of key metrics considered relevant for measuring animal welfare, environmental sustainability, and nutritional composition. Search terms were defined through workshops with FSA and using them in the search process above literature was assessed on whether it had relevant information on data and metrics used for imported food standards. Relevant literature sources identified were populated into the framework and evaluated to assess their relevance and robustness.

Completing the literature search

The literature search was conducted to assess the presence or absence of reliable data sources, and potential metrics across the three themes that allow an assessment of food import standards. In the original searches approximately 50 sources were identified for each theme. These were then filtered down to the 30 most relevant for each theme (Appendix 2). The literature search was tiered (summarised in Figure 2) to initially evaluate any identified targeted websites of interest,

then expanded to a general search engine search (Google search) which funnelled down to government and non-government organisation website searches.

Figure 2 Summary of tiered search process undertaken.



Source ADAS.

Screened literature sources were allocated a scoring based on a traffic light system (Red/Amber/Green) to indicate the rigour and relevance to the project aim. Literature which scored as green was progressed to the next evaluation stage, amber literature was reassessed by second reviewer to determine if it should be green or red, and red literature was then excluded from any further analysis.

Evaluation of literature

Literature sources selected were evaluated using the framework discussed in section 2.1, to determine the impact on animal welfare, environmental sustainability, and nutritional composition parameters of imported food production standards. The evaluation process provided insight into relevance and robustness of literature for conversion into measurable metrics. The findings for animal welfare, environmental sustainability and nutritional composition are summarised in chapter 3.

Identification of metrics

Relevant literature was evaluated to understand how it compares to UK data metrics (where applicable, present, and appropriate). This provided a benchmark against which UK metrics on food production standards can be assessed to see where they align or differ to those found in the literature.

Data related to imported food production standards: Findings for each theme

Import and export standards

Food import and export standards have the capacity to function as both a non-tariff trade barrier through impeding the accessibility of agricultural commodities into a country, and as a catalyst to trade through modernising food supply chains to promote export gains. Research studies by [Blind and Jungttag \(2005\)](#) and [Shepard and Wilson \(2013\)](#) assessed voluntary food import and export standards and showed their positive effects on trade flow intensities globally. Conversely, research by [Li and Beghin \(2021\)](#), which assessed compliance criteria of public food import and export standards, such as sanitary and phytosanitary requirements, concluded that public standards generally function as a non-tariff barrier to the trade of agricultural commodities. Further information on food import and export standards is described in the [Codex Food Import and Export Inspection and Certification Systems report](#).

Animal welfare

Incidents which negatively impact animal welfare can occur at various intervals of an animals' life during the production cycle. To prevent negative incidents which breach animal welfare, standards are required to ensure a good level of welfare for all farmed animals. Welfare standards are driven by various factors from country to country. These factors include, but are not limited to, culture, public recognition of animal sentience, and perceived importance of animal welfare. Incidents which breach animal welfare can occur on farm, during transportation, or at the processing facility from arrival on site, during lairage, right up to the point of slaughter. Therefore, the production process for livestock throughout their lifecycle requires stringent monitoring and regulation to minimise risk of poor welfare practices and any breach of animal welfare safeguarding. Potential metrics to assess animal welfare standards are presented in Figure 3.

Figure 3 Potential options which can be used as mechanisms to monitor animal welfare

Data available on current practices

Imported food standards

Data available on current global practices for animal welfare in imported food standards is generally lacking. However, some requirements were identified in trade agreements.

The [EU-Chile FTA \(2003\)](#) contains specific animal welfare requirements for exports of animal products from Chile to meet the same animal welfare standards as the EU. Global organisations such as the [World Organisation for Animal Health \(WOAH\)](#) have a set of [international animal welfare standards \(2019\)](#) in which Article 7.5.1 addresses farmed livestock welfare basic capacity.

[Main et al., \(2014\)](#) suggested that the WOAH standards should be included in all trade agreements as an absolute minimum. However, the global application of WOAH standards would require emphasis of the favourable outcomes they provide animals, which are generally measures against the [‘five freedoms’ \(2022\)](#).

The [UK-New Zealand FTA \(2022\)](#) and the [UK-Australia FTA \(2021\)](#) each include a specific chapter on animal welfare, which require both parties to maintain their current animal welfare standards. However, neither FTA specifically considers the standards set by the [World Organisation for Animal Health](#).

Assurance scheme

In the UK, there are various farm assurance schemes, many of which capture measurable metrics such as those listed in the [global farm metric](#). These include [Red Tractor](#) and [Lion Eggs](#) which detail animal welfare provisions. Other countries also have examples of assurance schemes, for example, Namibia developed their own quality assurance scheme for meat – [Farm Assured Namibian Meat \(FANMEAT\)](#), which aims to improve traceability and quality assurance.

[Ruckert et al., \(2020\)](#) discusses the difference between binding governance and non-binding governance as a mechanism for improving animal welfare standards. For example, Canada do not have many legislative animal welfare standards, but they do have a voluntary 'Best Practice Code'. [The National Farm Animal Care Council code \(2016\)](#) outlines key criteria to be followed, such as metrics related to antibiotics use.

[Fleming et al., \(2020\)](#) suggests the adoption of a quality assurance system that covers all sectors of the supply chain, thus providing a whole industry approach, would support the monitoring and regulating of animal welfare. [Trade Animal Welfare Coalition \(2020\)](#) recommends the imposition of a set of 'core standards'. These standards would be independent of any imported food standard, also applying to countries where there is no established agreement.

[Global GAP](#), [Codex Alimentarius](#) and the [International Federation of Organic Agriculture Movements \(IFOAM\)](#) are examples of global assurance schemes. Global GAP established a voluntary animal welfare add-on, though these are limited in application to broilers and finishing pigs. IFOAM's International Animal Husbandry Alliance is an informal network designed to strengthen organic animal husbandry, and better define animal welfare standards.

Information on measurable metrics

The literature review did not identify any published data at the international scale that indicated availability of data that had been converted to measurable metrics on animal welfare production standards. However, there were examples of data that have been used in the short term (for example, for academic or research purposes) which could be further developed going forwards, as well as numerous recommendations of data that could be converted into measurable metrics in the future. These potential libraries of data include:

- Benchmarking
- Key Performance Indicators
- Carcass Assessments
- Animal assessments – physical and mental
- Quality Assurance schemes
- Resource and management-based measurements
- Organic certification schemes

It is crucial that all animal-based measures define explicit animal welfare targets based on sound scientific evidence. [Sandøe et al., \(2020\)](#) developed a benchmarking tool which was based on a comprehensive list of welfare indicator parameters. Each benchmark value is calculated on a scale from 0-100 that indicated the potential animal welfare outcome – the higher the value the better the outcome. Whilst the focus of this research was porcine production, there is an opportunity to translate this methodology to other livestock species and/or forms of animal production.

Whilst there are assurance schemes that promote animal welfare through capturing compliance criteria requirements, there is no mechanism which provides continuity throughout the production and supply chain. [Certified organic schemes](#) in the UK follow the animal from farm to farm, then on through the slaughter and supply chain. The metrics employed by such certification schemes could provide a blueprint of upscaling quality assurance schemes to ensure cohesion throughout the import/export process.

Resource and management-based measure and increasing the scope of animal welfare assessment tools beyond animal-based measures, could enable a more comprehensive assessment of production standards. [Fleming et al., \(2020\)](#) suggested the development of a 'welfare dashboard' to record the following types of data in the live animal exports industry:

- Certification, training, and/or experience of individuals within the supply chains (for example, stock handlers)
- Radio Frequency Identification tags for data collection and collation
- Body condition scores of animals
- Qualitative behavioural assessments

Although the UK is moving towards ending live animal exports through implementing a [ban on live animal exportation](#), the measurable metrics provided in this study could be applied to the production and supply chain as suggested by [Harley et al. \(2012\)](#). The article also details how meat chemistry changes in relation to stress are caused during the animal's treatment pre-slaughter. Animals experiencing a state of stress causes depletion in glycogen stores, which acidifies the meat resulting in discolouration and bitter taint. Carcass bruising and meat quality could be assessed at the point of import which would provide information on the recent experience of livestock – for example, whether they have recently experienced states of injury, fear, pain, stress, or general duress.

Comparability of data to UK food production

Our research found that some standards for imported foods contain requirements relevant to animal welfare. For example, the UK trade agreements with [New-Zealand](#) and [Australia](#) include animal welfare as a part of the requirements listed. These are designed to reinforce and expand the scope of the OIE animal welfare standards for both parties, enable information exchange, expertise and understanding of regulatory systems, policies, and strategic approaches relevant to safeguarding animal welfare standards. The OIE standards include specific provisions to meet the [Terrestrial animal welfare code \(2022\)](#). Additional countries which outline animal welfare stipulations include those listed in the [EU-Chile FTA](#). The Royal Society for the Prevention of Cruelty to Animals (RSPCA) recommend that trade agreements must describe a chapter on [animal welfare](#).

