IFS Food

FOOD FRAUD FACT SHEETS

Quick and practical reference summarising reported food fraud incidents, methods of fraud analysis and more

ENGLISH

INTRODUCTION

Food fraud remains a topical issue. New cases are uncovered by institutions in the food industry again and again. The damage for companies unknowingly purchasing fraudulent products is often severe. Consequently, food-producing companies need to keep abreast of any new potential product risks and regularly assess their raw materials and ingredient supply chains for vulnerabilities to food fraud. Quality managers must know what to look for in food products and what kind of testing methods to use to uncover food fraud.

As a tool to support IFS Stakeholders in their daily compliance, IFS Risk Management has created food fraud fact sheets and compiled them in this brochure. It provides its readers with relevant information to consider in their risk management activities. The IFS Food Fraud fact sheets are a quick and practical reference summarising reasons for food fraud adulteration, methods to detect it and further interesting facts about producing countries or historical food fraud cases. They provide updates about the latest developments and technologies. Sorted according to the IFS Product Scopes, readers can easily find the ones relevant to their businesses.

HOW IT WORKS

We chose a two-page summary for the fact sheets with graphic visual representations of the analytical findings and additional information.

On the first page of each fact sheet, we list findings from analysed media reports from the last twenty years to show the food authenticity issues mostly seen for specific products or product groups. For further research, we provide examples of media reports. We then present product-specific analytical methodologies according to the Food Integrity Handbook of the Food Integrity Project. Knowing and understanding these methodologies is a significant element in the fight against food fraud.

On the second page of the fact sheets, we inform about producing countries, deep dive into historical food fraud cases or highlight other remarkable details about the specific product.

We have optimised the design of the IFS Food Fraud fact sheets for easy reading and using them both online and offline:

- All data sources, such as text references or newspaper articles, have hyperlinks. Feel free to click on the link to access the data source for further reading and research.
- It is easy to print the fact sheets for specific products or product groups. Quality managers may want to display them on whiteboards in staff areas to raise awareness of food fraud topics with their production staff.

It belongs to the corporate values of IFS to support IFS certified or assessed businesses with complementary practical resources like this brochure. Inform yourself about more IFS Tools and resources supporting your risk management activities on the following page.

IFS RISK MANAGEMENT TOOLS

Knowing, analysing, and monitoring the risks in your supply chain is a vital part of delivering safe food products. Having an effective and comprehensive risk management system for food safety in place is therefore of high importance for food companies and quality assurance managers.

IFS offers its certified businesses, auditors and consultants various tools that provide information about the latest issues in their markets. This way, they receive an excellent overview of the most important developments that are relevant to them, and it saves them a lot of time. In addition, IFS provides practical guidelines such as the Product Fraud Guideline. These services are all complimentary.

We at IFS help our stakeholders to stay on top of their risk management!

IFS Trend Risk Monitor

This is the homepage of the IFS Database. Here, you find a comprehensive overview of alerts sorted by IFS Product Scopes and hazards.

MORE INFORMATIONS

IFS Trend Risk Report

This monthly report gives an overview of food fraud cases, recalls, news, price developments and other relevant topics.

MORE INFORMATIONS

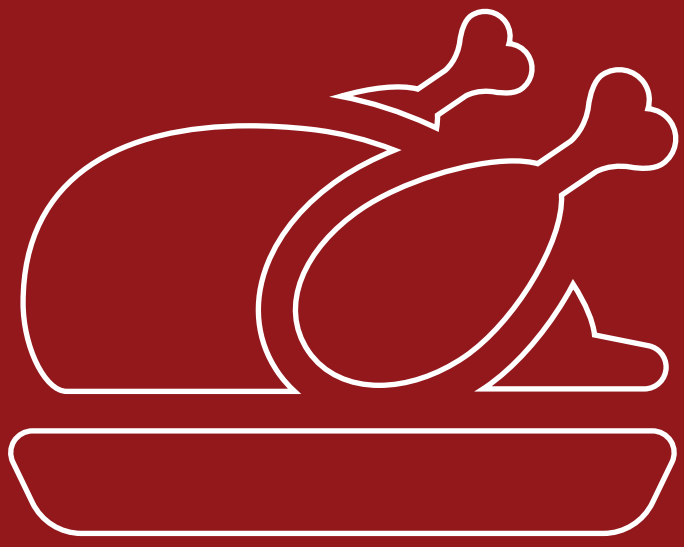
IFS Food Fraud Guideline

The guideline gives practical guidance on how a company can implement the IFS Requirements regarding product fraud.

MORE INFORMATIONS

TABLE OF CONTENT

SCOPE 1



RED AND WHITE MEAT, POULTRY AND MEAT PRODUCTS

IFS FOOD FRAUD FACT SHEET

BEEF

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising the main reasons for food fraud adulteration and the methods to detect it. Also, it informs about the primary beef-producing countries and a historical food fraud case.

MAIN REASONS FOR ADULTERATION

MISLABELLING

It is considered when the adulterant is an expired product, unfit for human consumption or if it is wrongly stated as organic, halal or kosher. It is also included when normal beef is sold as a premium one (beef Kobe or Wagyu).

Examples of media reports:

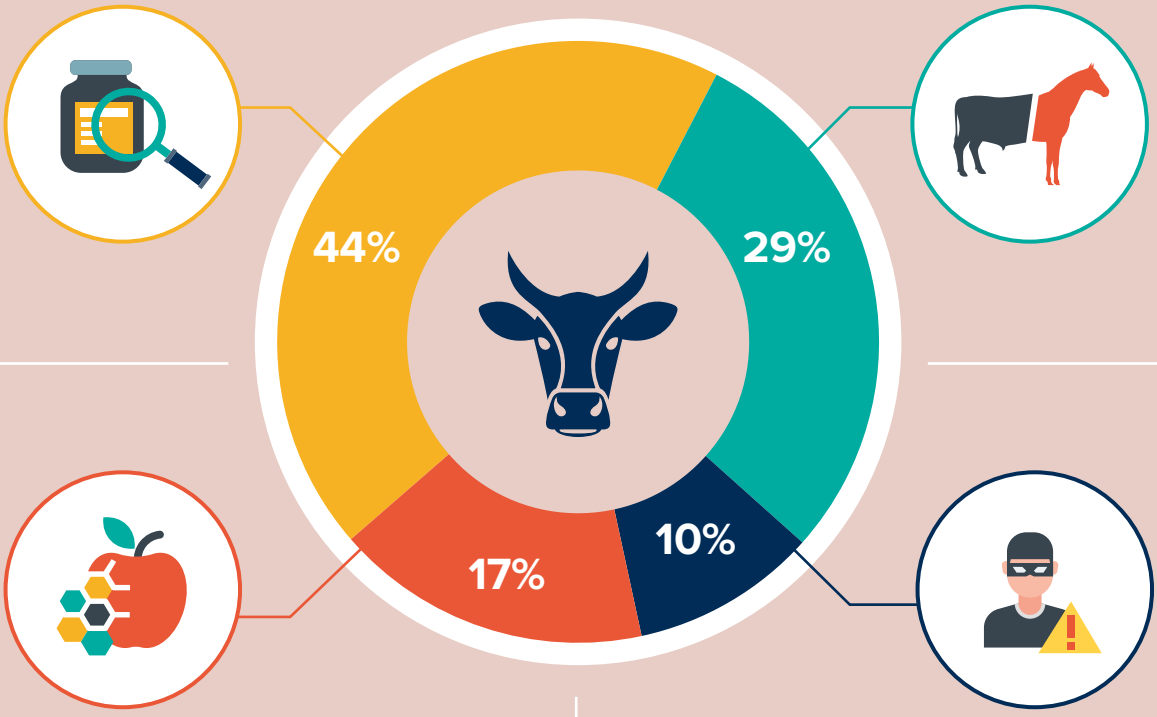
- Flogging cheap foreign meat as Aberdeen Angus (UK, 2019)
- Malaysian cartel allegedly sold fake halal meat to Muslims for 40 years (Malaysia, 2020)
- Selling expired beef to McDonald's, KFC and Pizza Hut (China, 2014)

SUBSTITUTION

Replacing beef or part of beef with another type of meat.

Example of media reports:

- $1million of adulterated meat including whole cow hearts labelled as “ground beef” (USA, 2019)
- Horsemeat Scandal: how horsemeat ended up in beef products (UK, 2013)



CONCEALMENT

Hiding the low quality of food ingredients or products. For instance, adding formaldehyde, bleach or melamine.

Example of media reports:

- Kenyan butchers using toxic chemicals to preserve meat (2018)

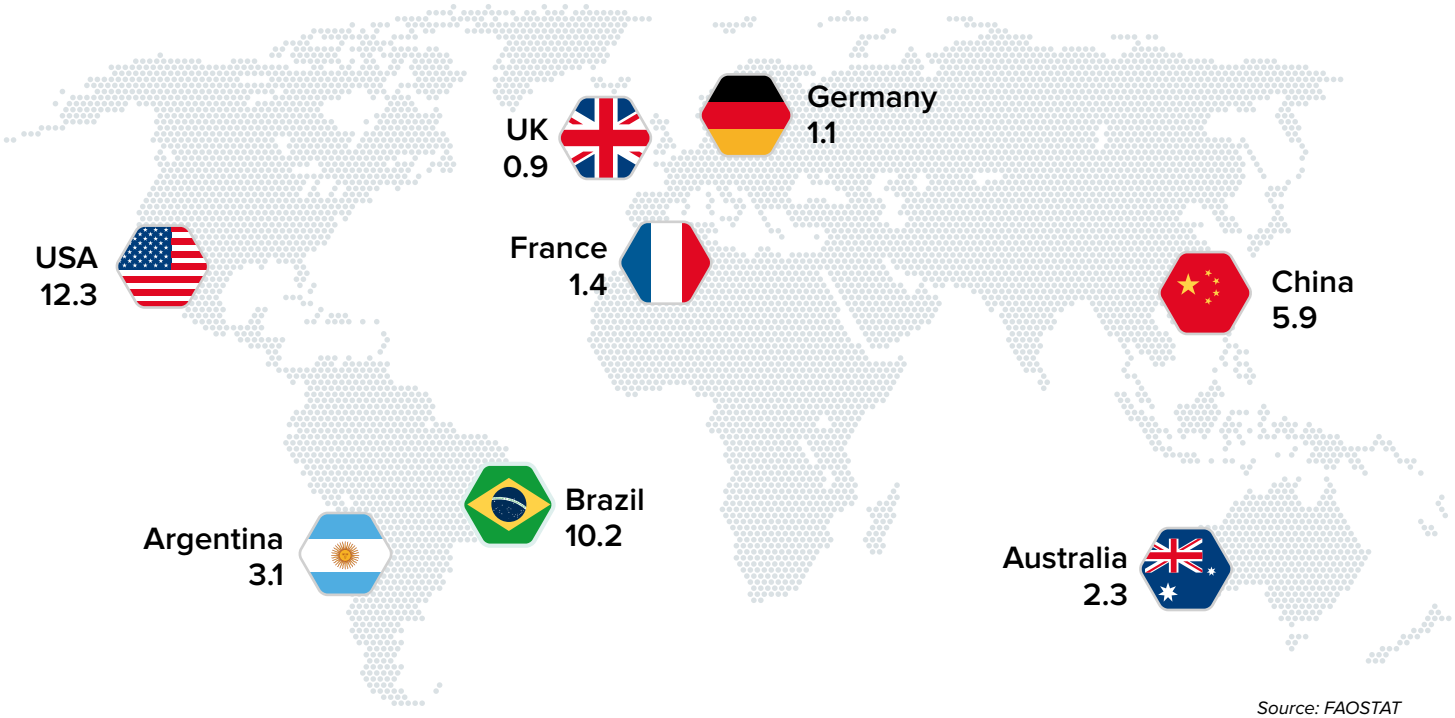
OTHERS

Source: © IFS, media reports from Jan 2000 to May 2021

IFS Scope 1 – Red and white meat, poultry and meat products

MAIN BEEF PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Breed substitution:
- Genetic analysis

Geographical origin:
- Inductively coupled plasma mass spectrometry
- Isotope-ratio mass spectrometry

Fresh/thawed conservation:
- Microscopy

Species substitution:
- Multiplex PCR
- ORBIT (overnight rapid bovine identification test)
- NIR spectroscopy with chemometrics (depend on species)

Addition of nitrites and nitrates, phosphorus and polyphosphates or preservatives:
- Spectroscopic method

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

In 2013, the Food Safety Authority of Ireland identified horse and pig DNA in frozen beef burgers. This resulted in an international scandal as horsemeat was detected in numerous products labeled as beef across several European countries and elsewhere. Among the affected products were frozen meals, frozen lasagna, and frozen beef burgers. The product passed through complex supply chains that involved several countries, but the horsemeat ultimately originated from suppliers in Poland and Romania. Some traders were convicted and the scandal affected consumers' perception of the integrity of the market in general, in particular pre-prepared products containing meat.

Source: FoodIntegrity Handbook, FAIR, Agnoli et al., 2016, Falkheimer & Heide (2015), Tse et al., (2016).

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

PORK

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for pork, and the main pork producers.

MAIN REASONS FOR ADULTERATION

MISLABELLING

It is considered when the adulterant is an expired product, unfit for human consumption or if it is wrongly stated as organic, halal or kosher.

Examples of media reports:

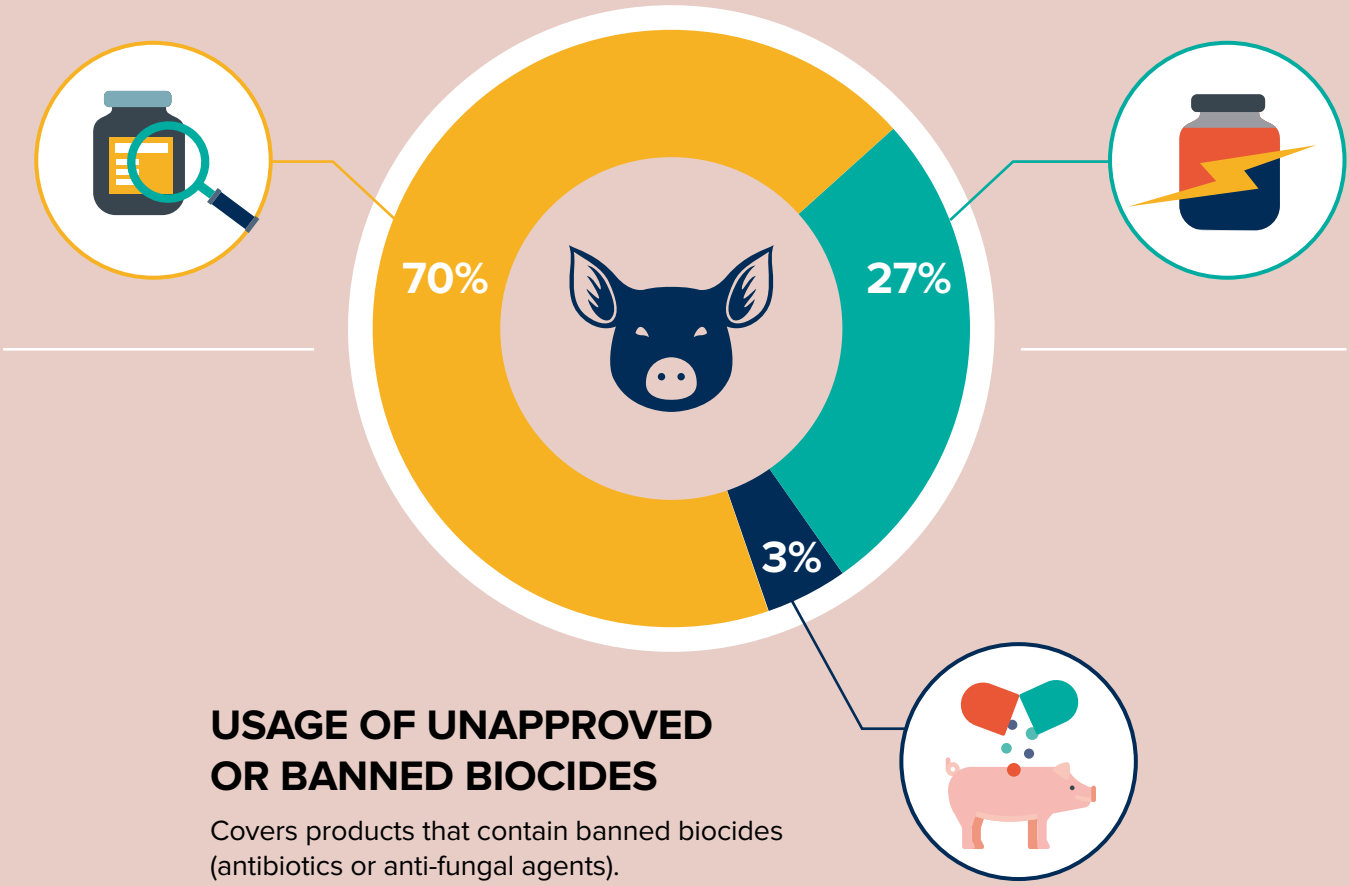
- Pork meat sold as British (UK, 2018)
- Farmer sells conventional pigs as organic (Germany, 2021)

SUBSTITUTION

Replacing pork or part of pork with another type of meat.

Example of media reports:

- Pork sausages substituted with soy protein (Poland, 2019).



