Appendix 3: What works to prevent food fraud - definitions and meanings of food fraud

Successful prevention of food fraud is hindered if ambiguity concerning what food fraud is, and what the term means, still exists. Although food fraud dates back to ancient Greece and Rome and is still regularly operationalised, there is no agreed definition within academic literature or regulation. Due to the lack of a set legal definition of food fraud, there are inconsistencies among researchers and regulatory bodies with regard to what food fraud and related terms are as concepts and mean in practice (Wisniewski and Buschulte, 2019; Lotta and Bogue, 2015; Spink et al., 2015). A range of academic literature, government publications, and stakeholder guidance have defined food fraud, with examples presented in Table 3.1. Although within these sources definitions of food fraud often differ, as well as describing the types of food fraud that can occur, most definitions found in the literature agree that food fraud is an intentional and deceptive act primarily undertaken for economic gain associated with food or feed ingredients or products.

According to the FSA and Department of the Environment, Food and Rural Affairs (Defra), food fraud is defined as the act of “deliberately placing food on the market for financial gain, with the intention of deceiving the consumer” (Defra, 2014).

In addition to understanding what food fraud is, describing types of food fraud helps to determine how food fraud might occur in the food supply chain which will aid prevention and mitigation of food fraud. Food fraud has been categorised by type by many authors (GAO, 2009; Spink and Moyer, 2011; Manning and Soon, 2016; GFSI, 2017; Bouzembrak et al., 2018; Manning and Soon, 2019; CEN, 2019; NFCU, 2019a). While other publications have identified up to 38 types of food fraud, the NFCU (2019) however defines seven general types of food crime which includes some types of food fraud (Table 3.2). Wider food-related crime and food defence threats extend beyond food fraud, and there is a lack of consistency and clarity on what threats are included or exclude from a national or organisational FFPP. In the stakeholder interviews colloquial terms were used such as ‘passing off,’ ‘ripping off,’ ‘swapping-out,’ ‘reboxing,’ or ‘misdescribing.’ The terms used by interviewees to describe food crime and food fraud have been collated in Table 3.3.

Table 3.1: Exemplar Food Fraud definitions from the evidence base.

Source	Definition
Cruse (2019)	An intentional change in a food product that a consumer is unaware of with their purpose to deceive consumers- whether to cause harm or to economically benefit.

Source	Definition
Manning and Soon (2019)	Intentional modification of food products and/or associated documentation for economic gain and may lead to issues of food safety, legality and/or quality depending on the activities undertaken or the agent(s) used.
Spink et al. (2019a)	Long Definition: Illegal deception for economic gain using food encompasses deliberate and intentional substitution, addition, tampering, or misrepresentation of food, food ingredients, or food packaging; or false or misleading statements made about a product for economic gain. The types of fraud include adulteration, tampering, product overrun, theft, diversion, simulation, and counterfeiting.
Spink, (2019); Spink et al. (2019a; 2019b)	Short Definition: Illegal deception for economic gain using food
BRC, 2018	Fraudulent and intentional substitution, dilution or addition to a product or raw material, or misrepresentation of the product or material, for the purpose of financial gain, by increasing the apparent value of the product or reducing the cost of its production.
BSI British Standards institution (2017)	Dishonest act or omission relation to the production or supply of food, which is intended for personal gain or to cause loss to another party.
CEN (2019)	Intentionally causing a mismatch between food product claims and food product characteristics.
EC (2018)	Food fraud is about intentional actions taken by businesses or individuals for the purpose of deceiving purchasers and gaining an undue advantage therefrom, in violation of the European Union (EU) agri-food chain legislation. These intentional infringements may also constitute a risk to human, animal or plant health, or to animal welfare or to the environment as regards genetically modified organisms (GMOs) and plant protection products. The EU Food Fraud Network refers to four key operative criteria to distinguish whether a case should be reported as a suspicion of fraud or as a non-compliance: 1. Violation of EU law codified in the EU agri-food chain legislation. 2. Intention 3. Economic gain 4. Deception of Customer

Source	Definition
Foundation Food Safety System Certification (FSSC) 22000 (2019)	A collective term encompassing the deliberate and intentional substitution, addition, tampering or misrepresentation of food, food ingredients or food packaging, labelling, product information or false or misleading statements made about a product for economic gain that could impact consumer health (GFSI v7.2:2018).