UK assurance scheme programs such as Red Tractor and Lion Eggs capture various requirements regarding animal welfare. These include stocking density, housing, health, nutritional requirements, handling, transport etc. There are various countries which implement similar schemes or standards to promote and protect animal welfare throughout the chain of production (for example, the FANMEAT scheme in Namibia which matches UK Red Tractor assurance and traceability standards). Another example is the compliance of the Thai organic broiler production with UK good manufacturing practice and Hazard Analysis and Critical Control Point (HACCP) standards, which operates independent inspectors who audit and regulate compliance to the scheme.

It is evident that similar standards and assurance scheme compliance criteria exist internationally. These can be used to measure the quality of imported livestock products to maintain alignment with UK production standards. However, despite the existence of similar assurance scheme and animal welfare standards to those in the UK, the level of regulations and policy regarding animal welfare standards can vary greatly between two countries.

[The Animal Protection Index \(2022\)](#) developed by World Animal Protection ranks 50 countries according to their animal welfare policy and legislation (Figure 4). The index gives each country an overall score based on a seven-point lettered and colour-coded scale (A – dark green, B – light green, C – yellow, D – light orange, E – dark orange, F – light red, and G – to dark red; highest to lowest ranking), where A represents the highest results and G identifies countries with the most room for improvement. The index focuses on the recognition of animal sentience and prohibition of animal suffering. Additional elements addressed within the index are the presence of animal welfare legislation, the establishment of supportive government bodies and the support for international animal welfare standards, it does not include any voluntary schemes.

The Animal Protection Index provides a general overview and comparative score of each country's welfare policy and legislation. For example, countries shown as dark red (e.g., Iran) and light red (for example, Algeria, Belarus, Egypt, Ethiopia, Morocco, Myanmar, and Vietnam) are suggested in the tool to have lower animal welfare standards compared to those countries shown as light green (for example, Austria, Denmark, Netherlands, Sweden, Switzerland, and the UK). It is noted that none of the index countries listed (where data is available) meet the highest grade (A – dark green).

Figure 4. Animal Protection Index map. Ranks 50 countries according to their animal welfare policy and legislation. Scale works from Green (highest ranking) to Dark Red (lowest ranking). Source: Screenshot of the Animal Protection Index website page.

In the UK, since 2018, Closed Circuit Television (CCTV) has been a legal requirement in slaughterhouses across England and Scotland. The Welsh Government has also made a commitment to require CCTV in all [slaughterhouses](#). CCTV implementation is considered to reduce any breach in animal welfare and support to safeguard and protect livestock from experiencing breakdowns in animal welfare practices. CCTV is therefore perceived to protect and promote the overall welfare of animals at the point of slaughter. Mandatory CCTV in slaughterhouses has been adopted as a legal requirement across only two other countries: Spain and Israel. CCTV implementation (voluntary or mandatory) in slaughterhouses across a wider group of countries would potentially increase data availability and measurable metrics for the assessment of animal welfare production standards for imported livestock products into the UK.

Major gaps in data availability

The major gap in data availability for animal welfare is the lack of available measurable metrics to assess global welfare standards. This includes the lack of connectivity of animal welfare standards from farm to fork.

Although there are chapters included within some trade agreements, they do not currently provide consistent or comparable measurable metrics to enable the assessment of animal welfare standards within different production regions.

Despite the variation of regulations and codes of practice between countries, the use of metrics such as the implementation of a health or biosecurity programme on farms, or the uptake of CCTV in slaughterhouses, is an avenue to increase data availability.

Currently, the only international animal welfare standards that exists are the animal welfare standards published by the OIE.

Key messages for animal welfare

- current animal welfare requirements in imported food standards are limited.
- there is considerable variation in animal welfare standards across the globe.
- measurable metrics are limited though there is scope to develop these from assurance standard compliance requirements.

Environmental sustainability

Environmental sustainability comprises both global factors, such as reducing climate impact and deforestation, as well as more localised issues such as pollution prevention to protect air and water quality and the protection of soils and biodiversity. Climate impact for production of commodities can be assessed from the production of a kilogram of an agricultural food stuff as outlined in the [GHG Protocol Agricultural Guidance](#). Data sources which can be used to measure the quality of imported foods are limited. However, trade agreements and assurance schemes offer some avenues to explore measurable metrics which capture environmental sustainability criteria for imported food standards.

Data available on current practices

Imported food standards

The data available on current practices for measuring the environmental impact of imported and exported food is limited. Whilst many trade agreements involve a mutual pledge between two or more parties to protect the environment, these pledges generally describe a generic, high-level commitment or group of commitments which broadly cover the various topic. The standards generally encompass environmental sustainability concepts through statements such as:

[Costa Rica-China FTA \(2010\)](#) Chapter 1 Article 2 point 'f' 'confirm their commitment to the promotion of trade and reaffirm their aspiration to achieve an appropriate balance between the economic, social, and environmental components of sustainable development.'

[EU-South Korea FTA \(2011\)](#) Chapter 13 Article 13.1 point 2 'The Parties recognise that economic development, social development, and environmental protection are interdependent and mutually reinforcing components of sustainable development. They underline the benefit of cooperation on trade related social and environmental issues as part of a global approach to trade and sustainable development.'

[US-Peru FTA \(2009\)](#) Chapter 18 Article 18.2 point 2 'The Parties recognize that it is inappropriate to encourage trade or investment by weakening or reducing the protections afforded in their respective environmental laws. Accordingly, a Party shall not waive or otherwise derogate from, or offer to waive or otherwise derogate from, such laws in a manner that weakens or reduces the protections afforded in those laws in a manner affecting trade or investment between the Parties.'

Another example is the [UK-New Zealand FTA \(2022\)](#), which outlines a range of considerations towards environmental sustainability which are elaborated in detail under Chapter 22 of the agreement. Examples of opening text to the various environmental articles listed within Chapter

22 of the agreement include:

Article 22.4 - General Commitments point 2 ‘Each Party shall endeavour to ensure that its environmental and other relevant law and policies provide for, and encourage, high level of environmental protection, and to continue to improve its respective level of environmental protection.’

Article 22.6 - Climate Change point 1 ‘The Parties recognise the importance of achieving the objectives of the UNFCCC and the Paris Agreement in order to address the urgent threat of climate change, and the role of trade and investment in pursuing this objective, and commit to working together to take actions to address climate change.’

The imported food standards that were assessed within FTAs did not present any detail regarding measurable metrics or tangible data, to which parties could be held accountable. Environmental sustainability commitments within the FTAs reviewed were general in nature, covering all imported products. No clear detail regarding metrics was identified which was specific to agriculture, or food imports/exports.

The broader scope was addressed for high level commitments detailing general environmental considerations (GEC) to reduce emissions, minimise the impacts of climate change and promote sustainable production of agricultural commodities and food products. The categories detailed across these high-level commitments within the FTAs reviewed are listed in Table 1.

Table 1: Environmental categories described in the evaluated free trade agreement

| Countries | General considerations | Climate change | Emissions reduction | Agriculture | Forestry | Deforestation | Biodiversity/conservation | Fisheries/aquaculture | Air quality | Energy | Trade and investment |
|------------------------------------|------------------------|----------------|---------------------|-------------|----------|---------------|---------------------------|-----------------------|-------------|--------|----------------------|
| UK - New Zealand | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| EU Vietnam | Y | Y | Y | - | Y | - | Y | Y | - | Y | Y |
| EU South Korea | Y | Y | - | - | - | - | - | - | - | - | Y |
| EU Mercosur | Y | Y | Y | - | Y | - | Y | Y | - | - | Y |
| EU Canada | Y | - | Y | - | Y | - | - | Y | - | - | Y |
| EU New Zealand | Y | Y | Y | Y | Y | Y | Y | Y | - | - | Y |
| China - Costa Rica | Y | - | - | - | - | - | - | - | - | - | - |
| Korea - Australia | Y | - | - | - | - | - | - | - | - | - | - |
| US-Peru | Y | - | - | - | Y | - | Y | - | - | - | - |

Assurance schemes

Assurance schemes are voluntary schemes with certified standards that allow farmers, growers, and producers to demonstrate that they have met specific criteria regarding various aspects of production. Assurance schemes cover various aspects of production of agricultural commodities and food products including environmental considerations. Schemes typically outline criteria requirements (that may include metrics) that set out what scheme users must demonstrate to confirm compliance across their production practices. Environmental sustainability criteria can include a vast range of criteria relating to various topics including plant protection product usage, application and storage, water use efficiencies, pollution prevention and soil health considerations, to name a few. Members of such schemes will typically be subject to thorough inspections, usually annually, to verify compliance to criteria listed within the assurance scheme standard. Assurance schemes evaluated for environmental sustainability criteria content are summarised in Table 2.