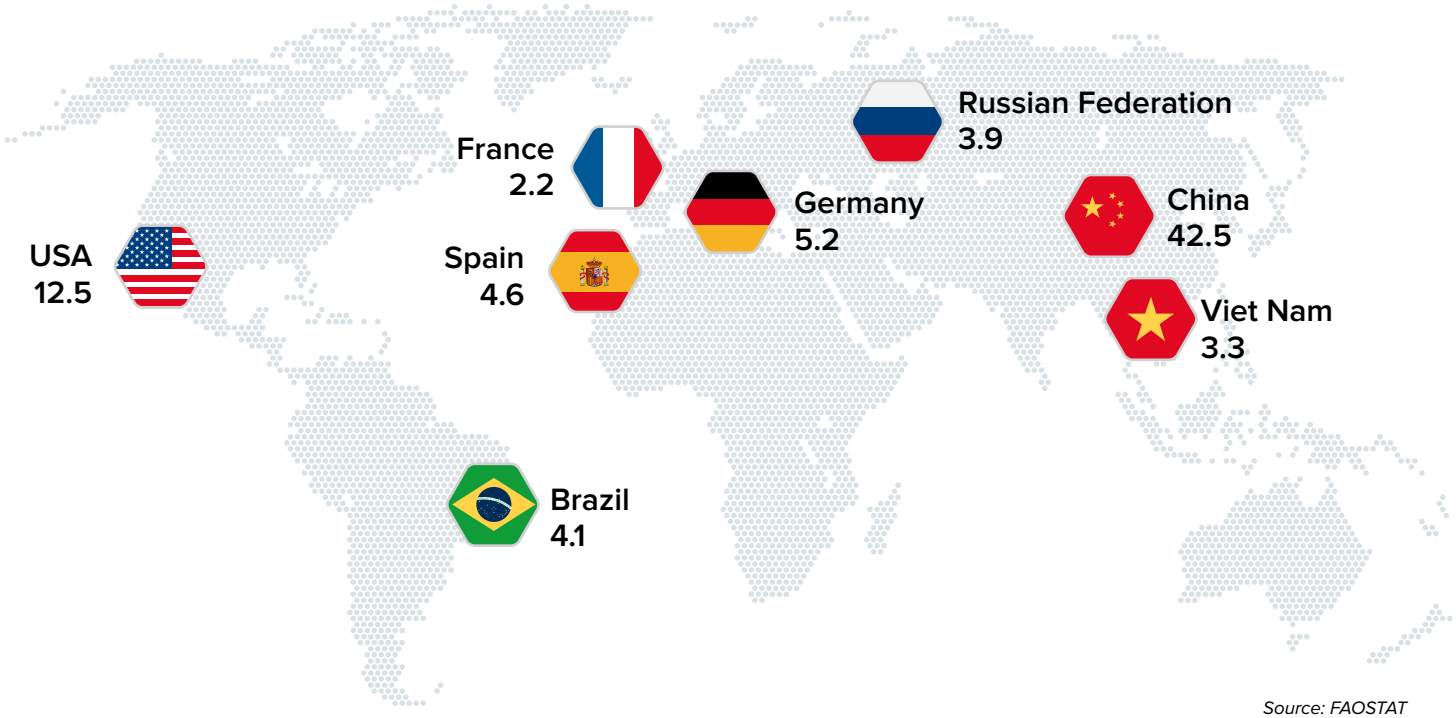
USAGE OF UNAPPROVED OR BANNED BIOCIDES

Covers products that contain banned biocides (antibiotics or anti-fungal agents).

Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN PORK PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Breed substitution:
- Genetic analysis

Geographical origin:
- Inductively coupled plasma mass spectrometry
- Isotope-ratio mass spectrometry

Religious slaughtering:
- No methods

Fresh/thawed conservation:
- Microscopy

Species substitution:
- Multiplex PCR

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

In 2015, Chinese authorities seized more than 100,000 tonnes of smuggled meat, worth 483 million dollars. Parts of it were frozen and dating back to the 1970s. According to official figures, more than a dozen different gangs across the country were involved in the smuggling of the meat, which originated from countries such as Brazil and India. Being part of criminal activities, the meat was not inspected by health officials and therefore could be the transmitter of serious diseases such as bird flu or foot-and-mouth disease. It further posed a risk to the end consumer as it had been frozen and defrosted multiple times during transport and storage.

Source: www.chinadaily.com.cn

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

LAMB

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for lamb, and the main lamb producers.

MAIN REASONS FOR ADULTERATION

SUBSTITUTION

Replacing lamb or part of the lamb with another type of meat.

Example of media reports:

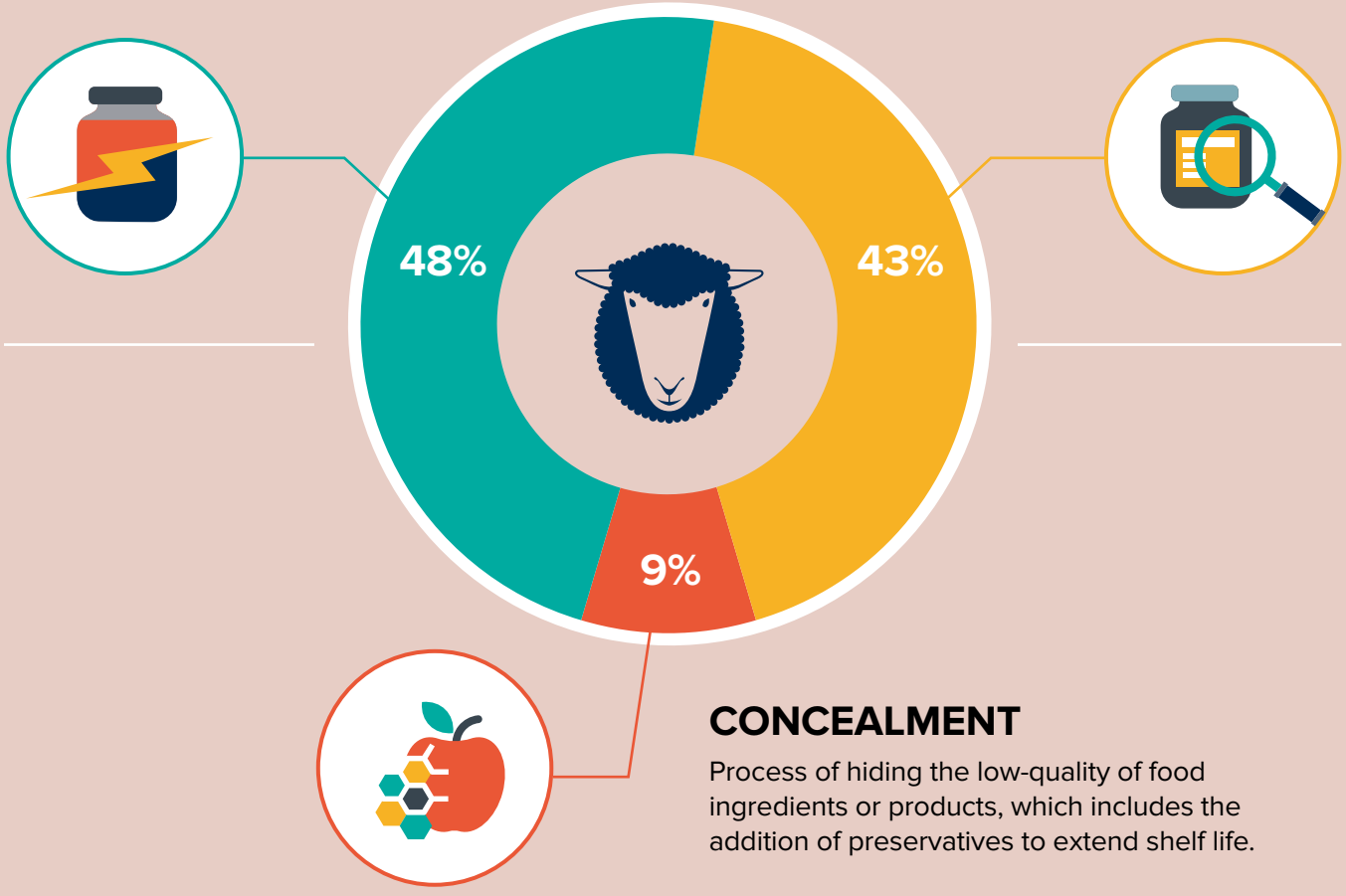
- Supermarket slapped with £20k fine after selling lamb mince substituted with beef (UK, 2016)

MISLABELLING

It is considered when the adulterant is an expired product, unfit for human consumption or if it is wrongly stated as organic, halal or kosher.

Example of media reports:

- Flogging foreign lamb as British one (UK, 2019)



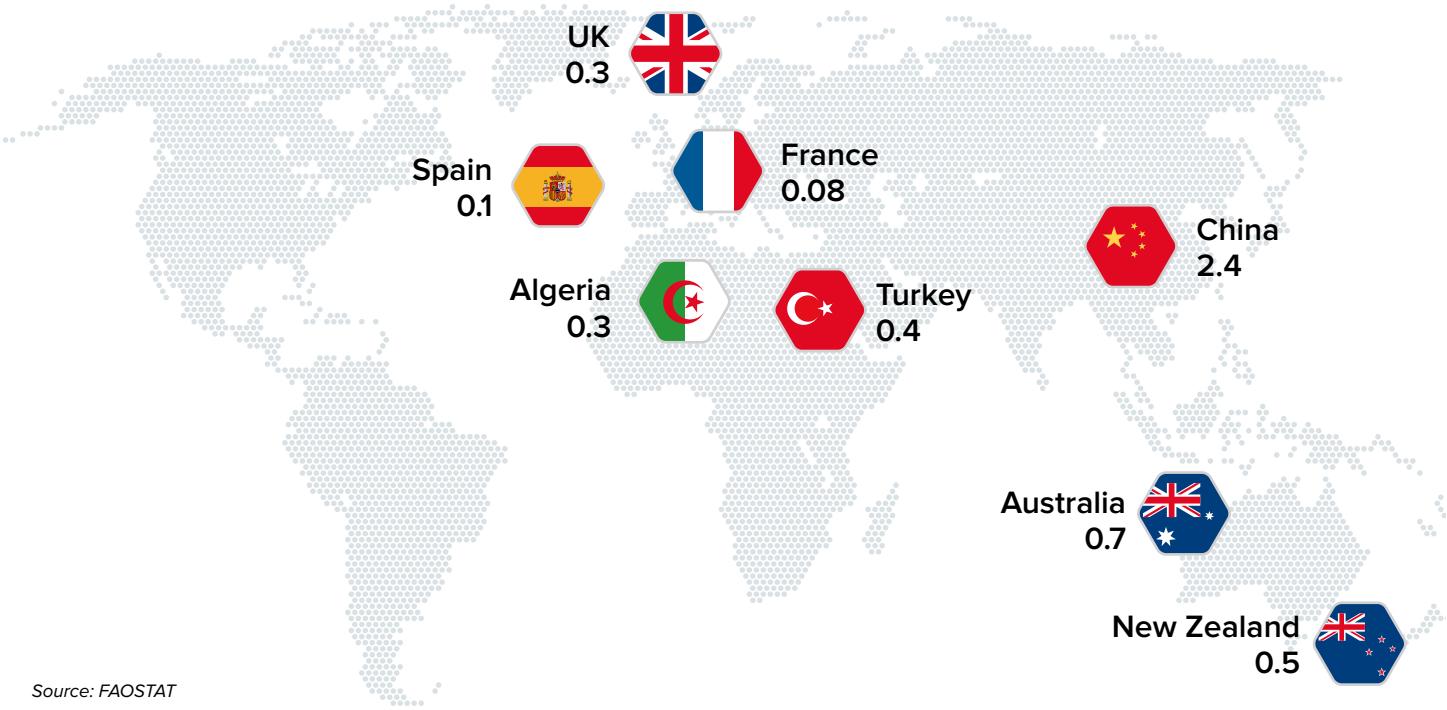
CONCEALMENT

Process of hiding the low-quality of food ingredients or products, which includes the addition of preservatives to extend shelf life.

Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN LAMB PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Breed substitution:
- Genetic analysis

Geographical origin:
- Inductively coupled plasma mass spectrometry
- Isotope-ratio mass spectrometry

Religious slaughtering:
- No methods

Fresh/thawed conservation:
- Microscopy

Species substitution:
- Multiplex PCR

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

Chinese police arrested 904 people for “meat crimes” in 2013, including a gang that sold fake mutton meat, it actually being fox, mink and rat meat. Authorities seized in total 20,000 tonnes of illegal products and solved 382 cases of toxic, diseased and adulterated meat. One suspect bought fox, mink and rat meat, treated it with gelatin, carmine and nitrate, and then sold it as mutton at farmers’ markets in the Jiangsu province and Shanghai. Another suspect from the Fengxiang city in Shaanxi province sold black mutton smelling of agricultural chemicals to a barbecue restaurant last year, killing one customer and poisoning numerous others.

Source: www.theguardian.com

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

CHICKEN

IFS Food

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for chicken, and the main chicken producers.

MAIN REASONS FOR ADULTERATION

MISLABELLING

It is considered when the adulterant is an expired product, unfit for human consumption or if it is wrongly stated as organic, halal or kosher.

Examples of media reports:

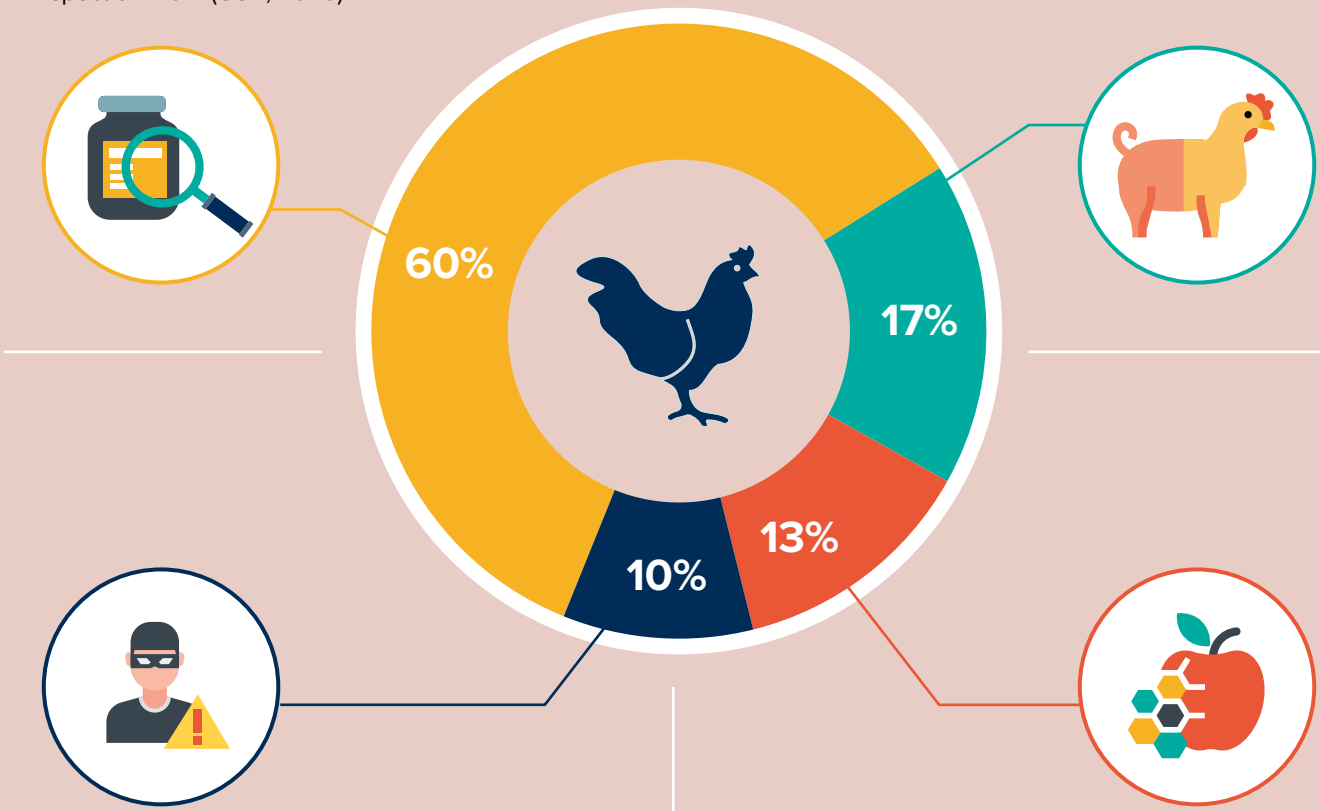
- False origin of chicken meat (UK, 2018)
- 6,000 poultry meat unfit for human consumption (Nigeria, 2020)
- Frozen Chinese chicken with fake USDA inspection mark (USA, 2020)

SUBSTITUTION

Replacing chicken or part of the chicken with another type of meat.

Example of media reports:

- Chicken injected with beef waste sold in the UK (Ireland, 2003).



OTHERS

CONCEALMENT

Hiding the low quality of food ingredients or products. For instance, adding formaldehyde, bleach or melamine.