An internationally recognised legal definition of food fraud and associated terminology (see Appendix 2) would represent a significant contribution and be advantageous for developing trade deals especially where food standards regulations vary from country to country. While a legal definition for food fraud is not strictly speaking necessary to combat food fraud, an agreed definition may still carry significant benefits in clarifying the regulators' intent and be conducive to ensuring consistent approaches across the food industry, and galvanising action and support for the chosen regulatory strategies.

Such a definition could bring clarity and focus on the fight against food fraud.

Table 3.2: Types of Food Crime as defined by NFCU (NFCU, 2019).

Forms of Crime	Definition
Adulteration	This involves adding a substance to a food to increase its weight or volume, or to improve its appearance or taste. For example, chilli powder may be spiked with cheaper and potentially harmful additives, or honey may be mixed with corn syrup.
Document fraud	This involves creating, altering, or using false or genuine documents, with the intent to deceive or pass specific controls.
Illegal processing	This involves slaughtering or preparing meat and related products in unapproved establishments or using unauthorised techniques.
Misrepresentation	This involves misleading consumers about the nature, substance, source, or quality of a food product. For example, a product may be labelled as "organic" or "non-GMO" when it is not, or a food may be marketed as being from a specific region or made with certain ingredients when it is not.

Forms of Crime	Definition
Substitution	This involves replacing a more expensive or higher-quality food with a cheaper or lower-quality substitute. For example, olive oil may be diluted with cheaper vegetable oils, or fish may be mislabelled as a more expensive species.
Theft	This involves dishonestly obtaining food, drink or feed products to profit from their use or sale.
Waste diversion	This involves illegally diverting food, drink or feed meant for disposal, back into the supply chain.

Terms used by interviewees to describe food fraud and food crime threats

- Adaption
- Addition
- Adulteration
- Authenticity
- Bribery
- Composition
- Corruption
- Counterfeiting
- Date coding
- Dilution
- Dishonesty
- Economically motivated adulteration (EMA)
- Excess claims
- Extortion
- Fair trade
- Forgery
- Hacktivism
- Lying
- Misdescribing

- Mislabelling
- Misleading
- Misrepresentation
- Nutritional labelling
- Over declaration
- Overrun
- Packaging
- Passing off
- Provenance
- Reboxing
- Replacement
- Replication
- Ripping off
- Similarity
- Smuggling
- Substitution
- Swapping out
- Tampering
- Terrorism
- Theft
- Under declaration
- Under weight

The BSI PAS 96:2017 Guide to protecting and defending food and drink from deliberate attack (BSI, 2017) defines a threat as 'something that can cause loss or harm and arises from the ill-intent of people.' Whilst multiple academic sources highlight the difference between food safety, food quality, food fraud and food defence; (see work of Spink cited in this report), in the interviews the terms 'hazard' and 'threat,' were used far more interchangeably and with more cross-over as shown in Table 3.3 and the codebook from the interviews (Appendix 7). For example, whilst smuggling, terrorism, or hacktivism, may be described in some academic sources as being food crime or food defence threats rather than food fraud issues, they were identified within the interviews as intentional acts of deception that were of concern, whether they were classically defined as food fraud or not.

Food fraud is associated with varying policy responses where 'food safety', 'food crime', 'food standards', 'food integrity', 'food authenticity', 'food security', 'food defence,' each imply different forms of regulatory action (Lord, 2017). These range from regulatory measures to persuade business to comply with prescriptive regulatory standards including self-regulation through to the developing of sentencing guidelines and the criminal sanctioning of individual offenders. Underpinning this policy agenda is a need to prevent food fraud, food crime, and food harms, and to improve the integrity of the national food system. This outcome was central to the Elliot Review

(Elliot 2014) into the integrity and assurance of food supply networks and the associated formation of the NFCU and FIIN. As Spink and Moyer (2011) note, '(w)hile classic intervention and response tactics have value whenever public health is threatened, proactive prevention is the logical progression' and this requires recognition that 'the root cause of food fraud has fundamentally different properties' to other policy agendas such as ensuring food on sale in the UK is safe.