Table 2 Environmental categories described in the evaluated assurance schemes

| Assurance scheme | General considerations | Climate change | Emissions reduction | Agriculture | Forestry | Deforestation | Biodiversity/conservation | Fisheries/aquaculture | Soil, water, air quality | Energy | Trade and investment |
|--|------------------------|----------------|---------------------|-------------|----------|---------------|---------------------------|-----------------------|--------------------------|--------|----------------------|
| Global GAP (Aquaculture) Standards | Y | - | - | - | - | Y | Y | Y | Y | Y | - |
| Fairtrade International Climate Standards | Y | Y | Y | Y | Y | Y | Y | - | Y | Y | Y |
| Rainforest Alliance - Sustainable Agriculture standard, Farm standards | Y | Y | Y | Y | Y | Y | Y | - | Y | Y | Y |
| Aquaculture Stewardship Council Standards (ASC) Salmon | Y | Y | Y | - | - | - | Y | Y | Y | Y | - |
| Forest Stewardship Council (FSC) Standards | Y | Y | - | - | Y | - | Y | - | Y | - | - |
| Marine Stewardship Council (FSC) Standards | Y | Y | - | - | - | - | Y | Y | Y | - | - |
| Red Tractor Standards (Beef and Lamb, Combinable Crops) | Y | - | - | Y | - | - | Y | - | Y | - | - |
| LEAF Standard | Y | Y | Y | Y | Y | - | Y | - | Y | Y | - |
| Soil Association Organic Standards | Y | - | - | Y | Y | - | Y | - | Y | Y | - |

Information on measurable metrics

The imported food standards and trade agreements evaluated did not present measurable metric criteria which could be used to assess the environmental sustainability of imported food and agricultural commodities. In particular, FTAs typically described general commitments across all commodities traded, and did not include environmental sustainability requirements specific to food imports or production.

Some of the parameters which are listed in assurance schemes include greenhouse gas (GHG) intensity and land area impacted by land use change. This somewhat aligns with requirements outlined in FTAs, with most addressing climate change in some capacity. The main consideration towards climate change and environmental sustainability is indicated through the party's recognition of the importance and urgency to achieve climate objectives described under the Paris Agreement or United Nations Framework Convention on Climate Change. Whilst there is no measurable metric listed in the FTAs, this affirmation of commitment towards the implementation of the Paris Agreement and undertaking of GHG reduction action to strengthening the international response to climate change, provides a tangible parameter for participating countries to navigate towards. Particularly given the strict timeframes for climate positive action described in the Paris Agreement.

The [UK - New Zealand FTA \(2022\)](#) describes a set of General Commitments, under article 22.4, which outline a requirement to adhere to, and enforce, local environmental laws; though do not detail information relating to any measurable metrics per se. The [UK - New Zealand FTA \(2022\)](#) agreement includes requirements around GHG emissions and sustainable agriculture, as well as associated trade which is listed in articles under Chapter 22. Examples of opening text to environmental articles are:

Article 22.13 Resource Efficient and Circular Economy point 4 'In accordance with Article 22.19 (Cooperation) the Parties shall cooperate on ways to encourage a transition towards a resource efficient and circular economy, which may include:

- (a) policies and practices to encourage the shift to a resource efficient and circular economy; 22-19
- (b) promoting and facilitating trade that contributes to a resource efficient and circular economy, including trade in secondary materials and used goods, and goods for repair, reuse, and remanufacture; and
- (c) resource efficient product design and related product information and quality standards for secondary materials and goods.'

The [EU - New Zealand FTA \(2022\)](#) has a designated chapter on sustainable food systems, which details how parties shall cooperate and share information. The [China - Costa Rica FTA \(2010\)](#) focusses on agriculture and livestock production of higher quality and lower environmental impact. The [UK - New Zealand FTA \(2022\)](#) expands on non-tangible metrics which include requirements for enhancing trade across environmental goods and/or services which promote renewable/low carbon energy, products/services attained through energy efficient means, clean heat and transport, sustainable finance, resource efficiency, carbon capture technologies, biological diversity and species conservation, ecosystem management, water conservation, pollution prevention, sustainable fisheries, agriculture and forestry management.

The New Zealand trade agreements with the [UK](#) and the [EU](#) also operate a sustainable fishery management system designed to prevent overfishing, reduce bycatch, promote recovery of overfished stocks and minimise impacts on associated ecosystems. [EU-Vietnam \(2019\)](#) and [EU-Mercosur \(2019\)](#) agreements commit to long term implementation of conservation and management measures.

FTAs listed, which address sustainable forestry/forest management (excluding the [US-Peru FTA 2009](#)), detail commitments to prevent illegal logging and associated trade. While sustainable forestry is a key focus in the majority of evaluated trade agreements, only FTAs which involve New Zealand (with the [UK](#) and the [EU](#)) specifically mention deforestation. In addition, these FTAs promote the long-term conservation of biological diversity and associated habitats. The two agreements involving New Zealand (with the [UK](#) and the [EU](#)) and the [EU-Mercosur FTA \(2019\)](#) agreement also pledge to combat the illegal wildlife trade. All FTAs assessed, excluding [China - Costa Rica FTA \(2010\)](#), have committed to implement [CITES](#) (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). CITES is an international agreement between governments which aims to prevent international trade of wild animals and plants to minimise the threat to their long-term survival. CITES describes a framework for sustainable wildlife trade and has reporting requirements and guidelines to ensure compliance. In addition, the [UK - New Zealand FTA \(2022\) FTA](#) details requirements to support environmental service technologies and facilitate their trade liberalisation, responsible business conduct and corporate social responsibilities. FTAs evaluated, which describe sustainable trade and investment, highlight the importance of barrier removal when considering sustainable trading relevant to climate change.

Information on measurable metrics for environmental sustainability within FTAs are limited. Assurance schemes are an area which can be explored for translatable metrics that could be

applied to imported food standards. Assurance schemes such as [Rainforest Alliance](#) and [Linking Environment and Farming \(LEAF\)](#) include information on management plan implementation for waste and waste water, plant protection products and fertilisers, conservation, energy and GHG reduction. These areas offer opportunities to identify measurable metrics which can be captured within imported food standards. Another consideration is an assessment of [EU Taxonomy](#) which is designed to support companies to identify [environmentally sustainable investments](#). The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. It covers six environmental objectives:

- Climate change mitigation
- Climate change adaptation
- The sustainable use and protection of water and marine resources
- The transition to a circular economy
- Pollution prevention and control
- the protection and restoration of biodiversity and ecosystems

Comparability of data to UK food production

Multiple research papers have highlighted the growing consumer interest and concerns towards the environmental impact of food and agriculture, including reviews by [Sanchez and Sabate \(2019\)](#) and [Mustafa, Mabhaudhi and Massawe \(2021\)](#). It is evident from our research that the level of environmental concern and commitments captured within trade agreements are highly variable country to country. The provision of environmental content in imported food standards supports environmental policies and protection through demanding effective enforcement of national environmental laws. However, the level of environmental protection and vigour of legal conditions is internationally varied. This variation is derived from inconsistencies across national sovereign rights, priorities, extent of regulatory compliance, corruption pervasiveness and prosecution discretion regarding incidences breaching environmental laws. Pursuit of multilateral environmental agreements can therefore be challenging.

FTAs (for example, between the UK, and New Zealand, Norway, Iceland, and Liechtenstein, Australia and an economic partnership agreement with Eastern and Southern Africa countries (Mauritius, Seychelles, Zimbabwe)) provide high-level descriptions of environmental considerations, commitments to address these considerations, and a need for collective action to mitigate climate change and GHG emissions. Granularity regarding the monitoring, management and minimisation of adverse environmental impacts and its associated implementation is not included in the FTAs.

Whilst environmental sustainability is described in FTAs at a high-level, the standards do not currently include environmental sustainability measurable metrics. Instead, national assurance/certification schemes were identified as a better source of this data. The UK has numerous assurance/certification schemes for agricultural commodities which capture criteria requirements that support resilient, climate and nature positive farming production practices, and which aim to minimise negative impacts on air and water quality.

UK assurance/certification schemes include [Red Tractor](#), [Soil Association](#) (which provides organic certification), and [Linking Environment and Farming \(LEAF\)](#) which is a member of the International Social and Environmental Accreditation and Labelling Alliance ([ISEAL Alliance](#)) that functions to increase the robustness of environmental considerations across sustainability standards. The schemes cover a range of environmental criteria:

- [Red Tractor](#) environmental sustainability requirements include compliance criteria requirements for practices which positively impact biodiversity and conservation, soil management plans, water management plans, fertiliser management plans, waste management and Integrated Pest Management (IPM) plans.

- [Soil Association](#) environmental criteria requirements include environmental management and conservation, biodiversity conservation and enhancement, responsible energy use, soil management and fertiliser management stipulations.
- The [LEAF](#) standard lists specification criteria concerning the implementation of soil management plans, organic matter management, fertiliser management plan, IPM plans, agrochemical and waste management plans, energy action plan, water management plan, biodiversity enhancement plan.

Given the range of environmental criteria captured in UK assurance and certification schemes, there is scope for using these criteria to infer metrics that could be used in imported food standards.

Major gaps in data availability

Statements within trade agreements surrounding environmental sustainability typically capture all traded commodities, and therefore are not specific to food or agriculture. Whilst our research did identify a limited number of metrics for environmental sustainability within imported food standards and trade agreements, the general absence of specific metrics for agriculture and food production is a clear gap that prevents the monitoring and comparison of standards between different sourcing regions. For example, one metric identified was air quality (with the [UK - New Zealand FTA](#) recognising the threat of air pollution to public health and ecosystem integrity, noting the link between reduced air pollution and reduced GHG emissions).