Example of media reports:

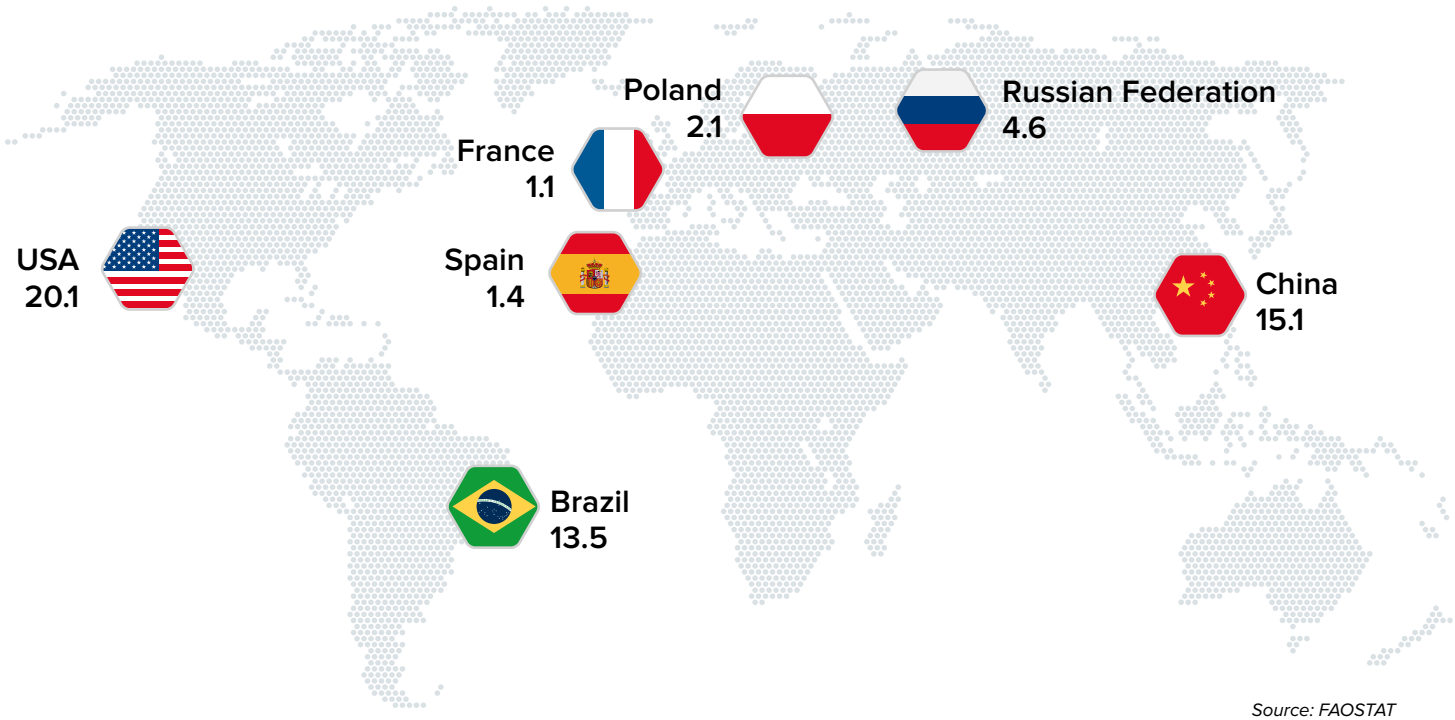
- Chicken offal with formaldehyde (Indonesia, 2016)

Source: © IFS, Analysis of Media Reports from January 2000-2021

IFS Scope 1 – Red and white meat, poultry and meat products

MAIN CHICKEN PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Breed substitution:
- Genetic analysis

Geographical origin:
- Inductively coupled plasma mass spectrometry
- Isotope-ratio mass spectrometry

Fresh/thawed conservation:
- Microscopy

Species substitution:
- Multiplex PCR
- PROFIT (poultry rapid overnight field identification test)
- TaqMan Real-Time PCR (depend on species)

Source: FoodIntegrity Handbook

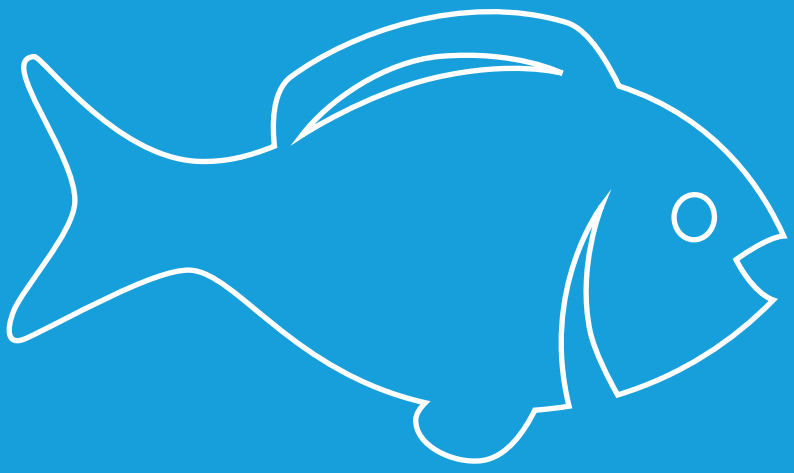
HISTORIC FRAUD CASE

A British meat wholesaler delivered frozen chicken to his customers in 2019, that was “suitable for animal feed only”. The chicken was relabelled to make it appear to be almost two years fresher than it actually was. The company, which claims on its website to supply “major supermarket chains”, was fined £50,000 and ordered to pay £20,000 costs after admitting five allegations under food safety and hygiene regulations.

Source: www.manchestereveningnews.co.uk

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 2



FISH AND FISH PRODUCTS

IFS FOOD FRAUD FACT SHEET

FISH

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for fish in general, the main fish producers and some additional information.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Process of putting false claims on packaging for economic gain. This includes expired products, products unfit for human consumption or if a specific species like Baltic salmon is substituted by normal salmon.

Examples of media reports:

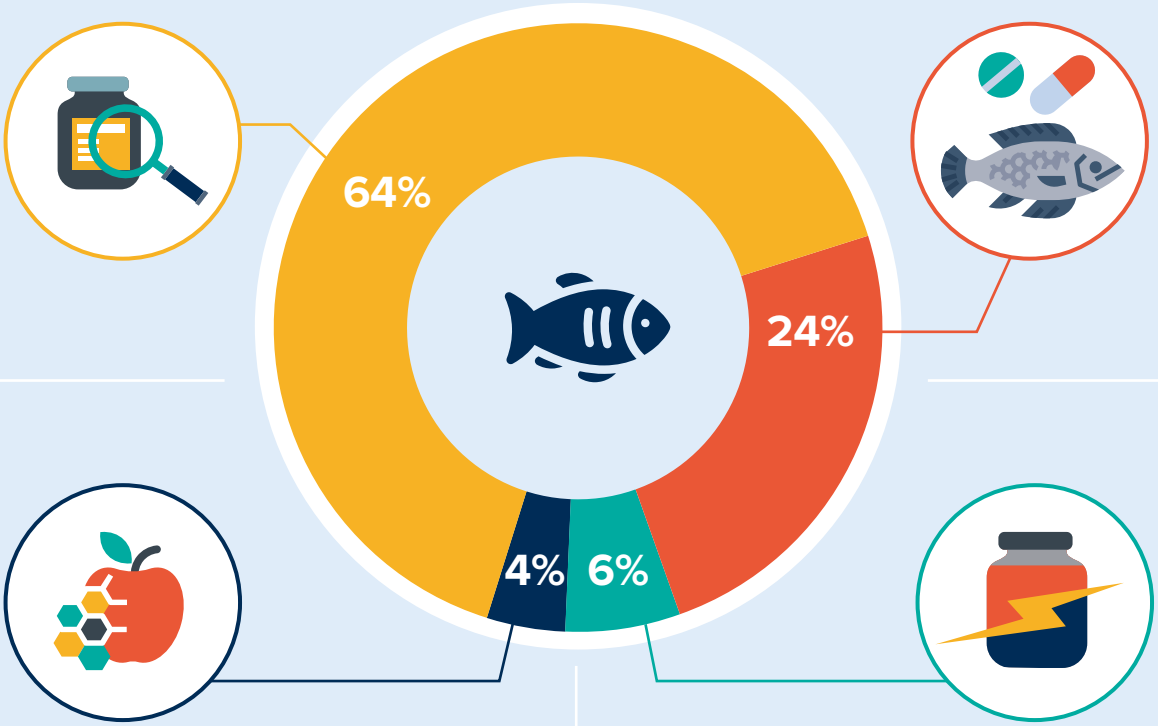
- Selling ling as Atlantic wolffish (Iceland, 2010)
- Mislabelling Scottish salmon as coming from Shetland Products and Fraserburgh Freezing and Cold Storage companies (UK, 2017)

CONCEALMENT

Hiding low-quality of food ingredients or products, which includes the addition of preservatives to extend shelf life.

Example of media reports:

- Around 5,000 kg of fish preserved in formalin (India, 2018)



UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to the fish product to enhance its quality attribute.

Example of media reports:

- Spain seized 45 tonnes of illegally treated tuna (Spain, 2018)
- Almost 80 tons of tuna enhanced with carbon monoxide were seized in Belgian fraud operation (Belgium, 2021)

SUBSTITUTION

Replacing part of the fish, with another nutrient, ingredient, or part of the food.

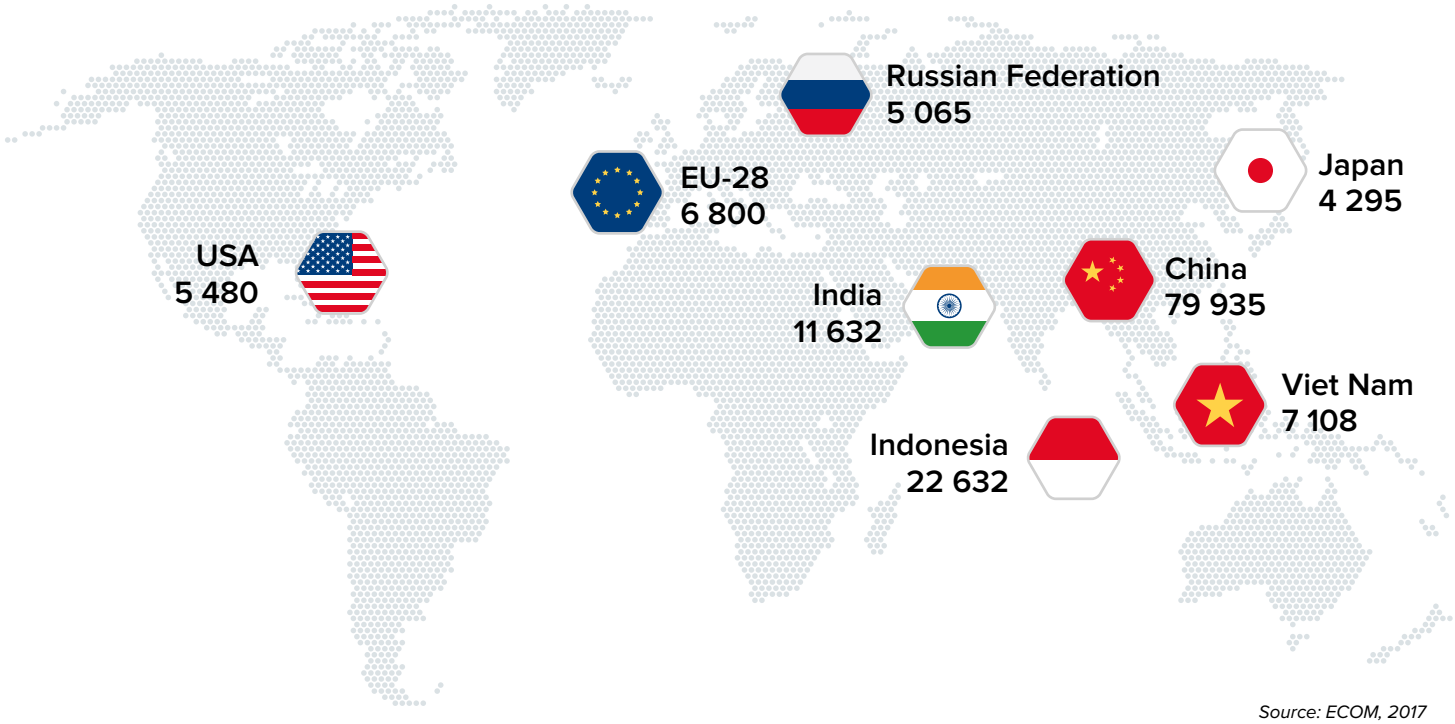
Example of media reports:

- Pollock adulterated with chemicals and water (China, 2017)

Source: © IFS, media reports from Jan 2000 to May 2021

MAIN FISH (GENERAL) PRODUCERS WORLDWIDE (2017)

Total production = catches + aquaculture in volume in 1 000 tonnes live weight



Source: ECOM, 2017

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Species identification:
- Gel electrophoresis, isoelectric focusing, capillary electrophoresis, immunoassay, or multiplex PCR

Discrimination of species:
- DNA mini-barcoding followed by High-Resolution Melting (HRM) analysis

Fresh and frozen fish:
- Front face fluorescence spectroscopy (FFFS)
- NIR spectroscopy, 780-2500 nm, with chemometrics

Geographical origin:
- Isotope ratio mass spectrometry (IRMS)

Differentiation wild and farmed and geographic origin (salmon):
- Stable isotope analysis, gas chromatography/mass spectrometry (GC/MS)

Source: FoodIntegrity Handbook

ADDITIONAL INFORMATION

EUROPOL considers fish the third highest risk category for food fraud. In 2017, Italian and Chinese scientists performed 153 DNA tests on Xue Yu samples (a type of cod) from 30 different brands. Fifty-eight percent of the samples were found to be substituted with other fish species.

(Xiong et al., 2017). FAO

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

SHRIMPS AND SEAFOOD

IFS Food

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for shrimps and seafood, the main shrimps and seafood exporters' countries and some additional information.

MAIN REASONS FOR ADULTERATION

MISLABELLING

It is considered when the adulterant is an expired product, unfit for human consumption or if it is wrongly stated as organic.

Examples of media reports:

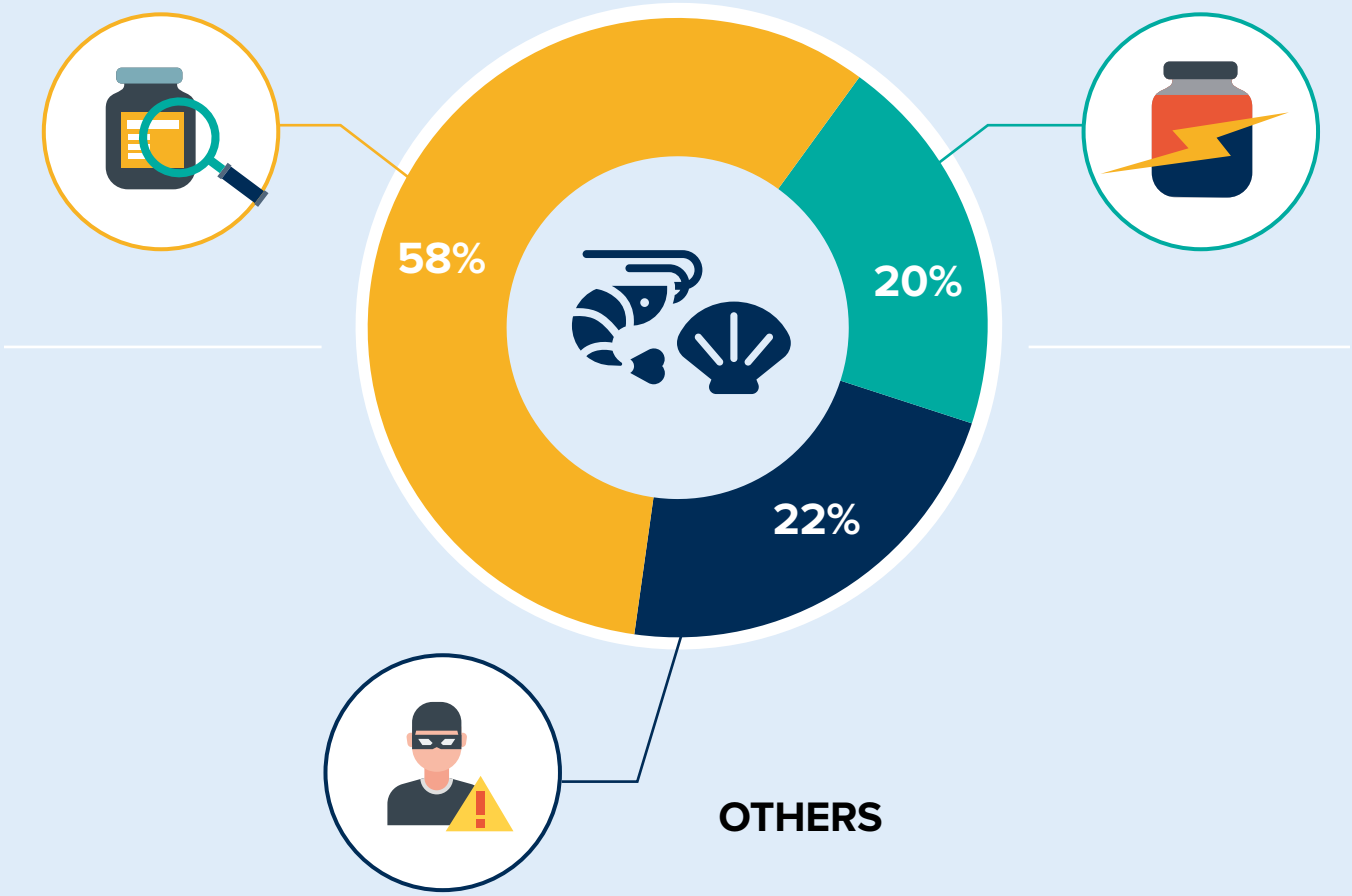
- Expired shrimps (Taiwan, 2017)
- Study finds over a third of seafood products were mislabeled (UK, 2021)

SUBSTITUTION

Replacing shrimps or seafood or part of it with another type of food.