Interventions for food fraud prevention strategies

VACCP and Enterprise Risk Management (ERM) were highlighted as a focus for strategies so they are comprehensive, robust, real-time and integrated (Moyer et al., 2017). Integration and a combination of effective identification and mitigation strategy and a well-coordinated supply chain system are essential to counter fraud (Everstine et al. 2018; 2020; Barnard and O'Connor 2017; Fassam and Dani, 2017). Harsher sanctions to neutralise expected economic gains of fraudsters, combined with whistleblowing facilities and improvements in electronic certification system in the food supply chain are all of value (Afrodita et al., 2018). Strategies for preventing fraud must evolve and be responsive to changes in tactics by the perpetrators of food fraud (Barnard and O'Connor 2017). Cadieux et al. (2019) suggest that establishing public-private partnership between the government, the industry and academia will help reduce fraud incidences. Applying penalties alone without joint efforts by stakeholders will be counter-productive. Gimonkar et al. (2020) propose collaboration among the stakeholders, stricter law enforcement and an effective management system associated with a vulnerability assessment plan.

Uncoordinated and disjointed efforts will sabotage the fight against fraud prevention. To prevent food fraud, stakeholders and government must work together and ensure that all preventive measures are in place. Brereton et al. (2016) suggest developing a FCMS with stakeholders' engagement is key to effective food fraud prevention. Manning and Soon (2019) propose collaboration between profit and non-profit sectors to build up information sharing.

Intelligence gathering, information sharing and surveillance

Luijckx et al., (2021) propose intelligence gathering, risk assessment and risk management control are combined to aid fraud prevention. Using fraud detection methods without carrying out real-time supply chain mapping and fraud assessment will 'not work' due to the transitory nature of food fraud activities. It is important to identify at which stage within the supply chain fraud is likely to occur and when, to develop and adopt fraud mitigation measures that will be effective (Luijckx et al., 2021). Brooks et al. (2017) propose intelligence gathering and sharing of information among the stakeholders and adequate funding of relevant agencies involved in food fraud mitigation. Elliot et al. (2019) discuss the foundation for an understanding of the fraud opportunity utilising holistic and all-encompassing information sharing systems.

They also highlight the need for more guidance or harmonisation on vulnerability assessments, strategy development and management, and correlation to all other enterprise-wide risks (ERM/COSO). Da Silva et al. (2018) propose a comprehensive food fraud and adulteration prevention programme which requires the enforcement of regulatory systems, increased sampling and monitoring, training of food producers and handlers, and development of precise, rapid, and cost-effective methods of fraud detection. The availability of robust methods to identify the chemical constituents of foods is also a decisive step, both to detect and prevent fraud and to open up new markets to these products.

Use of technology

Food fraud prevention needs effective new approaches by building digital traceability capacity into the supply chain system. An integrated approach to counter fraud, implement a fraud classification scheme (fraud identification and mitigation) ‘will work’ (Everstine et al. 2018). A combination of new technologies (Blockchain, IoT, AI and big data) deployed simultaneously will work well in fraud prevention (Danese et al. 2021; Hassoun et al. 2022). Fang and Stone (2019) propose the use of blockchain to guarantee food product data integrity and to prevent the incidence of product misrepresentation. The operation of voluntary technology-based systems that go beyond legal requirements is promising to ensure food traceability (Garius and Treibmaier, 2021) guarantee food product data integrity and prevent incidence of product misrepresentation (Daniel et al., 2022). Alzahani and Bulusu (2018) propose combining Blockchain and Near Field Communication (NFC) technologies to prevent fraud; and Alkhudary et al. (2022) highlight a supply chain system supported by Blockchain technology, IoT sensors and an ADRM system.

A one size fits all approach does not work in fraud prevention. An integrated approach is needed which requires the combination of several prevention interventions to form an effective strategy. Bager et al. (2022) propose the digitisation of supply chain systems to assure transparency and traceability and highlight that it is important to understand the technicalities of Blockchain technology before it can be deployed for fraud prevention. Disjointed and uncoordinated supply chain systems will not work in fraud prevention (Collart and Canales, 2022).