Each section of the FTAs discussed contain information regarding planned cooperation and exchange of information between parties, being technical or policy based, to best achieve the trade and sustainable development commitments laid out in their respective chapters. There is considerable variation in the detail of these specific commitments between the trade agreements (Table 1). The [UK - New Zealand FTA](#) was an example where there is a dedicated section for each of the environmental criteria, whereas other FTAs are brief in the coverage of each topic; often with only a single line of text.

Our research found that FTAs provide commitments, but no measurable stipulations to monitor and evaluate. Assurance schemes such as Global GAP, Fair Trade and others cover a spectrum of agricultural commodities and criteria relevant to environmental sustainability concepts. These can include soil, water and air quality, biodiversity, conservation, energy efficiency, climate and emissions reduction, deforestation, pest management, fertiliser usage, waste management etc. A detailed review of the specific requirements of these schemes and the data captured within them would be one potential next step to identify further data availability for environmental metrics.

Key messages for environmental sustainability

- commitments in trade agreements are general across all imported products being non-specific to the food industry
- no clear detail regarding metrics was identified which is specific to agriculture
- only general environmental considerations are described within trade agreements, which are broad in context
- sustainability standards and assurance schemes offer a greater depth of environmental metrics, but these only cover some farms and some agricultural systems.

Nutritional composition

This section outlines data sources, identified within imported food standards, that could be used to assess the nutritional composition of imported products compared with products available on the domestic market. The nutritional content and quality of food is an important factor, recognised

in the Rome Declaration on Nutrition, which calls for 'trade policies to be conducive to fostering food security and nutrition for all' ([Food and Agriculture Organisation \(FAO\), 2014](#)).

Since the UK took charge of its own trade policy, there have been a number of areas where compromises in food standards have been highlighted as a potential concern. These relate to how the quality of food could change based on imports from an open market. For example, where practices or norms in one country differ to those of the UK.

One area of consideration is around high-fat, high-salt and high-sugar (HFSS) foods.

Imported foods with insufficient information about the HFSS nutritional composition could lead to exacerbated health problems. The [World Health Organisation \(2015\)](#) estimates that worldwide obesity has more than doubled since 1980, and that in 2014, 39% of all adults were overweight and 13% obese. Due to the increase in associated non-communicable diseases including diabetes and cardiovascular disorders, strategies to curb the obesity epidemic are of global interest, and a key part of these approaches is raising the profile of issues associated HFSS foods. The FSA's Nutrient Profiling Model, updated by [Public Health England \(2018\)](#) identifies these foods through a scoring process balancing 'risk increasing' components (for example, energy content, saturated fat, sugar and salt) against 'risk decreasing' components (for example, percentage of 'fruit, vegetables and nuts', fibre and protein). Foods and beverages exceeding a points threshold are classified as HFSS and subsequently subject to controls on their promotion in the UK, particularly to children under the age of 16.

The availability of reliable, accurate and representative data regarding the nutritional composition of imported foods is crucial for the FSA to be able to compare the quality of foods from different sourcing regions.

Data available on current practices

Data on nutrient composition of foods is typically obtained by lab analysis of food products. For international trade purposes, the standardisation of sampling protocols, analytical techniques, and frequency of repeat testing are important factors. These are all necessary to enable reporting of nutrient content of foods and to monitor changes over time ([Schönfeldt and Pretorius, 2020](#)). International standards for analytical techniques are established in the Codex Alimentarius published by the UN's Food and Agriculture Organisation (FAO, 2021).

Information obtained from analysing representative food samples of foods is used to produce food composition databases (FCDB) for a range of purposes including nutritional labelling. The [FAO's \(2022\)](#) International Network of Food Data Systems (INFOODS) maintains a directory of FCDBs from across the world that can be useful for assessing the composition of food for nutrient content and availability. The UK's FCDB provides detailed composition information for the most commonly eaten foods in the domestic market ([McCance and Widdowson, 2021](#)). Databases of this quality are very expensive to produce since they rely on extensive food analysis programmes, so FCDBs from many mid- or lower-income countries may contain very old data or use information from other FCDBs. Absence of up-to-date, localised information reduces the value of many FCDBs since nutritional composition varies substantially as a result of advances in production and processing methods, environmental factors and geographical location ([Greenfield and Southgate, 2003](#)).

There are no internationally binding standards when considering and describing nutrient composition. The Codex General Standard for the Labelling of Pre-packaged Foods provides international guidance for descriptive ingredients labelling, order of inclusion, (i.e. ingredient total mass in descending order), additives and allergens to member states and associate members of the FAO and WHO ([FAO, 1991](#)). [The European Union Food Information Council \(EUFIC; 2018\)](#) reported an increasing number of nations adopting mandatory codes to define which nutrients must be listed and on what basis. These nations include the United States, Canada, Mexico,

Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Uruguay, United Kingdom, European Union Member States, Russia, Israel, Gulf Cooperation Council members, Nigeria, India, Hong Kong, China, Japan, South Korea, Malaysia, Taiwan, Thailand, Philippines, Indonesia, Vietnam, Australia, and New Zealand. In addition, voluntary codes are implemented by several countries, including Venezuela, Turkey, Switzerland, Morocco, Lebanon, Jordan, Singapore, Brunei, Myanmar, Vietnam, Kenya, Mauritius, and South Africa.

Regulations for country-specific nutritional details on packaging, as well as nutrient profiling, are dependent on national legislation ([UK Government, 2016](#); [the United States Food and Drug Administration \(FDA\), 2022](#); and [Australian Government, 2021](#)) or supranational legislation ([EU, 2022](#)). The legislation can be informed by public health policies, such as country-specific marketing of HFSS foods, and by manufacturers intention to curate the information provided to their customers. Further information regarding food labelling is listed by the [Institute for Agriculture and Trade Policy](#). Ensuring compliance with nutrient composition labelling legislation is also a key component. The [European Commission \(2012\)](#) and [Canadian Food Inspection Agency \(2022\)](#) manage testing and enforcement schemes, which are intended to create an effective balance between public health, consumer protection and fair treatment of manufacturers.

Nutritional composition labelling information can be 'front of pack', or 'back (or side) of pack'. Product composition may be listed by legally defined nutrient groups in several ways dependent on local legislation:

- by weight or volume per 100g/ml
- by specified portion size
- by nutrients per 100 kilocalories

This nutritional content information is listed on a standardised label such as those shown in Figure 6 (UK) and Figure 7 (USA) located on the back or side of the product packaging.

Front of pack labelling

Labels on the front of pack have been widely adopted to present simplified nutrition information of processed foods. Research by [Becker et al., \(2015\)](#) and [Hagmann and Siegrist \(2020\)](#) highlighted increased consumer attention and interest in nutrition labelling due to front of pack label systems and improved consumer ability to quickly identify healthier product options. Front of pack labelling has increased in many countries in recent years and frequently includes visual displays and/or a traffic light colour coding system (red, amber, green) which clearly display the content of key nutrients per specified grouping system used (per 100g/ml, per portion, per 100 kilocalories) in relation to recommended daily intake levels ([Department for Health, 2016](#)). [McKevitt et al., \(2020\)](#) highlighted that food labelling remains unstandardised on the international level, as well as being applicable only to packaged food given that fresh produce is often unpackaged and the nutritional composition undeclared. Figure 5 shows examples of European front of pack label summary logos.

Figure 5. Examples of European front of pack labels, outlining the range of labels used from summary logos, to detailed information regarding specific components.

Source: [EUFIC \(2022\)](#).

Front of pack labels range from simple visual logos illustrating aspects of general healthiness criteria achieved by the product such as 'Keyhole' and the 'Heart Health symbol' used across members of the [Nordic Council \(2022\)](#). The keyhole logo representing general health awareness and the Heart Health symbol targeting more specific nutrition issues. Alternative logo metrics used can be simplified graded indicators advising general nutritive value such as Nutri-Score, introduced in 2017 by [Santé Publique France \(2022\)](#). Alternatively, a more detailed declaration can be given, such as specific nutrient information declaration as laid down by both the UK and EU's food information regulations. The system can be further illustrated using a traffic light colour-coding system, as is found on many products in the UK and outlined in UK front of pack nutrition labelling guidance ([Department for Health, 2016](#)).

Back of pack labelling

A typical nutritional composition back of pack label lists key nutrients per specified grouping system used (per 100g/ml, per portion, per 100 kilocalories) as demonstrated for a UK marketed product in technical guidance on nutrition labelling ([Department of Health, 2017](#)). Obligatory declarations, highlighted in pink and expressed in Figure 6 as content per 100g of product, include energy (in kJ and kcal), fat, saturated fats, carbohydrate, sugars, protein, and salt. Manufacturers may also provide details of unsaturated fat, fibre, and mineral content, but are under no legal obligation to do so. Any nutrient claims made, for example 'good source of iron', must be supported by listing the quantity of the nutrient in question. The [British Dietetic Association](#) provide additional information on food labelling and nutrition requirements.