Example of media reports:

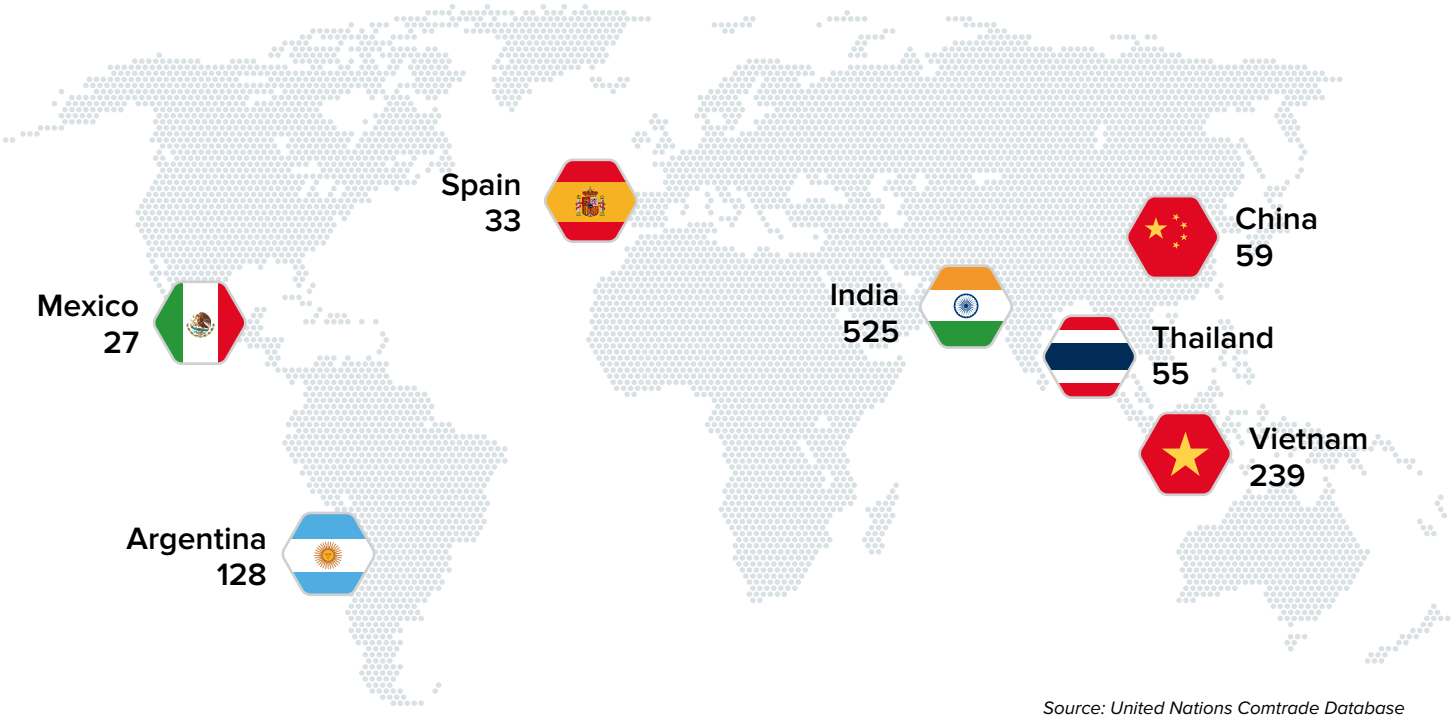
- Shrimps injected with gelatin (China, 2017)



Source: © IFS, Analysis of Media Reports fromJanuary 2000-2021

MAIN SHRIMPS AND SEAFOOD EXPORTERS COUNTRIES (2020)

in million kilograms



Source: United Nations Comtrade Database

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Geographical origin verification:
- Multi-isotope ratio analysis

Geographical origin:
- Inductively coupled plasma mass spectrometry
- Isotope-ratio mass spectrometry

Discrimination of species:
- DNA mini-barcoding followed by High Resolution Melting (HRM) analysis

Authentication of species identity and geographical origin of shrimps:
- High-resolution mass spectrometry-based metabolomics

Production method, geographical origin and species authentication in commercially relevant shrimps:
- Stable isotope ratio and/or multi-element analyses combined with chemometrics

Source: FoodIntegrity Handbook

ADDITIONAL INFORMATION

A growing problem in some countries in Asia and the Pacific is the injection of gel into shrimps to increase their weight and make them look more appealing. The health consequences of such practices are unknown, but because the substances used for injections are not designed for food use, they are likely to be dangerous.

Source: FAO. 2021. Food fraud – Intention, detection and management. Food safety technical toolkit for Asia and the Pacific No. 5. Bangkok

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 3

EGG AND EGG PRODUCTS

IFS FOOD FRAUD FACT SHEET

EGGS

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for eggs, the main eggs producers and a historic fraud case.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Mislabelling has been reported as the main reason for food fraud in shell eggs. This includes expired products labelled with a new use-by-date or conventional eggs being sold as organic or free-range.

Examples of media reports:

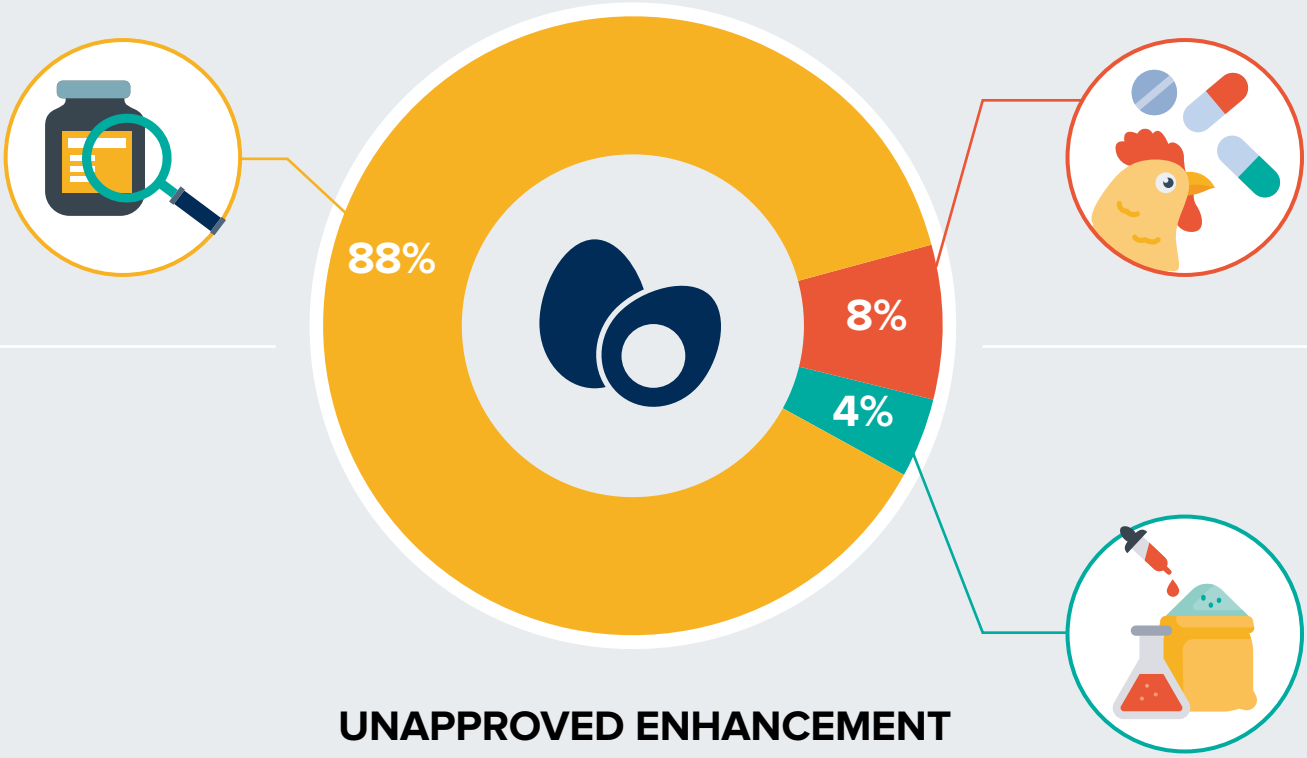
- Fake free-range claim on shell eggs from Portugal (Portugal, 2020)
- Eggs with fipronil and fake free-range label, the Netherlands (NL, 2019)

USAGE OF UNAPPROVED OR BANNED BIOCIDES

Covers products that contain banned biocides (antibiotics, or anti-fungal agents).

Examples of media reports:

- Eggs contaminated with pesticide fipronil sold as fit for human consumption (NL, 2019) (UK, 2017)



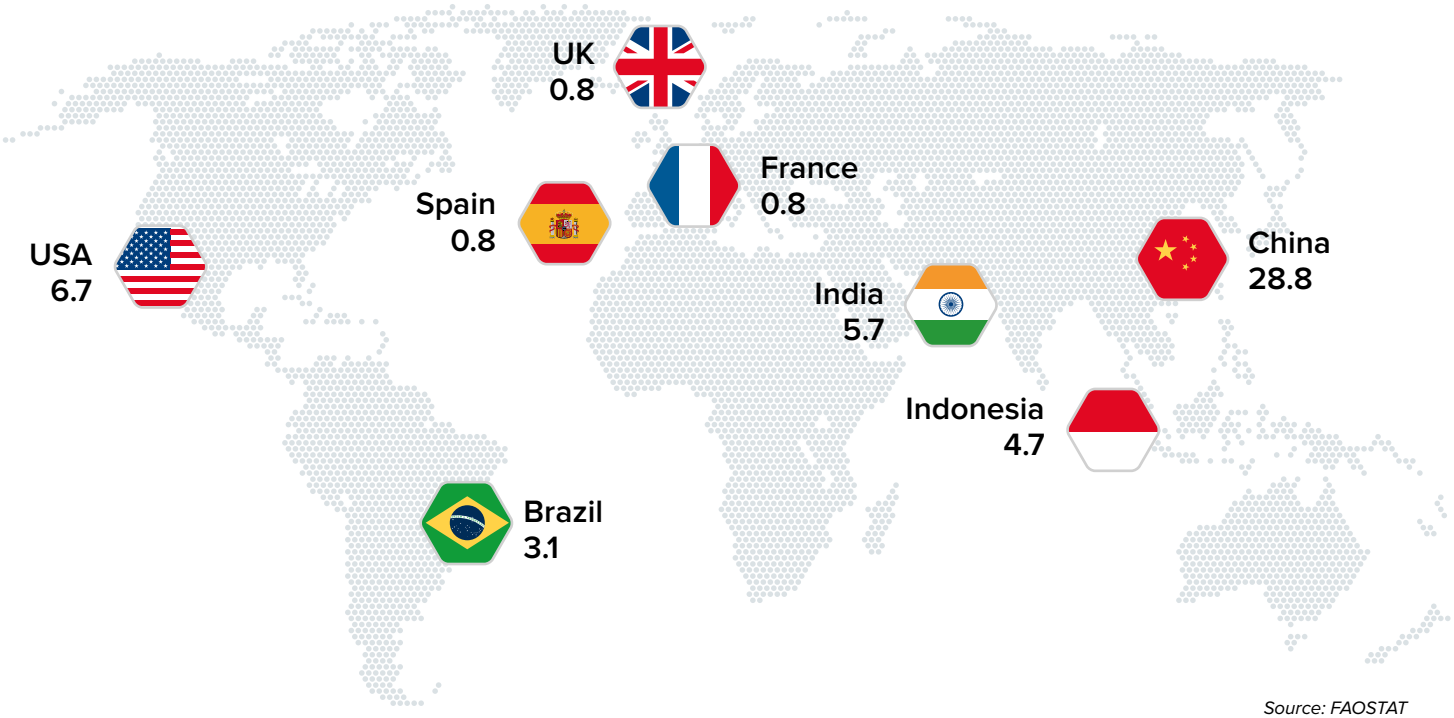
UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to eggs/egg products to enhance their quality attributes.

Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN EGGS PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Differentiation organic vs conventional:

- HPLC-PDA for carotenoid fingerprinting with chemometrics

Eggs laid in a caged regimen vs eggs laid by free-range hens:

- Nitrogen isotope composition of chicken eggs, measured with IRMS techniques

Dyes addition:

- UHPLC-MS/MS analysis

Rapid method for detecting fipronil on egg shells and in liquid eggs:

- Raman microscopy

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

The European Commission was informed on 20 July 2017 about the identification of eggs contaminated with fipronil in Belgium. Since then, similar contamination was found in other European countries. Fipronil is an acaricide not allowed in Europe for use as a veterinary medicinal product on food-producing animals. Therefore, the contamination with this substance results from its illegal use on laying hens and their farms.

Source: European Food Safety Authority (EFSA), Reich, H., & Triacchini, G. A. (2018). Occurrence of residues of fipronil and other acaricides in chicken eggs and poultry muscle/fat. EFSA Journal, 16(5), e05164

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 4

DAIRY PRODUCTS

IFS FOOD FRAUD FACT SHEET

MILK (COW)

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for cow milk, and the main milk producers.

MAIN REASONS FOR ADULTERATION

DILUTION

Mixing a liquid ingredient of high value with a liquid of lower value.

Examples of media reports:

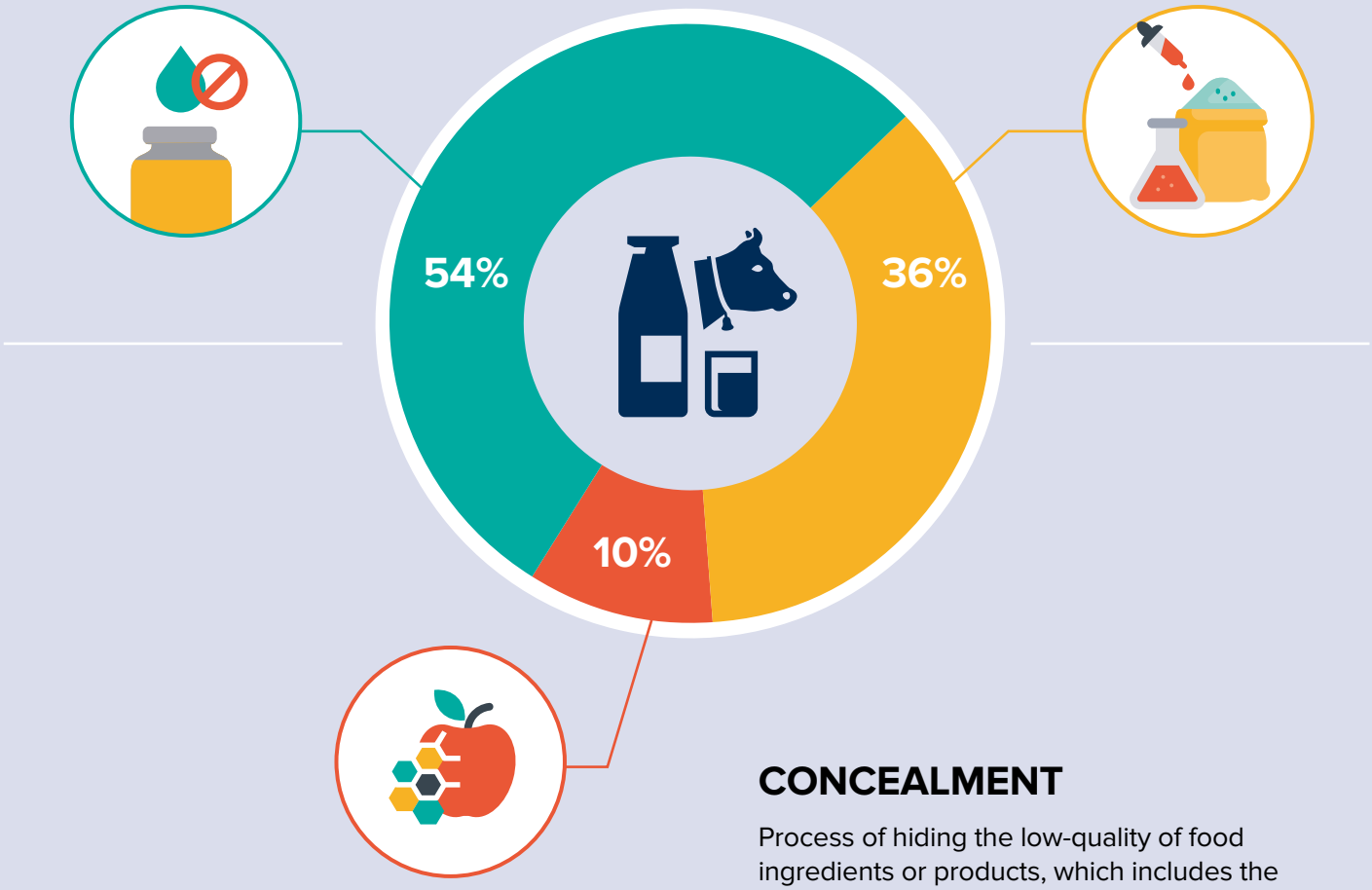
- 20,000 litres of synthetic milk adulterated with detergent, chemicals and palm oil (India, 2019)
- Highly toxic synthetic milk sold as branded Milk (India, 2019)

UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to milk to enhance its quality attributes.

Examples of media reports:

- Milk adulterated with formaldehyde, urea, hydrogen peroxide (Kenya, 2014)



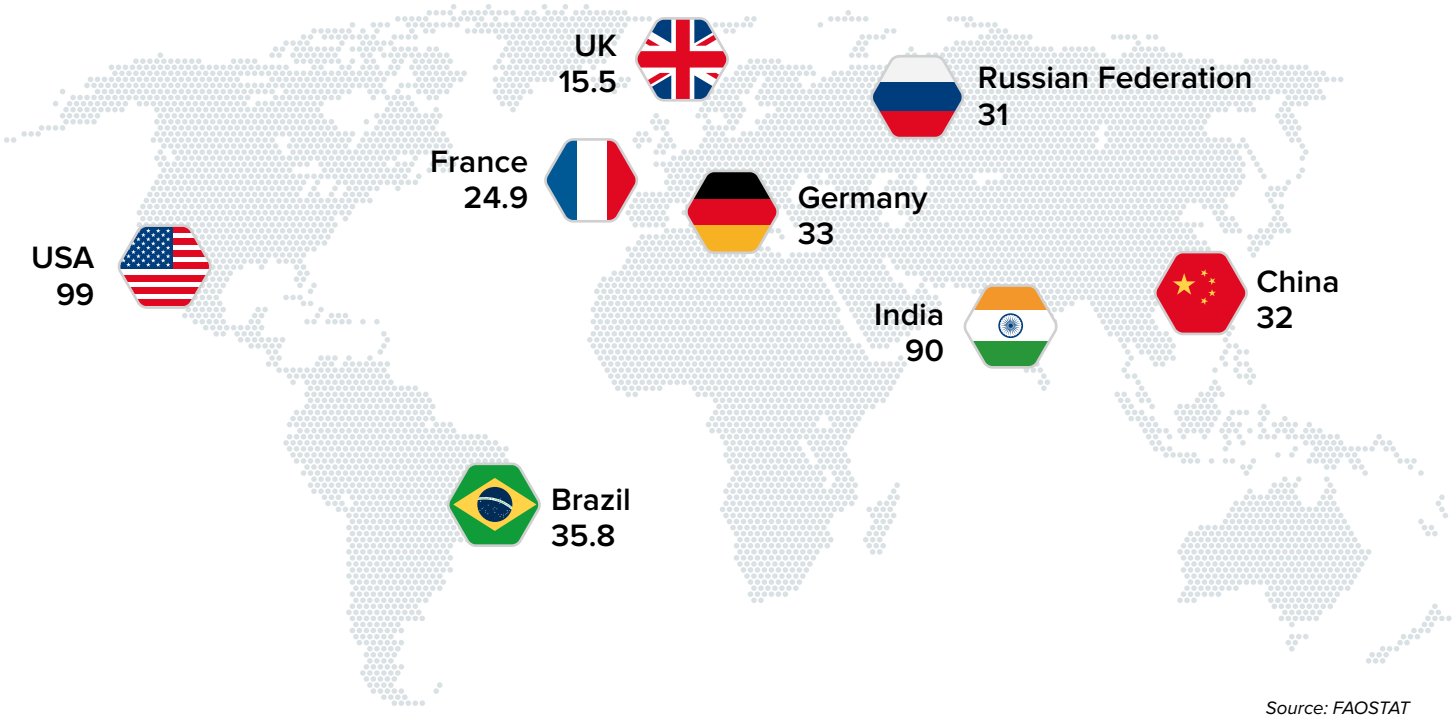
CONCEALMENT

Process of hiding the low-quality of food ingredients or products, which includes the addition of preservatives to extend shelf life.

Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN MILK (COW) PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Addition of water; melamine; addition of vegetable lipid or proteins; adulteration (non-targeted approach):

- Spectroscopy

Addition of non-food nitrogenous compound:

- LC-MS/MS

Adulteration regarding species origin; assessing freshness; addition of foreign proteins:

- Mass spectrometry (LC-MS and MALDI-TOF-MS)

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

As part of a 2020 government operation to control adulterated milk being placed on the market, the Punjab Food Authority (PFA) teams disposed of nearly 80,000 litres of chemically contaminated milk. Urea and water were added to the milk, evidence being obtained on the basis of lactometer readings. In total, the PFA teams inspected over 400,000 litres of milk loaded on 272 milk delivery trucks.

Source: www.urdupoint.com

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

CHEESE

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for cheese, the main cheese producers from different types of milk and additional information about mozzarella cheese.

MAIN REASONS FOR ADULTERATION

SUBSTITUTION

Process of replacing a nutrient, an ingredient or part of the cheese with another nutrient, ingredient, or part of the food.

Examples of media reports:

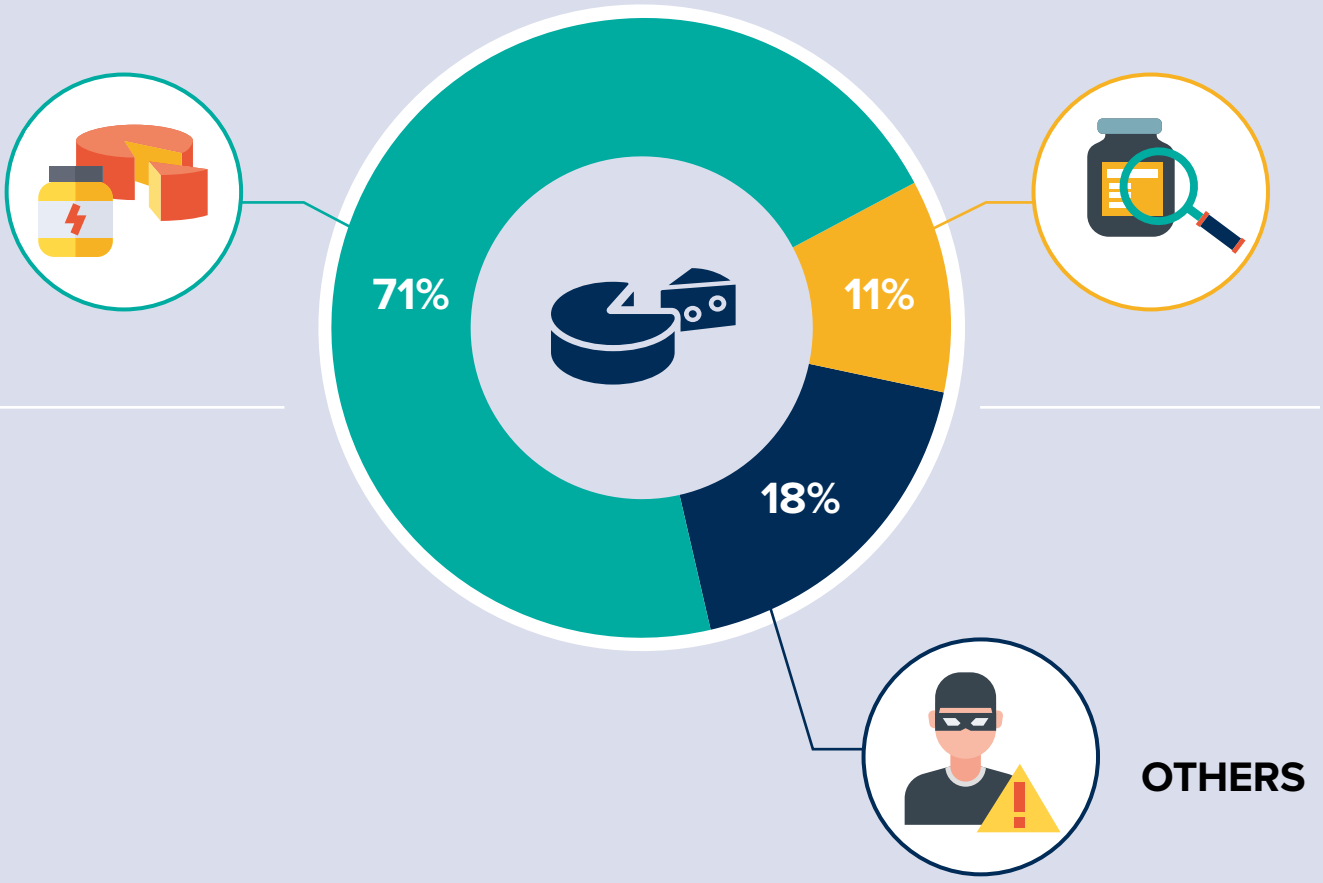
- 2,000 kg spurious paneer adulterated with sulfuric acid, skim milk powder (India, 2018)

MISLABELLING

Process of putting false claims on packaging for economic gain. This includes expired products or products unfit for human consumption.

Examples of media reports:

- Adulterated mozzarella claimed to be 100% buffalo milk (Spain, 2020)
- Criminal charges laid over fake kosher cheese (Canada, 2017)



Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN CHEESE PRODUCERS WORLDWIDE (2018)

in tonnes

C Cow milk cheese B Buffalo milk cheese S Sheep milk cheese G Goat milk cheese

Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Bovine milk in sheep, goat and buffalo cheese:

- Isoelectric focusing

Raw bovine milk in sheep´s and goat´s cheese:

- ELISA

Mozzarella:

- PCR or real-time PCR assays with TaqMan

Source: FoodIntegrity Handbook

ADDITIONAL INFORMATION

Mozzarella di Bufala Campana cheese is prone to fraud because of its specialty consideration and higher price. Therefore, the use of cow milk instead of buffalo milk is a common type of fraud. Another type of adulteration that can occur is the use of frozen curd or frozen milk (which is prohibited), as the mozzarella is more often consumed in summer but the production of water buffalo milk reaches its peak in winter.

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

MILK POWDERS AND INFANT FORMULAS

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for milk powders and infant formulas, the main fresh cow milk producers and a historic fraud case.

MAIN REASONS FOR ADULTERATION

MISLABELLING

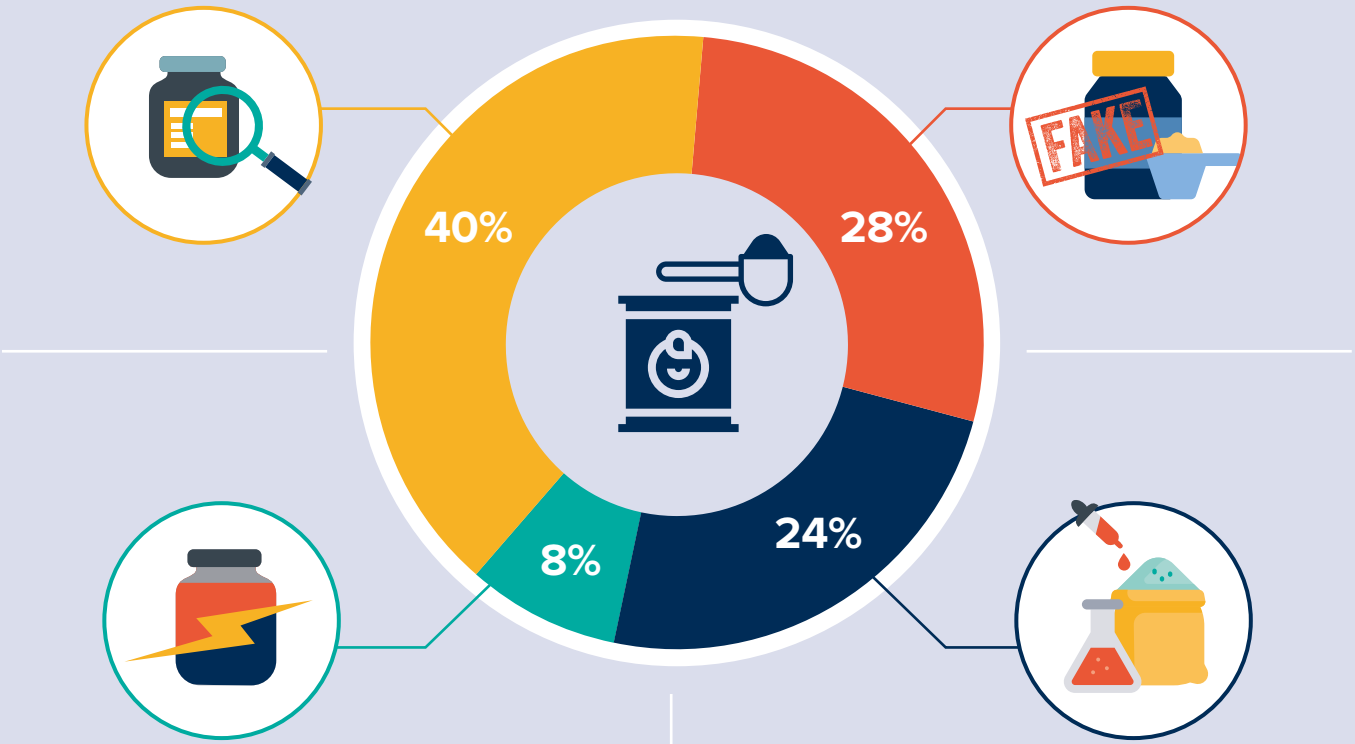
Process of putting false claims on packaging for economic gain. This includes expired products or unfit for human consumption.

Examples of media reports:
- Non-instant milk powder sold as instant (Brazil, 2018)

COUNTERFEIT

Copying the brand name, packaging concept, recipe, processing method, etc. of food products for economic gain.

Example of media reports:
- Infant formula counterfeited (China, 2016)



SUBSTITUTION

Process of replacing a nutrient, an ingredient or food with another nutrient, ingredient or food of a lower quality or value.

UNAPPROVED ENHANCEMENT

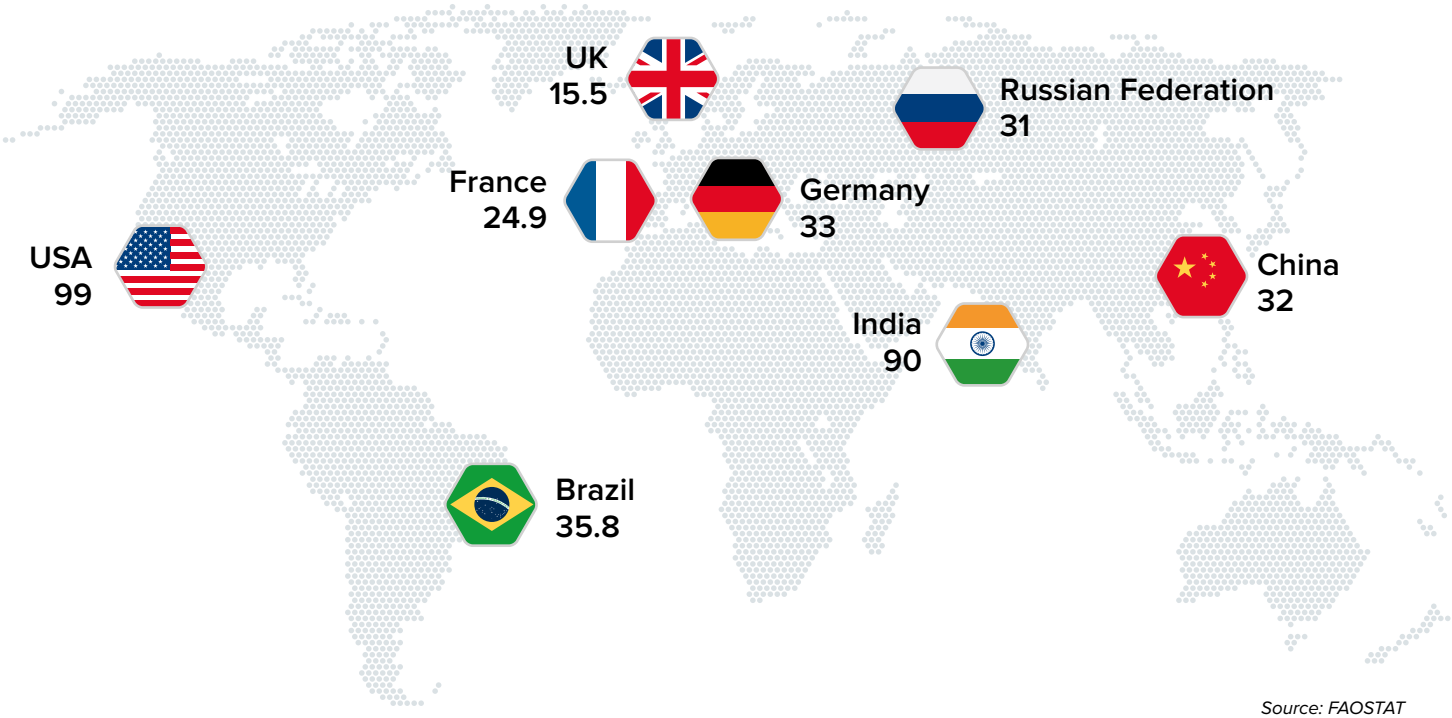
Process of adding unknown and undeclared compounds to food products to enhance their quality attributes.

Example of media reports:
- 26 tons of melamine-tainted milk (China, 2016)

Source: © IFS, media reports from Jan 2000 to May 2021

MAIN (COW) MILK PRODUCERS WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Species identification:

- NIR, FTIR-ATR, FTIR-DRIFT

Vegetable proteins (soybean):

- ELISA

Addition of water; melamine; addition of vegetable lipid or proteins; adulteration (non-targeted approach):

- Spectroscopy

Source: FoodIntegrity Handbook; Mauer et al., 2009 and Sun et al., 2010

HISTORIC FRAUD CASE

Melamine (2,4,6-triamino-1,3,5-triazine) is a nitrogenous heterocyclic compound commonly used to increase the apparent protein content of powdered milk. In 2008, melamine was detected in the infant formula of 22 Chinese dairy companies with the consequence of 294 000 affected babies, 50 000 of them hospitalized and 6 confirmed deaths.

Source: FoodIntegrity Handbook

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 5

FRUIT AND VEGETABLES

IFS FOOD FRAUD FACT SHEET

FRUIT AND VEGETABLES

IFS Food

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, and the main methods of fraud analysis for fruit and vegetables.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expired products with a new use-by-date, products that are unfit for human consumption or products falsely presented as organic.

Examples of media reports:

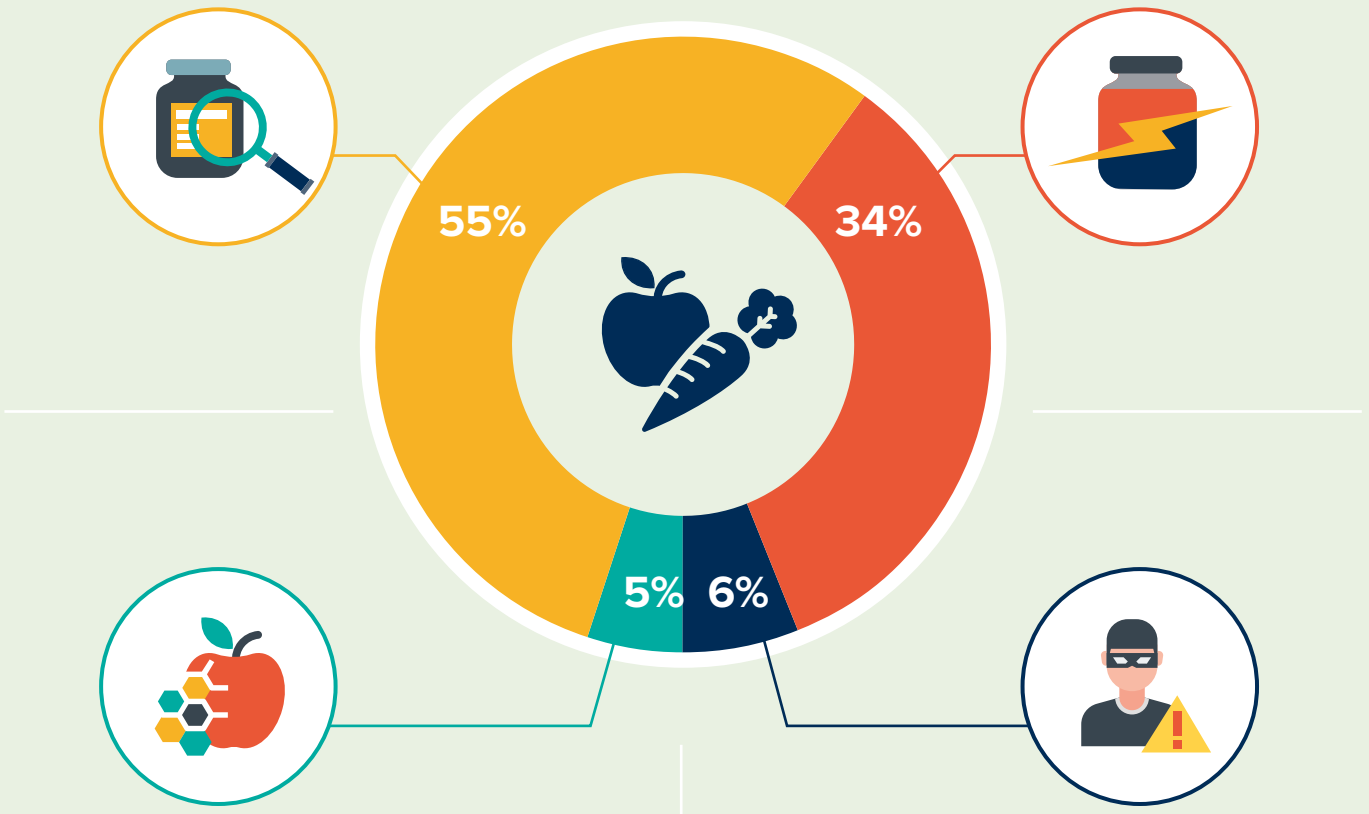
- 162 tonnes of Polish mushrooms were sold as entirely French production (France, 2017-2018)
- Non-organic apples sold as organic (Moldova, 2020)

UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to food products to enhance their quality attributes; such as calcium carbide.