Industry, government (central and local), and academic collaborating together can support food fraud detection. Examples of this collaboration include the co-creation of incident databases, but this approach is not specifically aimed at fraud prevention. However, many databases are ‘pay-to-access’ leaving micro, small and medium sized businesses (MSMEs) with minimal access to databases or guidance. The Food Industry Intelligence Network (FIIN) is an example of collaborative best practice in the UK. The Defra Review of Food Fraud Drivers and Mitigation Tools Project in a data collection period between 2018 and 2021 and published in 2023 identified the five most commonly used databases. These were the European Rapid Alert System for Food and Feed (RASFF) Safety database and within the UK the UK Food Surveillance System (UKFSS); HorizonScan - Fera Science; and the Local Authority Enforcement Monitoring System (LAEMS) Database.

Creating a public platform to underpin food fraud prevention through greater access to information and simple diagnostic tools for MSMEs is essential. The creation of food fraud databases from text mining academic and media sources and the creation of a risk pathfinder system that combines data supports detection of likely food safety and food fraud events (Tao et al., 2020).

Davidson et al. (2017) suggest that food safety integration with food defence works well in prevention. The inclusion of food fraud specifically in HACCP and carefully defining different forms of food fraud and other food crime, for example, adulteration and contamination, is important (Manning and Soon, 2016). This is explained within the main report. Esteki et al. (2019) consider the integration of food fraud risk system into food management system coupled with the implementation of fraud prevention policies and strict enforcement of existing legislation. Clearer product traceability, transparent market interaction and assured supply chain integrity will also prevent the incidence of food fraud (Ehmke et al., 2019). Strengthening of a harmonised FCMS will be a key enabler for an effective food supply chain response (Cawthorn and Mariani, 2017).

Use of modelling techniques can help to predict and prevent food fraud for example, Bayesian network modelling linked to the RASFF database (Bouzembrak and Marvin, 2016). Djatna et al. (2020) also propose product data modelling and an associated information system supported by blockchain technology and the use of smart contract system as being effective for fraud prevention. Higher financial penalties and open data publishing of food fraud perpetrators might also be effective in fraud prevention (Bimbo et al., 2019).

Developing food fraud awareness amongst consumers will also support prevention strategies (Bitzios et al., 2017). Lee et al. (2022) propose that efforts should be made to create consumer awareness about precautions when purchasing products using online vendors and receiving seemingly legitimate but malicious ads or links via unsecure chatting apps. They suggest the use of various forms of technologies to digitally trace and authenticate food related products would strengthen the level of surveillance and, in turn, increase the likelihood of detecting suspicious activity.

Upstream prevention through supply chain assurance is recognised as a key strategic focus for food fraud prevention. Upstream and downstream food fraud countermeasures can be effectively implemented wherein the focus should be holistic, comprehensive, and on integrated solutions. Supply chains/networks need to be more visible to identify existing and emergent vulnerabilities and be mapped according to specific attributes. The Defra Review of Food Fraud Drivers and Mitigation Tools Project highlighted supplier approval processes and supply chain verification tools as key food fraud mitigation strategies. They also link to project management lifecycle software and forensic accounting as key strategies to adopt.

Verification activities identified in this research include the monitoring of: financial flows, waste flows (especially where waste products could be potential adulterants), product integrity, process integrity, human integrity, data integrity and establishment integrity. Mass balance analysis and traceability assessments as means of verification are essential within this upstream/downstream prevention approach. The dominance of the multiple retailers and third-party certification such as the BRC Global Standard is effective as an approach in developing FBO certifiable food safety management systems. However, vulnerabilities can arise if adoption strategies are based upon compliance with the standard at the expense of more bespoke (contextually specific) approaches to FCMS focussed specifically upon the prevention of food fraud. Verification including inspection and auditing processes should not be limited to compliance with FCMSs but should verify the efficacy of the FCMS as a proposition to identify, eliminate and/or mitigate food fraud, and promote food integrity.