Figure 6 Typical UK nutritional composition information on back of pack labelling

Nutrition

| Typical values | 100g contains | Each slice (typically 44g) contains | % RI | RI* for an average adult |
|--------------------|---------------|-------------------------------------|------|--------------------------|
| Energy | 985kj | 435kj | - | 8400kj |
| Energy (kcal) | 235kcal | 105kcal | 5% | 2000kcal |
| Fat | 1.5g | 0.7g | 1% | 70g |
| of which saturates | 0.3g | 0.1g | 1% | 20g |
| Carbohydrates | 45.5g | 20.0g | - | - |
| of which sugars | 3.8g | 1.7g | 2% | 90g |
| Fibre | 2.8g | 1.2g | - | - |
| Protein | 7.7g | 3.4g | - | - |
| Salt | 1.0g | 0.4g | 7% | 6g |

This pack contains 16 servings.

*Reference intake of an average adult (8400kj/2000kcal)

Source: [British Dietic Association, 2022.](#)

Nutritional composition labelling can also include nutrition claims such as ‘low fat’, ‘high fibre’ and health claims such as ‘Vitamin D is needed for normal bone health’. It is required by the [Department of Health and Social Care \(2011\)](#) that such claims may only be listed when the food product is compliant with specific conditions in food labelling legislation. This is to ensure labelling is not misleading to the public and consumers. In the UK, product nutritional composition is listed per 100g/ml of product, whilst the United States places strong emphasis on the energy content of food portions with nutritional information based on ‘typical’ servings or per package, as shown in Figure 7 ([FDA, 2018](#)). These variations in metrics present difficulty when assessing nutritional composition between products from countries that have different labelling requirements.

Figure 7 Example United States nutritional composition information labels.

Source: [FDA, 2018](#)

Assurance scheme

In addition to nutrition-related labelling, a range of other front of pack labels indicate measures of food quality such as adherence to assurance schemes. The UK-based [Red Tractor](#) assurance scheme logo informs consumers that food that has been produced, transported, stored, and packed to compliance criteria listed within the assurance scheme standards. Assurance for imported foods can be established by determining equivalence through benchmarking schemes such as that provided by [Global GAP](#). Similarly, cross-validation of international organic food certification is available through [IFOAM](#).

Information on measurable metrics

Measurable metrics have been discussed to some extent in the previous section covering FCDBs, which in addition to standardised analytical methods enable nutritional composition labelling of foods. A key purpose of labelling is to differentiate between foods based on their nutrient density. Measuring principal nutrients on a standardised basis, typically content per 100g or ml of food in the UK or per 100 kilocalories in the USA (albeit labelled as ‘calories’ see Figure 7) enables nutrient profiling (for example, [Public Health England, 2018](#)) and the ability to rank the nutritive value of food products by determining a balance between beneficial nutrients and those such as HFSS foods which need to be limited. Labelling policy for nutrients in the USA seeks to promote the consumption of protein, complex carbohydrates, dietary fibre and several key vitamins and minerals whilst reducing the intake of free or added sugars, saturated fats and salt ([Drewnowski and Fulgoni, 2014](#)). Nutrient density is further determined by reference to standardised daily recommended intake values, which can vary substantially between countries. Table 3 compares dietary reference values for the UK ([Public Health England, 2016](#)) with those of the United States ([FDA, 2022a](#)) and Australia and New Zealand ([Australian Government, 2022](#)). Reference values are presented as recommended daily intake for the UK, and Australia and New Zealand, and as daily values for the USA.

Table 3: Dietary reference values for energy, nutrients, fibre and minerals from [Public Health England \(2016\)](#), [FDA \(2022a\)](#) and the Australia New Zealand Food Standards Code [Australian Government \(2022\)](#).

| Dietary reference | PHE (male) | PHE (female) | FDA (All Adults) | ANZ (All Adults) |
|-----------------------------------|------------|--------------|------------------|------------------|
| Energy (MJ/day) | 10.5 | 8.4 | 8.4 | 8.7 |
| Energy (kcal/day) | 2,500 | 2,000 | 2,000 | 2,070 |
| Protein (g/day) | 55.5 | 45 | 50 | 50 |
| Fat (g/day) [Less than] | 97 | 78 | 78 | 70 |
| Saturated fat (g/day) [Less than] | 31 | 24 | 20 | 24 |
| Polyunsaturated fat (g/day) | 18 | 14 | - | - |
| Monounsaturated fat (g/day) | 36 | 29 | - | - |
| Cholesterol (mg/day) [Less than] | - | - | 300 | - |
| Carbohydrate (g/day) [Less than] | 333 | 267 | 275 | 310 |
| Free sugars (g/day) [Less than] | 33 | 27 | 125 | 90 |
| Added sugar (g/day) [Less than] | - | - | 50 | - |
| Dietary fibre (g/day) | 30 | 30 | 28 | 30 |
| Salt (g/day) [Less than] | 6 | 6 | 6 | 5.75 |
| Potassium (mg/day) | - | - | 4,700 | - |
| Iron (mg/day) | - | - | 18 | - |
| Calcium (mg/day) | - | - | 1,300 | - |
| Magnesium (mg/day) | - | - | 420 | - |

Additional considerations

Nutritional profiling is a mechanism to rank foodstuffs, but the metrics used can lack nuance. For example, expressing 'protein' as a percentage by weight ignores the marked difference in protein quality and bioavailability in terms of amino acid balance between animal and plant proteins. Given the current cultural shift towards 'plant-based' foodstuffs, [Drewnowski \(2021\)](#) highlighted a need to review this metric, since direct substitution of terrestrial meat for highly-processed meat substitutes may have negative health implications. This is also the case for plant-based beverages which are marketed as 'milks' and are therefore often viewed as equivalent to milk in nutritional value, despite often being low in protein and fortified with variable amounts of calcium, and vitamins A and D ([Drewnowski et al., 2021](#)).

The [European Commission \(2018\)](#) highlighted issues regarding 'dual quality of foodstuffs' through identifying that same brand products tested in Slovakia, Czechia and Hungary found that a significant number had differences in composition as well as in sensory properties (taste, aroma etc.). The report proposed the adoption of a harmonised testing methodology to determine discrepancies between seemingly identical products. A further consideration may arise where similarly labelled products have widely divergent nutritional compositions due to traditions. For example, 'sausage' in the UK usually means a raw, unsmoked, and uncured meat mixed with rusk, whilst many continental sausages have higher meat contents and are often cured and smoked.

National traditions are sometimes codified into rules. For example, in the UK, [legislation for milk chocolate](#) states that 'The product...contains not less than 35 per cent total dry cocoa solids, including not less than 18 per cent cocoa butter and not less than 14 per cent of dry non-fat cocoa solids', whilst in the United States, rules state 'Milk chocolate contains not less than 10 percent by weight of chocolate liquor' ([FDA, 2022b](#)).

Comparability of data to UK food production

UK food nutrition labelling standards are largely similar to EU labelling standards, with EU regulations and tertiary legislation relating to nutrition being retained as UK law following Brexit, as stated in the European Union (Withdrawal) Act 2018. As such, the UK government produced [Technical guidance on nutrition labelling \(2016\)](#) which provides an explanatory text for UK food producers to the retained EU legislation defined by the [Regulation \(EU\) No. 1169/2011 on the provision of food information to consumers \(2011\)](#).

There are mandatory and voluntary labelling standards under EU and UK law. All processed food in the UK is required to display the energy value in both kilojoules and kilocalories. In addition to the amount of fat, saturates, carbohydrate, sugars, protein, and salt in grams (Figure 5). Manufacturers of processed food in the UK and EU may also voluntarily provide data on quantities of mono-unsaturates, polyunsaturates, polyols, starch, and fibre in the nutritional declaration. A number of vitamins and minerals may also be presented in the nutritional declaration, provided they are present in sufficient quantities, as defined in Annex XIII of Regulation (EU) No. 1169/2011 [European Commission \(2011a\)](#). There are several foods exempt from requiring a nutrient declaration stated in this regulation. These include unprocessed foods, processed foods that have only undergone maturing and consist of one ingredient category, and food supplied by small manufactures directly to the public or small local retailers.

The UK and EU also share the same food labelling tolerances, with the guidance document of Regulation (EU) No 1169/2011 [European Commission \(2011b\)](#), providing clarification on these tolerances. It is stated in this document that the nutritional values of food presented on the packaging should be within these tolerance during the entire shelf life of the product. Ensuring these tolerances have the correct sensitivity is crucial in maintaining clarity in food nutrition. Unreasonably tight tolerances will result in disproportionate product failures due sample variation

and testing accuracy, whilst excessively lax tolerances will erode the credibility of nutritional labelling [European Commission \(2011b\)](#).

The UK and EU share the same methods of calculating the nutrient values presented on food labelling and both require declared values to be based upon the manufacturers analysis of the food. This must be calculated from the known or actual average values of the ingredients used, or calculated from generally established and accepted data. In the UK these values are recommended to be taken from [McCance and Widdowson \(2021\)](#). However, no such recommendations are given in the EU. The EU and UK values obtained from manufacturer's analysis of the food are not standardised, with neither authority producing a comprehensive list of food analysis standards for each food type and relevant national factors. Neither the UK nor EU legislation explicitly mention the Codex Alimentarius. Though, both are members of the Codex Alimentarius Committee which seeks to provide a level of coherency between all Member Countries of the United Nations.