Example of media reports:

- Bean sprouts enhanced with urea , 6-benzylaminopurine and nitrite (China, 2011)
- 500 kg of mango unapproved enhanced with Calcium Carbide (India, 2018)



SUBSTITUTION

Process of replacing a nutrient, an ingredient or food with another nutrient, ingredient or food of a lower quality or value.

OTHERS

Source: © IFS, media reports from Jan 2000 to May 2021

EXAMPLES OF FRUIT AND VEGETABLE PRODUCERS WORLDWIDE (2019)

in million tonnes

Av Avocado To Tomatoes Ba Bananas Ch Cherries Ca Carrots and turnips

Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Discrimination of origin:

- Elemental fingerprinting analysis

Vegetable proteins (soybean):

- IRMS 1H NMR

Sources: Hong et al., 2017 and Danezis et al., 2016

ADDITIONAL INFORMATION

Fresh produce fraud can occur in a number of ways, such as fraudulent organic certification, fake brands, false geographical indications and the use of unauthorised ripening agents. As most fresh produce is visually recognisable, it is often not possible to partially dilute it or replace it with a cheaper substance. Fruit and vegetable fraud usually relates to information about production methods, origin or brand names. In some parts of the world, unauthorised substances can be used to speed up or promote ripening or to make fruit more visually appealing. In 2019, a Canadian company was sued for mislabelling broccoli grown in California as “Canadian product”. In 2018, officials seized 500 kilograms of mangoes from a market in Pondicherry, India, for using calcium carbide as a ripening agent.

Source: foodsafetytech.com

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

NUTS

IFS Food

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for nuts and a historic fraud case.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expired products with a new use-by-date, products that are unfit for human consumption or products falsely presented as organic.

Examples of media reports:

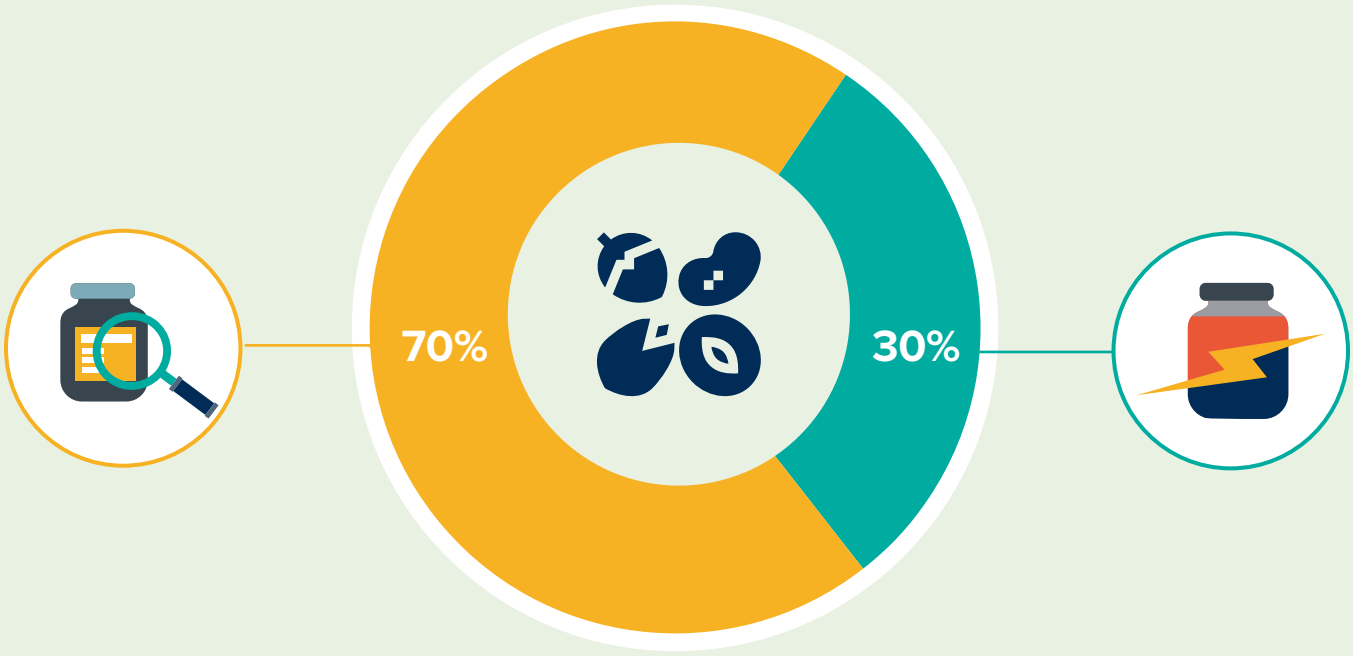
- Expired nuts sold as organic food (Taiwan, 2017)
- Fake organic pistachios worth over 6 million Euros sold in Spain & France (Spain, 2021)

SUBSTITUTION

Process of replacing nuts or part of the nuts with another nutrient, ingredient, or part of the food.

Example of media reports:

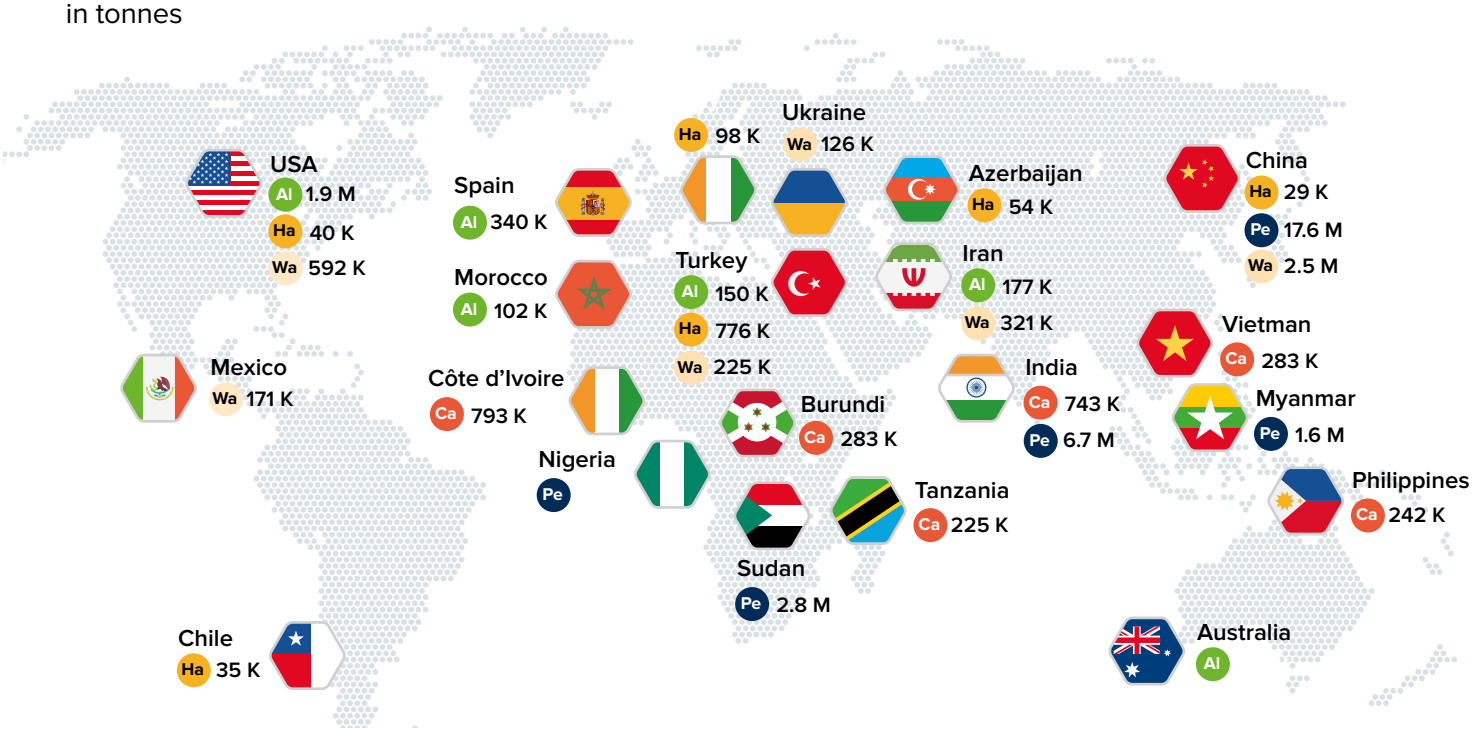
- Undeclared peanuts, cashew nuts and almonds in hazelnut products (Germany, 2017) (EU, 2017)



Source: © IFS, media reports from Jan 2000 to May 2021

MAIN NUT AND ALMOND PRODUCERS WORLDWIDE (2019)

in tonnes



Al Almonds Ca Cashew nuts, with shell Ha Hazelnuts Pe Peanuts Wa Walnuts

Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Geographical origin:
- Gas chromatography

Species identification:
- PCR

Hazelnut allergen:
- TaqMan real-time PCR

Source: FoodIntegrity Handbook

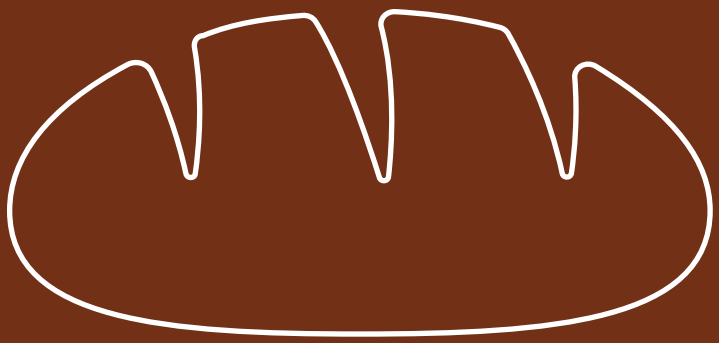
HISTORIC FRAUD CASE

In 2009, the Peanut Corporation of America shipped products before microbiological testing results were received. When results showed positive results for Salmonella, they did not notify customers. Moreover, other products were adulterated with dust and rat excrement, but were shipped anyway. Consequently, there were 714 officially recognized cases of Salmonella Typhimurium infections in the United States and 9 people died. The CDC stated that 20,000 people might have been sickened by the contaminated peanut butter but did not report about their sickness. Stewart Parnell, former CEO of the corporation, was sentenced and was the first federal food safety felony conviction in US history.

Source: FSN Food Safety News

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 6



GRAIN PRODUCTS, CEREALS, INDUSTRIAL BAKERY AND PASTRY, CONFECTIONARY, SNACK

IFS FOOD FRAUD FACT SHEET

HONEY

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for honey, and the main honey producers.

MAIN REASONS FOR ADULTERATION

DILUTION

Mixing honey with an ingredient of lower value, which in most cases is syrup.

Examples of media reports:

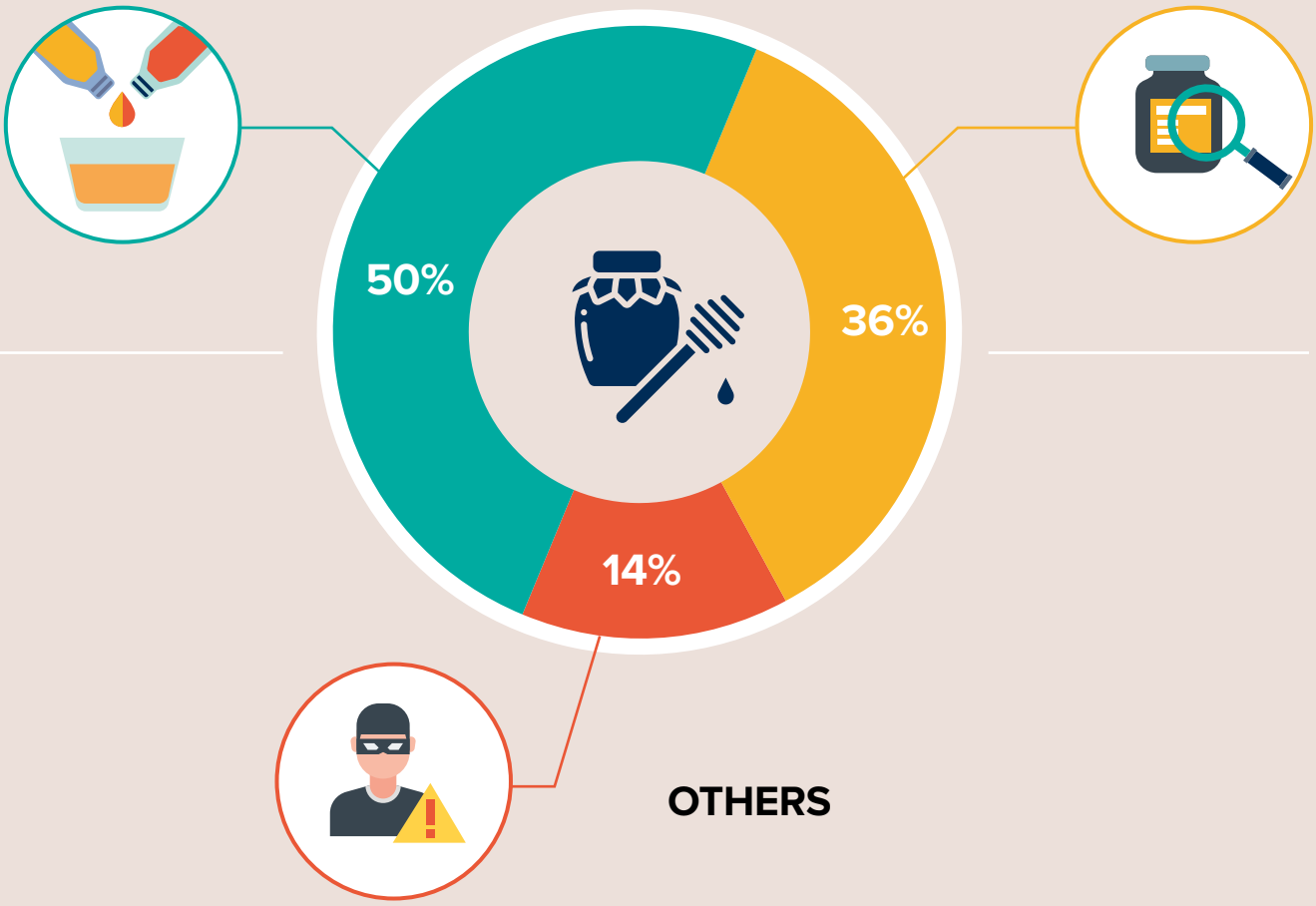
- Honey adulterated with syrup (Greece, 2020)
- Acacia honey mixed with other wildflower honey (Italy, 2017)

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expiry date modifications, false origin claims or false organic claims.

Examples of media reports:

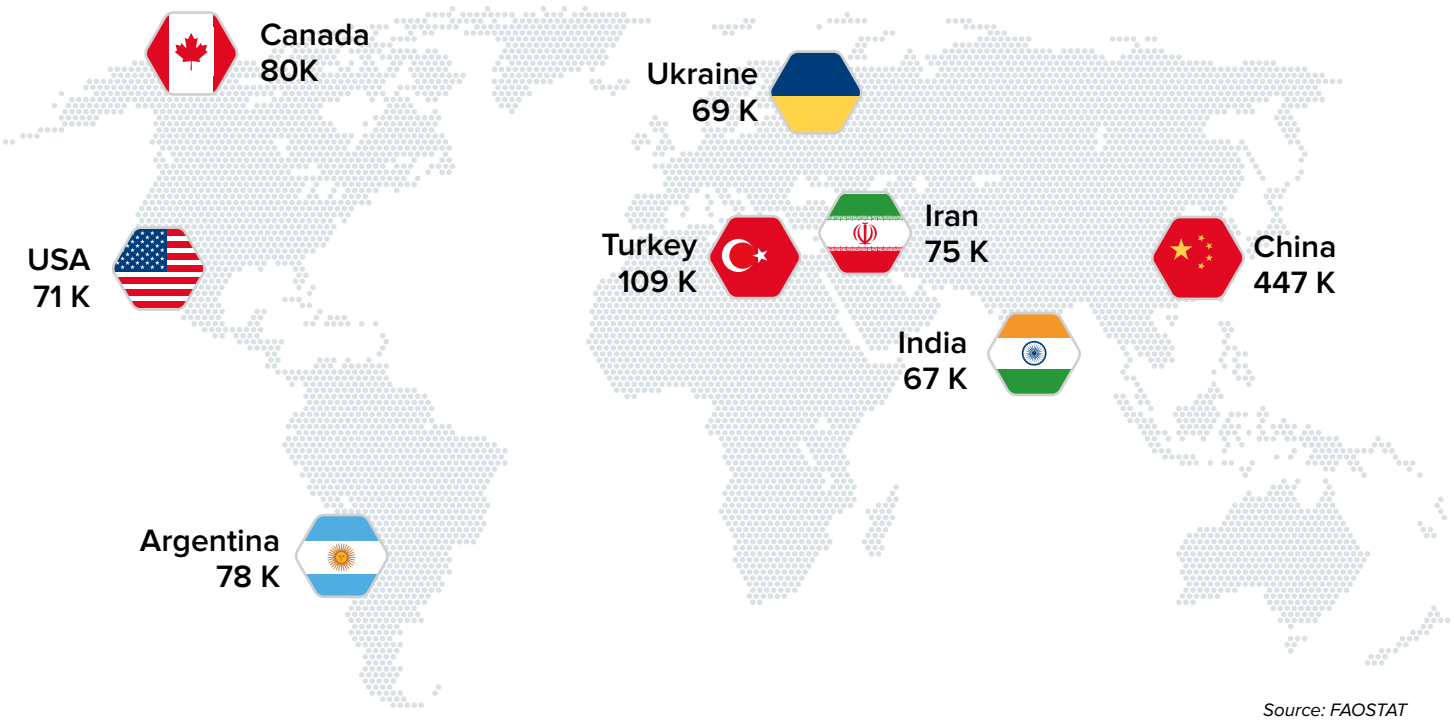
- Honey was not fit for human consumption (Italy, 2020)



Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN HONEY PRODUCERS WORLDWIDE (2019)

in tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Botanical and geographical source:
- Microscopy

Compliance with regulated limits:
- Refractometry

Sugar profile, detects abnormal sugar profile:
- HPLC, GC

Syrup additions, quality deviations, mannose, botanical/geographical origin:
- 1 H-NMR

Geographical origin and detection of C4 sugar addition:
- EA-IRMS

Addition of dyes or colourings:
- LC-MS

Click **here** for the harmonized methods of analysis from the International Honey Commission

Source: FoodIntegrity Handbook

ADDITIONAL INFORMATION

In the honey market, a common fraud is the adulteration of the product with foreign sugars, as elaborated in the article of Zhou et al. (2018). Manuka honey from New Zealand has antiseptic properties unlike other types of honey. This special quality attribute and the production of it being very small (1,700 tons per year), makes the product vulnerable to fraud. To try to overcome the problem, the New Zealand Ministry for Primary Industries published a document with the five attributes of Manuka honey that can be detected by liquid chromatography and real-time PCR.

Source: Zhou et al. (2018), Wu, L. et al. (2017) and FoodIntegrity Handbook

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

RICE

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for rice and the main rice producers.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expiry date modifications, false origin claims or false organic claims.

Examples of media reports:

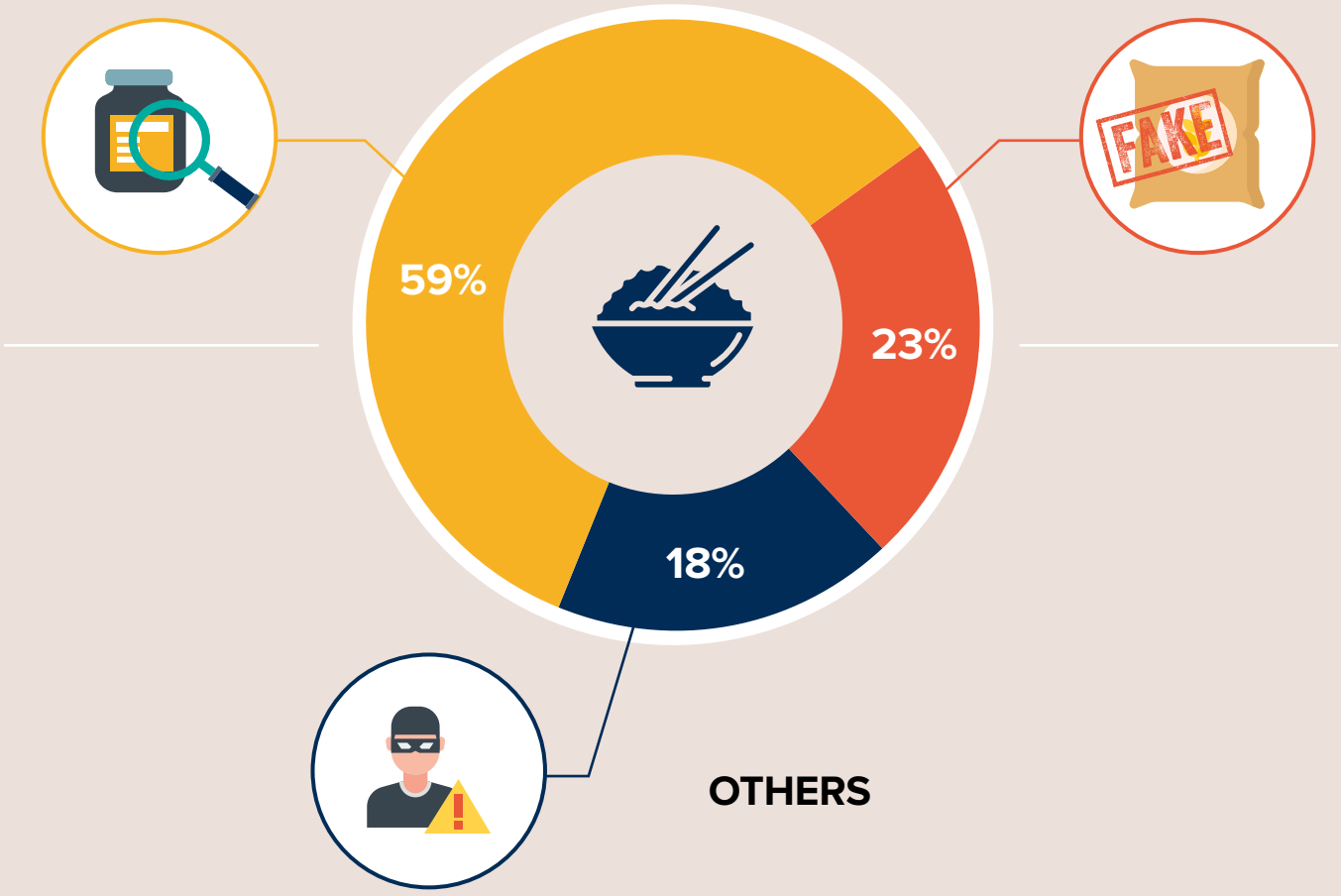
- 19,000 kilograms of rice not for human consumption (Sri Lanka, 2020)

COUNTERFEIT

Copying the brand name, packaging concept, recipe, processing method, etc. of food products for economic gain.

Examples of media reports:

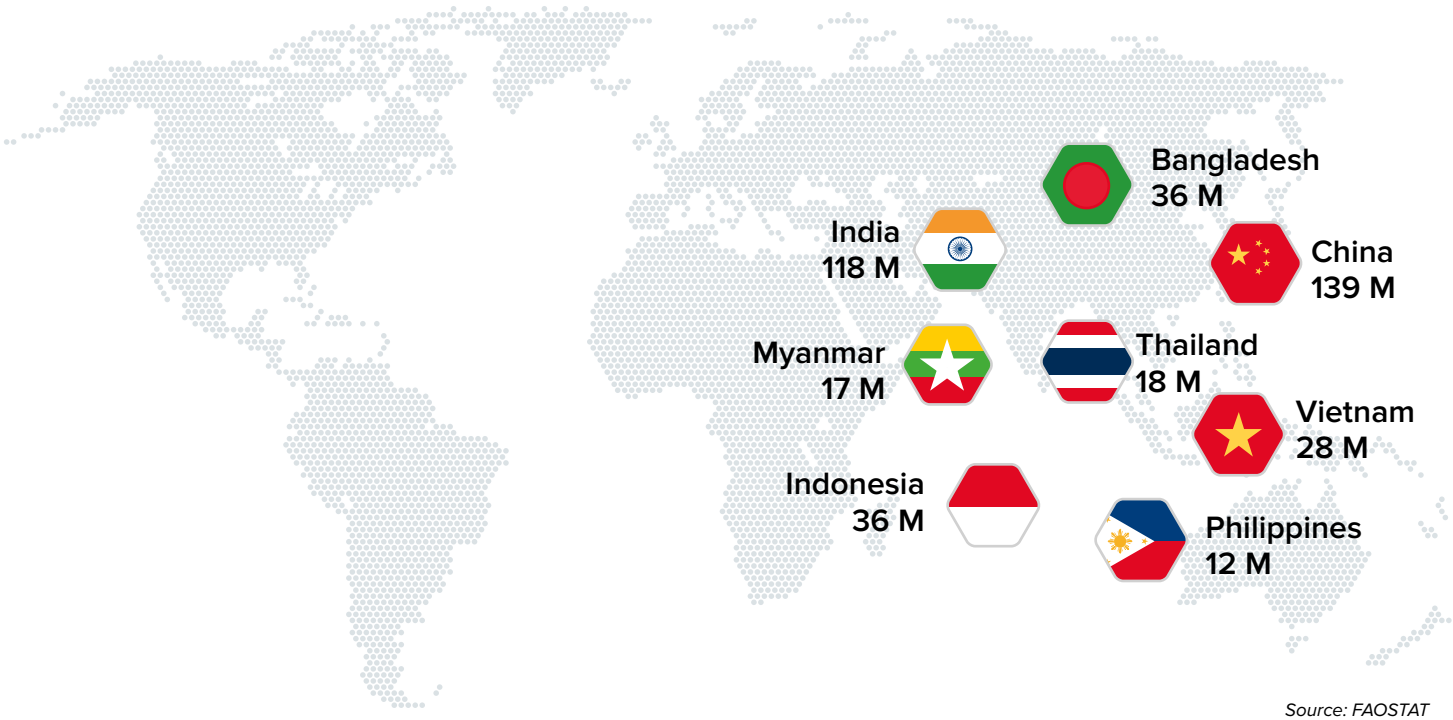
- 15,000kg of counterfeit rice (China, 2018)



Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN MILLED RICE PRODUCERS WORLDWIDE (2019)

in tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Discrimination of rice varieties:

- DNA based methods

Geographical origin:

- Stable isotope ratio analysis

Cooking and processing qualities:

- Colourimetric determination (AACCI Method 61-03.01)

Source: FoodIntegrity Handbook

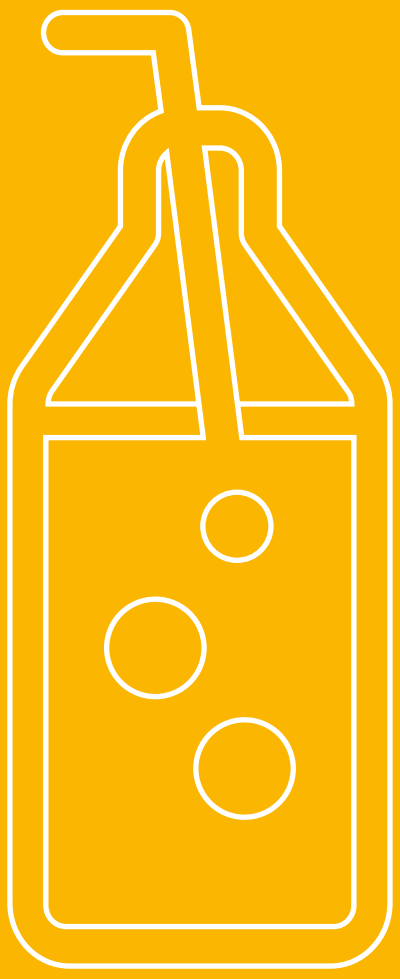
ADDITIONAL INFORMATION

The economics of the rice trade make it a particularly attractive target for criminals. More than 3.5 billion people worldwide rely on rice for up to 20 % of their daily calorie intake. Asia accounts for 90% of global rice consumption, but the grain is also the fastest growing staple food in Africa and Latin America. Most of the crimes in the rice supply chain are about substituting high-quality products, such as Basmati rice or Thai Hom Mali rice, with low-quality grains. Wuchang rice, a Chinese product protected by a geographical indication (GI), is also a frequent target. In a scandal that erupted in 2010, Wuchang reportedly sold ten times more rice than it produced.

Source: www.newfoodmagazine.com

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 8



BEVERAGES

IFS FOOD FRAUD FACT SHEET

SPIRITS

BRANDY, COGNAC, GIN, RUM, TEQUILA, VODKA, WHISKEY

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for spirits, the main exporter countries and a historic fraud case.

MAIN REASONS FOR ADULTERATION

COUNTERFEIT

Copying the brand name, packaging concept, recipe, processing method, etc. of food products for economic gain.

Examples of media reports:

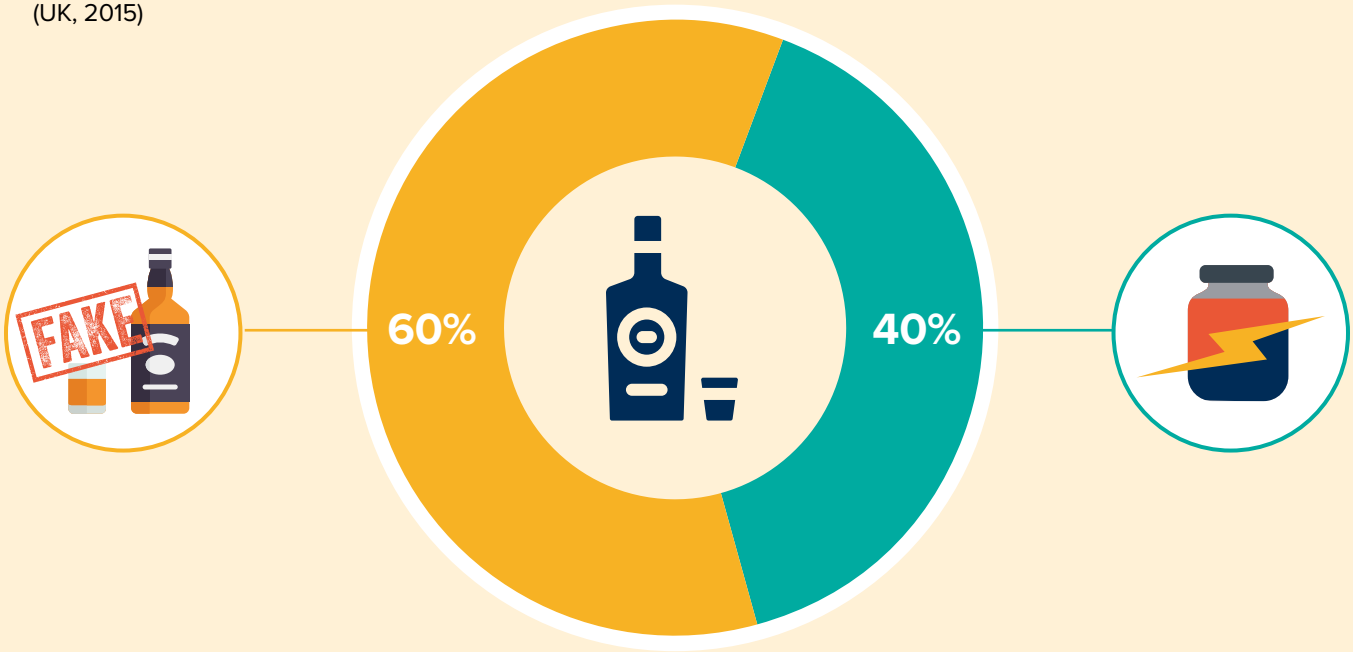
- 225,000 counterfeited rum bottles found by Spanish police (Honduras, 2021)
- Multi-million yuan fake alcohol ring busted in China (China, 2016)
- Fake scotch and tequila sold in liquor stores (Australia, 2018)
- The battle against fake Scotch (UK, 2015)

DILUTION

Mixing a liquid ingredient of high value with a liquid of lower value.

Examples of media reports:

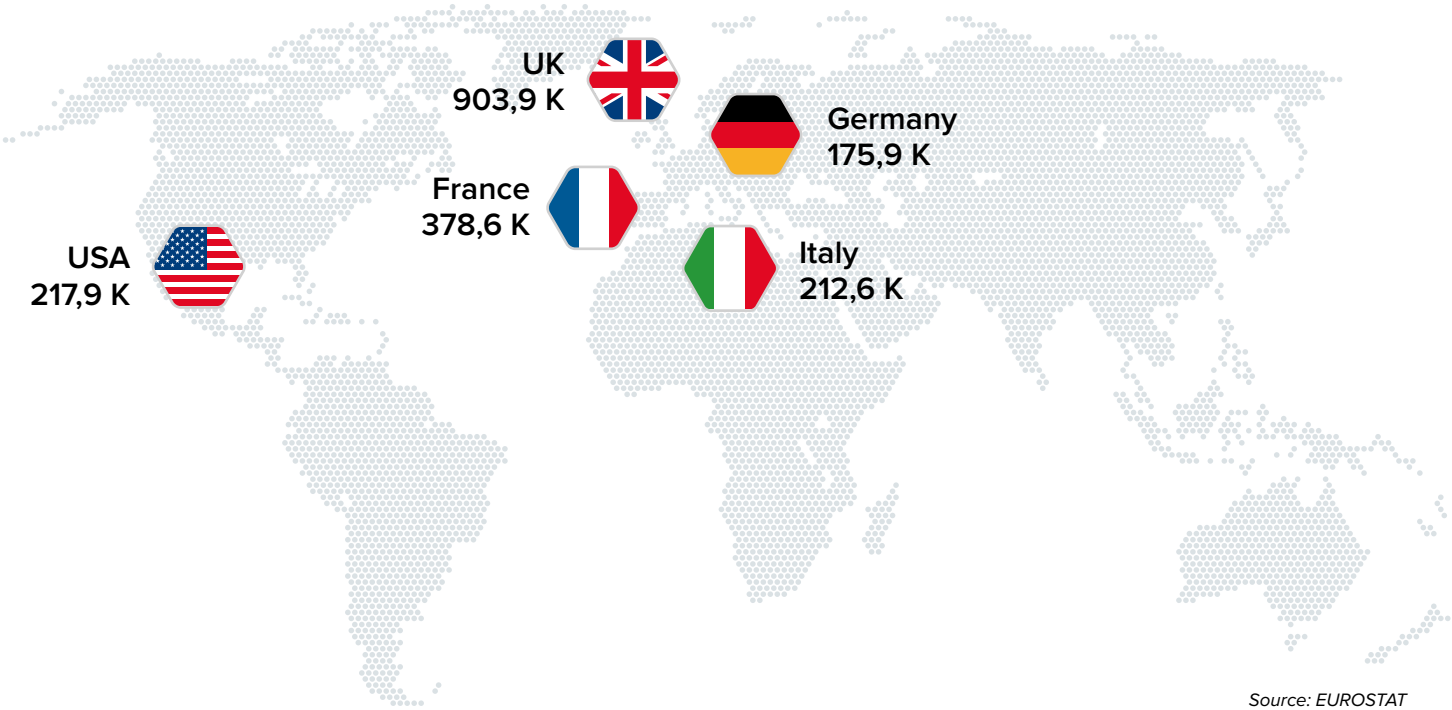
- 82 Dead after drinking tainted bootleg liquor adultered with methanol and mosquito repellent (Indonesia, 2018)
- Online scam leads to mass alcohol poisoning (Russia, 2015)



Source: © IFS, Analysis of 24 Media Reports from January 2000-2021

MAIN EXPORTER COUNTRIES OF SPIRITS

in tonnes



Source: EUROSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Reference methods for the analysis of spirits drinks are included in Regulation (EC) 2870/2000 to ensure compliance with Regulation 110/2008 for official controls for spirit drinks.