Major gaps in data availability

Observations regarding the availability of nutritional composition data of internationally-traded foods reflect those of Baker et al. (2019), who, reporting from an Australian perspective, stated that 'whilst domestic public health policy sought to mitigate similar non-communicable diseases issues to those in the UK, consideration of nutritional issues had been largely absent when framing international trade policy because it was not a political priority either in Australia or its trading partners'. Consequently, their focus is more on compliance with Codex Alimentarius processes.

Our evidence search found little data available regarding the nutritional content of internationally traded foods, other than from variable quality FCDBs which largely inform the statutory labelling described above. Furthermore, these apply only to packaged products, many of which are highly processed. Information regarding bulk and unpackaged foods is likely to be derived from databases and provide no data regarding levels of micronutrients from products from different geographies that might reflect production on different soil types or from feeds/feeding systems.

Wider use of Codex Alimentarius international composition testing standards could address lack of data, provided analysis is undertaken to ISO/IEC 17025 standards upheld [United Kingdom Accreditation Service](#)–accredited laboratories.

Current nutritional composition testing processes do not provide sufficient data to assess and quantify food quality. A proposed framework for selecting and testing of food products to assess quality-related characteristics may help address this issue within the context of the EU ([European Commission 2018](#)). The issue of declining protein quality arising from the rapid increase in popularity of 'plant-based' manufactured foods and beverages also raises potential concerns. [Drewnowski \(2021\)](#) and [Drewnowski et al. \(2021\)](#) proposed improved labelling to help avoid protein deficient diets.

Key messages for nutritional composition:

- the FAO holds a worldwide directory of Food Composition Databases that can give guidelines for assessing nutritional composition of foods. These vary in quality, dependent on factors such as age, sampling/analytical methodologies used, source and geographic relevance.
- despite efforts for harmonisation, international nutritional labelling systems can vary substantially, both in terms of the basis for assessing nutritional content and nutrients declared.
- widely divergent front of pack labelling standards are used to deliver important information to consumers, but do not provide sufficient data in a centralised system to be useful for the

FSA.

- no framework is in place to monitor or provide assurance that similarly packaged foods are alike in different countries.

Summary

Our research found a general absence of data availability across imported food standards for all three themes. Considerable variation exists across imported food standards with regards to the quantity and quality of informative literature between countries. Whilst some trade agreements include a chapter on animal welfare ([UK-New Zealand FTA \(2022\)](#), [UK-Australia FTA \(2021\)](#)), environmental sustainability ([UK - New Zealand FTA \(2022\)](#), and [EU-New Zealand \(2022\)](#)), there was no data regarding nutritional composition within trade agreements assessed ([EU-New Zealand \(2022\)](#), [UK-India \(2022\)](#) and [UK-New Zealand \(2022\)](#)), only data on food safety was identified.

It is evident from this research report that the existing limitations in this space provide considerable development and refinement opportunities to support the development of inter-country data metrics regarding animal welfare, environmental sustainability, and nutritional composition of agricultural commodities. One opportunity to fulfil the data gap for measurable metrics is through using assurance schemes compliance criteria to function as a proxy. The collection of uniform metrics across animal welfare, environmental sustainability and nutritional composition aspects within imported food standards will support to increase the robustness of baseline quality standards of imported food being consumed in the UK.

Data which would be of value to collect and analyse, with the conversion potential into measurable metrics across the three themes, are as follows:

Animal Welfare

- Non-binding governance for example, best practice code
- Mortality and pain relief metrics
- National / Regional Quality Assurance Schemes
- Global Quality Assurance Schemes
- Welfare Dashboard
- Carcass Assessments
- OIE Global Standards
- Animal Protection Index
- CCTV in Slaughterhouses

Environmental Sustainability

- [Biodiversity Indices](#)
- Targets for fertiliser usage reductions
- Targets for pesticide usage reductions
- [Soil Sampling for Environmental contaminants](#)
- [Surface Water Sampling \(PDF\)](#) GHG emissions per kg production

Nutritional Composition

- rear of pack labelling standards – nutrient listing and comparative standards to align with either UK standards or 100g product assessment
- front of pack labelling – visual display /grading standards compatibility, recommended daily allowances, assurance scheme equivalence
- nutrient testing scheme compliance – methodology, frequency, tolerances
- product formulation uniformity

This research has demonstrated that metrics for measuring animal welfare, environmental sustainability and nutritional composition are not currently available in imported food standards. Whilst there are metrics being developed in assurance schemes and programs such as the [global farm metric](#), this research has highlighted a clear requirement for implementation and development of consistent measurable metrics which assess food production practices between countries and territories. The global farm metric aims to harmonise metrics to measure the three themes discussed and deliver metrics relevant to the UK import market.

To develop understanding in discrepancies across production standards for animal welfare, environmental sustainability and nutritional composition, data analysis could be conducted through further reviewing national and international laws, legislation, and assurance scheme standards. This would provide further insight into the similarities and variances across inter-country standards of production for food products.

Recommendations

The availability of data to assess the quality of food production standards regarding animal welfare, environmental sustainability, and nutritional composition was found to be limited in this research. However, there are certain avenues that could be further explored to aid either the collection, collation, or amalgamation of data in the short- and long-term to increase data availability to the FSA for better understanding the quality of food products across the three themes.

Short term (less than 12 months)

Data on animal welfare aspects will generally be easier to access and accrue due to the connection between animal welfare in relation to livestock productivity and thereby the commercial viability or financial longevity of the business.

Recommended data sources and metrics to further explore under the animal welfare theme include:

- mortality, carcass assessment and veterinary interventions (analgesics, antibiotics etc) are data points which producers record to understand operational input-output parameters to provide insight into productivity and profitability efficiencies of the business
- presence or absence of stock-check data is an additional metric which could be assessed as operations which check livestock daily will have an increased awareness of animal health and welfare of their livestock due to increased monitoring of the animals
- developing a benchmarking system which assesses intercountry variation such as the welfare dashboard described in the [Flemming et al. \(2020\) report](#) would support to understand animal welfare standards across countries exporting to the UK.

Short term actions to address environmental sustainability and nutritional composition of food imported to the UK is more complex to measure or implement; unless it is a requirement to obtain compliance to an assurance scheme. When considering environmental sustainability, the development of targets for fertiliser usage reductions, targets for pesticide usage reductions as stated in the [EU Green Deal](#), soil sampling and water sampling analysis protocols would be avenues to explore in the short term.

Due to the complexities of nutritional composition and legislation, actions under this area would be unlikely achieved in a short-term time frame, though data acquisition of sugar and salt content of processed food products would be an exploratory avenue for the short-term timeline.

Long term 2 to 3 years

Long term actions to better understand the standards of animal welfare would be further consideration of national, regional, and international assurance schemes, and the alignment of production practices to World Organisation for Animal Health global standards through addressing the Animal Protection Index high risk countries. An initial recommendation would be to collect data on the intercountry progress towards the uptake of CCTV in slaughterhouses would provide insight into animal welfare standards at the point of slaughter.

Further recommendation would be centred on benchmarking international assurance schemes to assess the standard of animal welfare, environmental sustainability, and nutritional composition. Benchmarking provides a level of consistency that can be applied across national and international standards will highlight to importers and consumers any variances. A system which benchmarks assurance schemes is the [Sustainable Agriculture Initiative Platform Farm Sustainability Assessment](#).

Long term actions for data on environmental sustainability could include the collection of data from countries reporting their GHG emissions (per kg production) across businesses which export to the UK and [implementing biodiversity indices](#). Long term nutritional composition actions could include the collation of data regarding front of pack and rear of pack labelling standards, nutritional analysis, and uniformity to compare the clarity and identify the level of detail across intercountry product formulation through compliance to nutrient testing schemes.

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Appendix 1: Databases and search terms used

Animal welfare

The databases searched, and search terms used, to find literature on nutritional composition requirements within standards and trade agreements, are outlined in Table A1-3. All searches were conducted in October and November 2022.

Table A1-3. Databases searched, and search terms used, to find literature on nutritional composition requirements within standards and trade agreements.

| Search terms used | Database searched |
|--|-------------------|
| Free trade agreement nutritional labelling | Google |
| Free trade agreement nutritional labelling US Canada | Google |
| Free trade agreement nutritional labelling UK | Google |
| Trade agreement ultra processed food | Google |
| Trade agreement ultra processed food labels | Google |
| 'Free trade agreement' nutritional labelling | Google Scholar |
| Nutrition labelling global | Google |
| Trade agreement 'nutritional labelling' | Google Scholar |
| Trade agreement back of pack nutrition | Google |
| Trade agreement nutritional composition standards | Google |
| Trade agreement nutrition standards | Google |
| Nutrition testing requirement import | Google |
| Nutritional Value testing 'import' accuracy | Google |
| Codex Alimentarius Methods of Sampling and Analysis | Google |
| Code of Federal Regulations, Title 21, Chapter 1, 1010.9 | Google |
| Nutritional Value testing EU | Google |
| Export nutrition testing standard | Google |
| Nutrition testing Australia export | Google |
| HFSS testing nutrition global | Google Scholar |
| Ultra-processed food export | Google Scholar |
| India export requirements | Google |
| Export requirements nutrition 'testing' list countries | Google |

Environmental sustainability

The databases searched, and search terms used, to find literature on environmental sustainability requirements within standards and trade agreements, are outlined in Table A1-2. All searches

were conducted in October and November 2022.

Table A1-2. Databases searched, and search terms used, to find literature on environmental sustainability requirements within standards and trade agreements.

| Search terms used | Database searched |
|---|-------------------|
| Free trade agreement environmental sustainability | Google |
| Environment sustainability export standards | Google |
| Environment sustainability export standards | Google Scholar |
| Environment trade agreement | Google |
| Climate free trade agreement | Google |
| Import standards plant protection products | Google |
| Trade agreement crop health | Google |
| Imported food environmental standards Canada | Google |
| Import foods carbon | Google |
| Import standards carbon | Google |
| Free trade agreement agriculture environmental sustainability | WorldCat |
| Trade agriculture environmental standards | WorldCat |
| Carbon border adjustment food | Google |

Nutritional composition

The databases searched, and search terms used, to find literature on nutritional composition requirements within standards and trade agreements, are outlined in Table A1-3. All searches were conducted in October and November 2022.

Table A1-3. Databases searched, and search terms used, to find literature on nutritional composition requirements within standards and trade agreements.

| Search terms used | Database searched |
|---|-------------------|
| Free trade agreement nutritional labelling | Google |
| Free trade agreement nutritional labelling US Canada | Google |
| Free trade agreement nutritional labelling UK | Google |
| Trade agreement ultra processed food | Google |
| Trade agreement ultra processed food labels | Google |
| 'Free trade agreement' nutritional labelling | Google Scholar |
| Nutritional labelling global | Google |
| Trade agreement 'nutrition labelling' | Google Scholar |
| Trade agreement back-of-pack nutrition | Google |
| Trade agreement nutritional composition standards | Google |
| Trade agreement nutrition standards | Google |
| Nutrition testing requirement import | Google |
| Nutritional Value testing 'import' accuracy | Google |
| Codex Alimentarius Methods of Sampling and Analysis | Google |
| Code of Federal Regulations, Title 21, Chapter 1, 101.0 | Google |
| Nutritional Value testing EU | Google |
| Export nutrition testing standard | Google |
| Nutrition testing Australia export | Google |

| Search terms used | Database searched |
|--|-------------------|
| HFSS testing nutrition global | Google Scholar |
| Ultra-processed food export | Google Scholar |
| India export requirements | Google |
| Export requirements nutrition 'testing' list countries | Google |

Appendix 2: List of materials shortlisted in the screening

Animal welfare

The literature found in the searches for animal welfare requirements within standards and trade agreements is outlined in Table A2-1.

Table A2-1. List of (initially relevant) literature that were found in the searches for animal welfare requirements within standards and trade agreements.

| Number | Literature identified | Inclusion status |
|--------|--|------------------|
| 1 | UK-New Zealand FTA Chapter 6: Animal Welfare - GOV.UK | Included |
| 2 | Chapter 25: Animal Welfare and Antimicrobial Resistance | Included |
| 3 | The EU—Chile Free Trade Agreement—a Boost for Animal Welfare | Included |
| 4 | UK-Australia Free Trade Agreement: A Welsh Government Perspective 2022 | Excluded |
| 5 | The Externalisation of Animal Welfare Standards by the EU through Free Trade Agreements Cases of Ukraine, Chile, and Canada | Included |
| 6 | Animal Welfare, Bilateral Trade Agreements, and Sustainable Development Goal Two | Excluded |
| 7 | Animal welfare regulations and practices in 7 (potential) trade-agreement partners of the EU with a focus on laying hens, broilers, and pigs | Excluded |
| 8 | Animal welfare and developing countries: opportunities for trade in high-welfare products from developing countries | Included |
| 9 | Defining core standards for Animal Welfare in Trade Policy | Included |
| 10 | Recommendations for the UK Trade Policy for Free Trade Agreements that protect animal welfare and comply with WTO rules | Excluded |
| 11 | Animal welfare in poultry production systems: impact of EU standards on world trade | Excluded |
| 12 | UK-Canada Free Trade Agreement: The UK's Strategic Approach | Excluded |
| 13 | RSPCA RESPONSE TO THE LORDS SUB COMMITTEE ON INTERNATIONAL AGREEMENTS: UK CPTPP FTA | Included |
| 14 | The EU-UK Trade and Cooperation Agreement | Included |
| 15 | Governing antimicrobial resistance: a narrative review of global governance mechanisms | Included |
| 16 | The Mandatory Use of Closed Circuit Television in Slaughterhouses (England) Regulations 2018 | Included |

| Number | Literature identified | Inclusion status |
|--------|--|------------------|
| 17 | CCTV cameras in slaughterhouses: Modest benefits for animal welfare | Included |
| 18 | CCTV to be introduced in all slaughterhouses in England in 2018 | Excluded |
| 19 | The Need for and Possible Implementation of a Workable System of CCTV in All Slaughterhouses in Wales | Excluded |
| 20 | Petition P-04-433 CCTV in Slaughterhouses January 2020 | Excluded |
| 21 | Overview of animal welfare standards and initiatives in selected EU and third countries | Included |
| 22 | The globalisation of farm animal welfare | Included |
| 23 | Poultry welfare scenario in South America: norms and regulations | Excluded |
| 24 | Live Animal Export Final Stage Impact Assessment | Excluded |
| 25 | Review of Livestock Welfare Indicators Relevant for the Australian Live Export Industry | Included |
| 26 | Benchmarking Farm Animal Welfare—A Novel Tool for Cross-Country Comparison Applied to Pig Production and Pork Consumption | Included |
| 27 | Trade and Agriculture Commission: Final Report 2021 (chapter 4 specifically) | Excluded |
| 28 | Animal welfare indicators for sheep during sea transport: Monitoring health and behaviour | Excluded |
| 29 | Importance and Feasibility of Animal Welfare Measures from a Consumer Perspective in Germany | Excluded |
| 30 | Livestock Export Review Summary of submissions | Excluded |
| 31 | Animal welfare risks of global aquaculture | Excluded |
| 32 | 2021 National Trade Estimate Report on FOREIGN TRADE BARRIERS | Excluded |
| 33 | Animal Well-Being Issues Associated with International Trade, Production and Animal Health | Included |
| 34 | Metrics provide the key to improved farm animal welfare | Included |
| 35 | Livestock export permit systems and processes | Excluded |
| 36 | The Five Freedoms in the global animal agriculture market: Challenges and achievements as opportunities | Included |
| 37 | Identification of key performance indicators for on-farm animal welfare incidents: possible tools for early warning and prevention | Included |
| 38 | Farm to fork strategy: Animal welfare, EU trade policy, and public participation | Included |
| 39 | Israel Trade Priorities - May 2022 | Excluded |
| 40 | BRIEFING: MERCOSUR Animal Protection in EU Trade Negotiations | Excluded |
| 41 | Broiler and swine production: animal welfare legislation scenario | Included |
| 42 | Best practice framework for animal welfare certification schemes | Included |
| 43 | Malaysia Halal Country Report | Included |
| 44 | Animal Agriculture Laws on the Chopping Block: Comparing United States and Brazil | Included |
| 45 | Benchmarking farm animal welfare – Ethical considerations when developing a tool for cross-country comparison | Excluded |
| 46 | Analysis of Halal assurance management on imported food products in Malaysia | Excluded |
| 47 | Playing Chicken at the WTO: Defending an Animal Welfare-Based Trade Restriction Under GATT's Moral Exception | Excluded |
| 48 | Organic Export Info | Included |
| 49 | Animal welfare assurance programs in food production: a framework for assessing the options | Included |

| Number | Literature identified | Inclusion status |
|--------|---|------------------|
| 50 | establishing an association between the European Community and its Member States, of the one part, and the Republic of Chile, of the other part | Included |
| 51 | British Lion Eggs | Included* |
| 52 | European Roundtable for Sustainable Beef (ERSB) | Included* |
| 53 | Red Tractor | Included* |
| 54 | Global Roundtable for Sustainable Beef | Included* |

*Sustainability standards were additions to the list, after the screening exercise had been undertaken. These were included in the assessment for inclusion/exclusion.

Environmental sustainability

The literature found in the searches for environmental sustainability requirements within standards and trade agreements is outlined in Table A2-2.

Table A2-2. List of (initially relevant) literature that were found in the searches for environmental sustainability requirements within standards and trade agreements.

| Number | Literature identified | Inclusion status |
|--------|--|------------------|
| 1 | UK-New Zealand FTA Chapter 22: Environment | Included |
| 2 | Enhancing sustainability in EU Free Trade Agreements: The case for a holistic approach | Included |
| 3 | Sustainability provisions in EU free trade agreements: Review of the European Commission action plan | Included |
| 4 | Trade and Sustainable Development in EFTA's FTAs | Excluded |
| 5 | Free Trade, Environment, Agriculture, and Plurilateral Treaties: The Ambivalent Example of Mercosur, CETA, and the EU–Vietnam Free Trade Agreement | Included |
| 6 | Sustainability standards in global agrifood supply chains | Excluded |
| 7 | Environment and Regional Trade Agreements | Excluded |
| 8 | Agreement on Climate Change, Trade and Sustainability (ACCTS) negotiations. | Included |
| 9 | EU – New Zealand Trade Agreement: Unlocking sustainable economic growth | Included |
| 10 | Climate change and trade agreements: Friends or foes? | Excluded |
| 11 | Can Preferential Trade Agreements Address Climate Change? | Excluded |
| 12 | The Official Controls (Plant Protection Products) Regulations 2020: policy statement | Excluded |
| 13 | Regulation of Plant Protection Products in the UK after Brexit | Included |
| 14 | UK-New Zealand FTA: advice from Trade and Agriculture Commission | Included |
| 15 | A UK/US Free Trade Agreement and its impact on UK agriculture | Included |
| 16 | Trade and Agricultural Commission Final Report 2021 | Included |
| 17 | Top 10 Risks from a UK- US Trade Deal | Included |
| 18 | EU-Mercosur Trade agreement - factsheet on agriculture | Excluded |
| 19 | Food-specific import requirements | Excluded |
| 20 | Review of national food control plans in Australia, Canada, New Zealand, and United States | Excluded |
| 21 | Designing Environmental Regulation of Agricultural Imports: | Included |

| Number | Literature identified | Inclusion status |
|--------|---|------------------|
| 22 | Are the sustainability criteria in the Swiss trade deal with Indonesia toothless? | Included |
| 23 | RISKIER BUSINESS: THE UK'S OVERSEAS LAND FOOTPRINT | Excluded |
| 24 | National Food Strategy: The Plan | Excluded |
| 25 | Impact of food trade on climate | Included |
| 26 | Government response to the Trade and Agriculture Commission report | Included |
| 27 | The carbon footprint of imported food is more complicated than you think | Excluded |
| 28 | Greening imports: a UK carbon border approach | Excluded |
| 29 | Carbon Border Adjustment Mechanism: Questions and Answers | Excluded |
| 30 | TRADE AND CLIMATE CHANGE | Included |
| 31 | Europe's Carbon Loophole | Included |
| 32 | Denmark ethics council calls for tax on red meat to fight 'ethical problem' of climate change | Excluded |
| 33 | Measuring and reporting environmental impacts: guidance for businesses | Excluded |
| 34 | Organisation Strategy for the Sustainable Trade Initiative (IDH) 2015-2020 | Included |
| 35 | Is Free Trade an Obstacle to Carbon Neutrality?: How does Free Trade Affect the Environmental Footprint of Sweden, as a Part of the EU, in the Agricultural Sector? | Included |
| 36 | Carbon Taxation in Sweden | Excluded |
| 37 | EU Considers Carbon Tariff on Imports | Excluded |
| 38 | Carbon Footprint: exploring the UK's contribution to climate change | Included |
| 39 | Which proposed climate policies are compatible with WTO rules? | Excluded |
| 40 | Food Policy on Trial: Fourth in the dock – Carbon Border Adjustment tax and food systems | Included |
| 41 | 15th June 2021 - JURY'S VERDICT AND SUMMARY | Excluded |
| 42 | Model-based risk-adjusted planning for sustainable agriculture under agricultural trade liberalization: Ukrainian case study | Excluded |
| 43 | The Fulfilments of European Standards about the Environment and Macedonia's Progress | Included |
| 44 | Trade deals, carbon taxes and cakeism | Included* |
| 45 | EU Taxonomy for Sustainable Activities | Included* |
| 46 | GlobalG.A.P | Included* |
| 47 | Fair Trade International Climate Standard | Included* |
| 48 | Linking Environment and Food (LEAF) | Included* |
| 49 | Sustainable Agriculture Initiative (SAI) Farm Sustainability Assessment (FSA) | Included* |
| 50 | Rainforest Alliance - Sustainable Agriculture Standard | Included* |
| 51 | Aquaculture Stewardship Council (ASC) | Included* |
| 52 | Forest Stewardship Council (FSC) | Included* |
| 53 | Marine Stewardship Council (MSC) | Included* |
| 54 | Roundtable on Responsible Soy Association Standard | Excluded* |
| 55 | Red Tractor | Included* |
| 56 | Soil Association | Included |
| 57 | UK - New Zealand FTA | Included |
| 58 | EU - Vietnam FTA | Included |
| 59 | EU - South Korea FTA | Included |
| 60 | EU - Mercosur FTA | Included |

| Number | Literature identified | Inclusion status |
|--------|------------------------|------------------|
| 61 | EU - Canada FTA | Included |
| 62 | EU - New Zealand FTA | Included |
| 63 | China - Costa Rica FTA | Included |
| 64 | Korea - Australia FTA | Included |
| 65 | US - Peru FTA | Included |

*Sustainability standards were additions to the list, after the screening exercise had been undertaken. These were included in the assessment for inclusion/exclusion.

Nutritional composition

The literature found in the searches for nutritional composition requirements within standards and trade agreements are outlined in Table A2-3.

Table A2-3. List of (initially relevant) literature that were found in the searches for nutritional composition requirements within standards and trade agreements.

| Number | Literature identified | Inclusion status |
|--------|---|------------------|
| 1 | Nutrition declaration | Included |
| 2 | Front of package food labelling, international trade, and their impact on food security | Excluded |
| 3 | New NAFTA limits labelling for food and workplace chemicals | Included |
| 4 | Report Name: Food and Agricultural Import Regulations and Standards Country Report | Excluded |
| 5 | Technical guidance on nutrition labelling | Included |
| 6 | Why labels won't protect UK food standards from a US trade deal | Excluded |
| 7 | Nutrition labelling is a trade policy issue: lessons from an analysis of specific trade concerns at the World Trade Organisation | Included |
| 8 | Report pursuant to Section 42 of the Agriculture Act 2020 (web version) | Included |
| 9 | Brexit: Trade, Healthy Eating and Obesity Soil Association | Included |
| 10 | Update on Chilean Advertising of Packaged Foods and Beverages | Included |
| 11 | The impact of Free Trade Agreements on British diets | Included |
| 12 | Joint association of food nutritional profile by Nutri-Score front-of-pack label and ultra-processed food intake with mortality: Moli-sani prospective cohort study | Excluded |
| 13 | Tensions and coalitions: A new trade agreement affects the policy space for nutrition in Vietnam | Included |
| 14 | Hollow Threats: Transnational Food and Beverage Companies' Use of International Agreements to Fight Front-of-Pack Nutrition Labelling in Mexico and Beyond | Included |
| 15 | Emerging threats of global pre-emption to nutrition labelling | Included |
| 16 | The threat of a UK-US trade deal to managing non-communicable diseases | Included |
| 17 | Anatomy of Non-tariff Barriers in India-Sri Lanka Free Trade Agreement: An Empirical Investigation | Excluded |
| 18 | Global Update on Nutrition Labelling | Included |
| 19 | Front-of-pack nutrition labelling to promote healthier diets: current practice and opportunities to strengthen regulation worldwide | Included |
| 20 | Arguments used by trade associations during the early development of a new front-of-pack nutrition labelling system in Brazil | Included |

| Number | Literature identified | Inclusion status |
|--------|---|------------------|
| 21 | Nutrition Labelling UK Post-Deal Guidance - Brexit Information | Included |
| 22 | Nutrition labelling schemes used in Member States | Included |
| 23 | Manual to develop and implement front of pack nutrition labelling | Included |
| 24 | The Nordic Countries Support the Development of a Harmonised Front-Of-Pack Nutrition Labelling | Included |
| 25 | Lessons from the Australia-UK Free Trade Agreement | Excluded |
| 26 | Who influences nutrition policy space using international trade and investment agreements? A global stakeholder analysis | Included |
| 27 | Formula Review on Pre-packaged Food - CIRS Group | Excluded |
| 28 | Part 2 - Analysis and feedback- Nutrition labelling compliance test | Included |
| 29 | CXS 234-1999 | Included |
| 30 | CFR - Code of Federal Regulations Title 21 - FDA | Included |
| 31 | Framework for selecting and testing of food products to assess quality related characteristics: EU harmonised testing methodology | Included |
| 32 | Testing requirements for export of food items Sigmatest | Included |
| 33 | Trade and nutrition policy coherence: a framing analysis and Australian case study | Included |
| 34 | Food Standards Code | Included |
| 35 | Food and Nutrition: Policy and Regulatory Issues | Included |
| 36 | Ultra-Processed Foods: Definitions and Policy Issues | Included |
| 37 | UK-India Free Trade Agreement the UK's Strategic Approach | Excluded |
| 38 | Export Requirements by Country and Jurisdiction (A-F) | Excluded |