Dilution:
- Distillation and Densitometry

Detection of non-potable alcohol and Category and brand discrimination:
- GF-FID

Lack of maturation:
- pH

Brand discrimination, the addition of flavourings, detection of non-potable alcohol:
- GC-MS or LC-MS

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

In the Czech Republic in 2012, 38 people died following the consumption of spirits in which part of the ethanol was replaced by methanol. Czech authorities temporarily banned the consumption of spirits above 20% alcohol by volume.

Source: Mika, Weissmannova, & Fiserova, 2014; Lachenmeier 2016

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

WINE

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for wine, the main wine producers and historic fraud cases.

MAIN REASONS FOR ADULTERATION

COUNTERFEIT

Copying the brand name, packaging concept, recipe, processing method, etc. of food products for economic gain.

Examples of media reports:

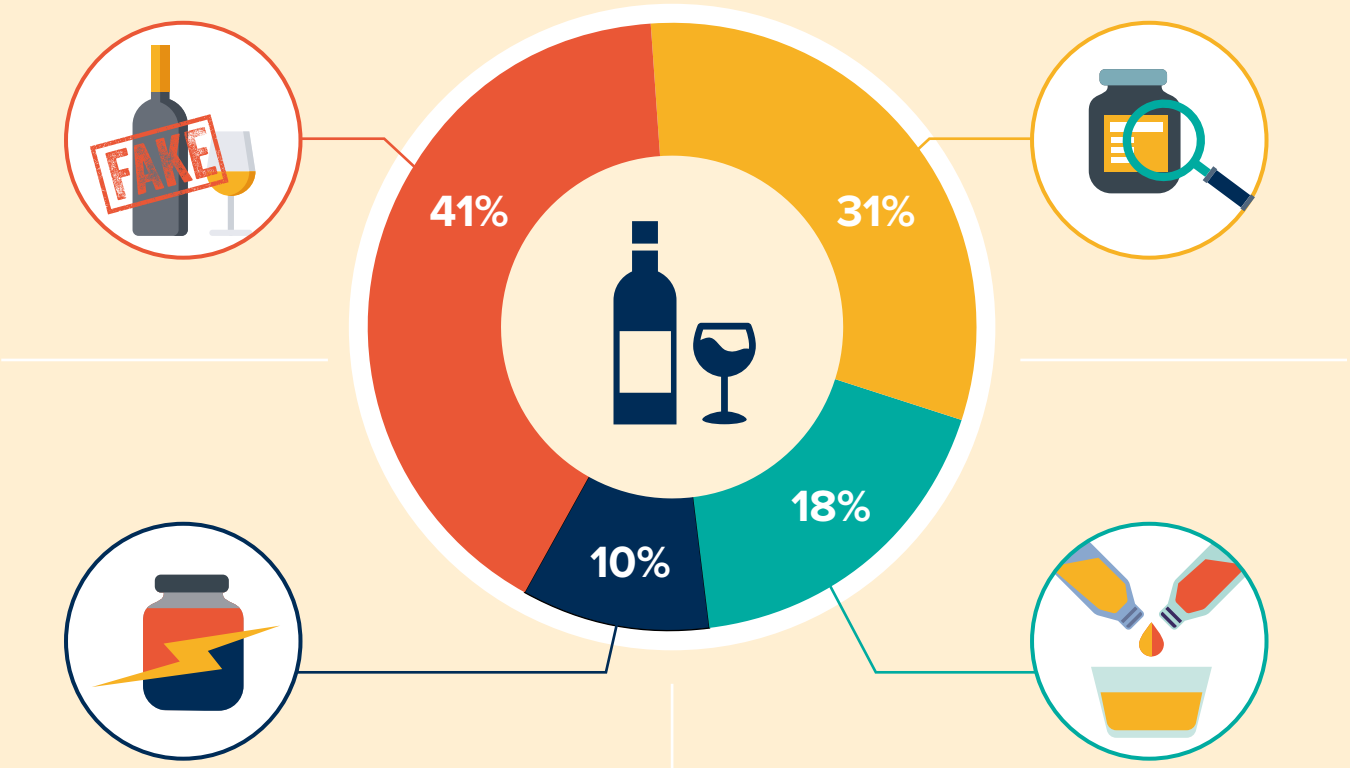
- Italian police bust fake Tuscan wine ring, seizing 4,200 bottles (Italy, 2020)

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expiry date modifications, false origin claims, false DOC claims or false organic claims.

Example of media reports:

- Fake wine Oltrepo Pavese (DOC and Organic) uncovered by police (Italy, 2020)
- Mislabeled Bordeaux wine from 2014-2015 (France, 2018)



UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to food products to enhance their quality attributes.

DILUTION

Mixing a liquid ingredient of high value with a liquid of lower value.

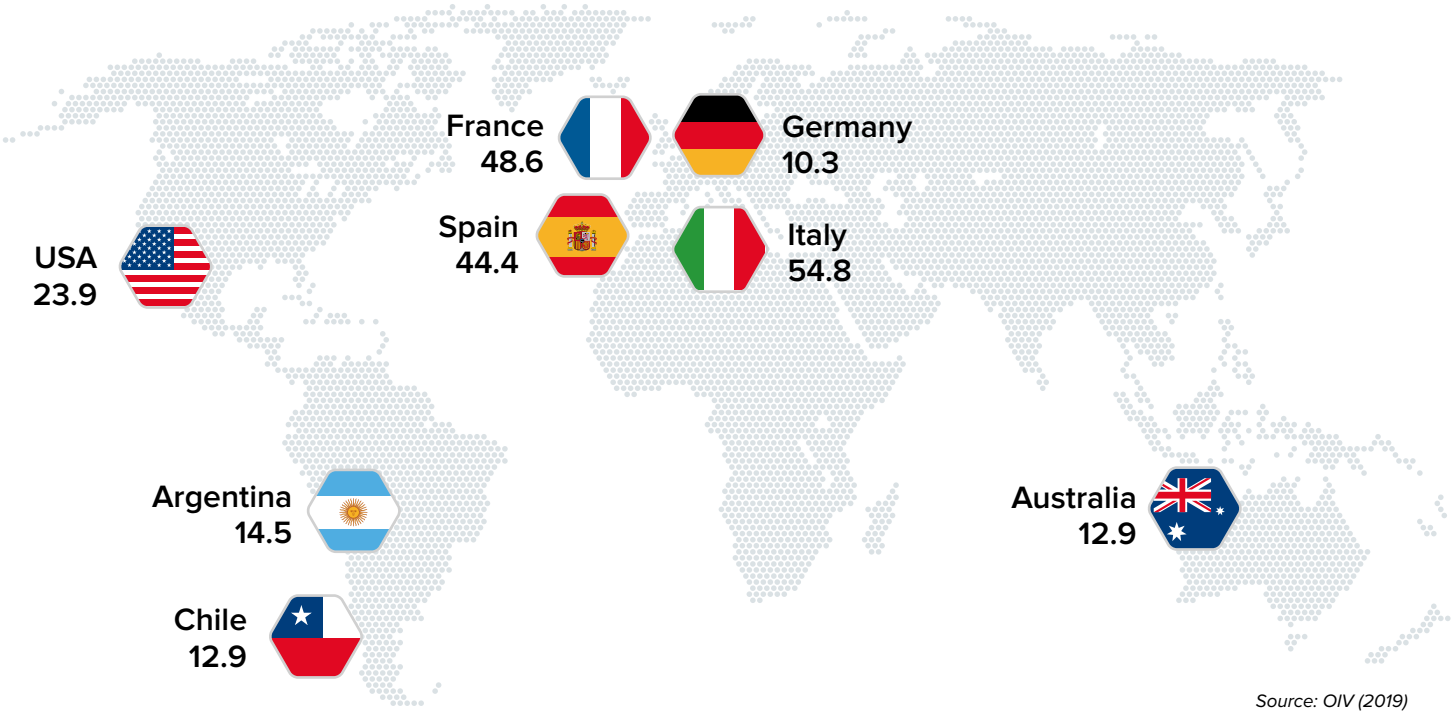
Example of media reports:

- Wine diluted with water (Czech Republic, 2020)

Source: © IFS, media reports from Jan 2000 to May 2021

MAIN WINE PRODUCERS WORLDWIDE (2018)

in million hl



Source: OIV (2019)

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Use of artificial sweeteners:
- TLC

Detection of sugar and water addition; application to withering, de-alcoholisation, stopping of alcoholic fermentation:
- Stable isotope analysis SNIF-NMR & IRMS

Origin of CO2 in sparkling wines:
- IRMS

Grape variety, vintage, geographical origin:
- H NMR screening

Classification of wine samples according to variety, origin/producer, vintage, quality:
- Metabolomics using LC

Grape varieties; yeast/bacterial strains:
- DNA-based techniques (SSR, microsatellites)

Grape varieties:
- HPLC or HPLC/UV

Click **here** for more methods listed in the Compendium of International Methods of Analysis of Wines and Musts (2 vol.) by OIV

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

Fraud cases like the “Jefferson Bottles” or the “Rudy Kurniawan (2007-2012)” are two of the main examples of fraud in wine. Rudy Kurniawan was the first person to be convicted of wine fraud.

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 9

OILS AND FATS

IFS FOOD FRAUD FACT SHEET

OLIVE OIL

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for olive oil, the main olive oil producers and a historic fraud case.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expiry date modifications, low-quality oil sold as high-quality oil.

Examples of media reports:

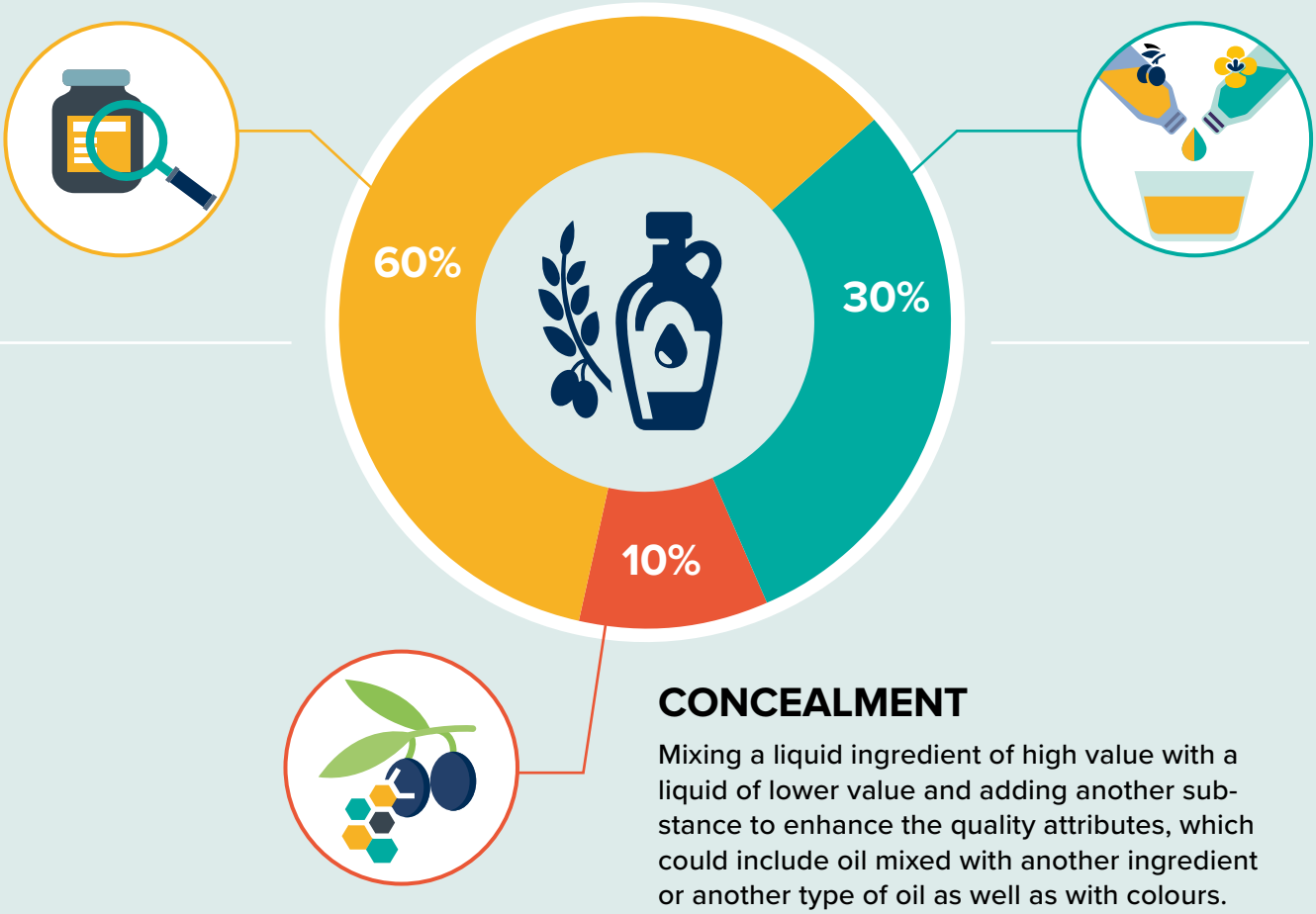
- 2,000 tons of olive oil falsely labelled as Italian (Italy 2016)
- Olive oil adultered with vegetable oil, chlorophylls, soybean oil, beta-carotene and sunflower oil sold in Germany, Switzerland and the US (Italy, 2016)

DILUTION

Mixing a liquid ingredient of high value with a liquid of lower value which includes oil mixed with another ingredient or another type of oil.

Examples of media reports:

- Spain's Civil Guard seizes 120 Tons of fake olive oil diluted with biodiesel (Spain, 2016)
- Dilution of imported olive pomace oil with other low-quality oil (Taiwan, 2013)



CONCEALMENT

Mixing a liquid ingredient of high value with a liquid of lower value and adding another substance to enhance the quality attributes, which could include oil mixed with another ingredient or another type of oil as well as with colours.

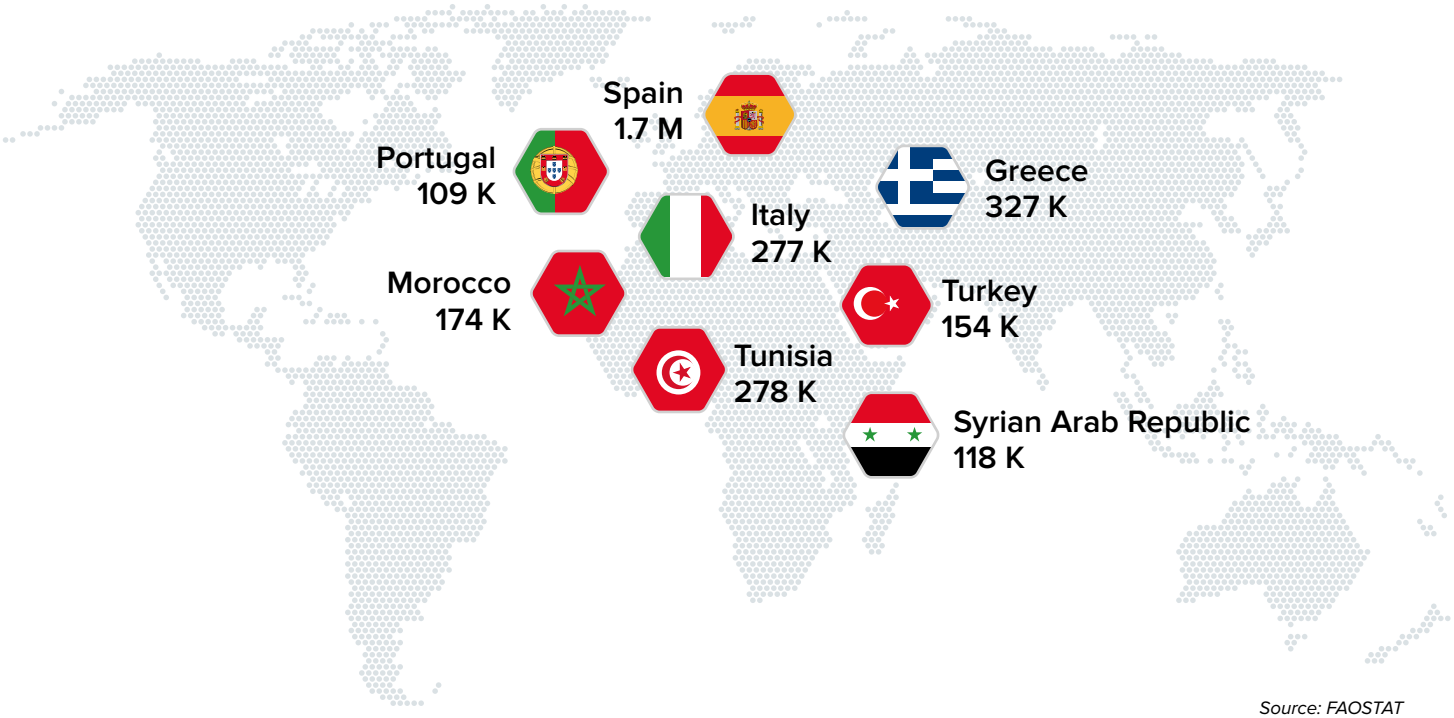
Example of media reports:

- Seed oil with colour sold as olive oil virgin extra (Greece, 2020)

Source: © IFS, Analysis of Media Reports from January 2000-2021

MAIN OLIVE OIL PRODUCERS WORLDWIDE (2018)

in tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Commission Regulation (EEC) N° 2568/91 set out the characteristics of olive oil and olive-residue oil and the relevant methods of analysis.

- Trade standard on olive oils and olive-pomace oils (Decision No DEC-III.1/114-VI/2021)
- Determination of sterenes in refined vegetable oils (Decision No DEC-III-2/106-VI/2017)

Click **here** for the methods of analysis of olive oil by the International Olive Council (IOC)

HISTORIC FRAUD CASE

In 1981, rapeseed oil denatured with aniline, a toxic compound for industrial use, was illegally refined. It was sold as olive oil, fit for human consumption, in Spain. Approximately 25,000 people became ill with toxic oil syndrome and an estimated 1000 people died after consuming the oil. It was delared a national catastrophe due to the amount of sick people and showed a complex web of criminal activity in the supply chain. 40 people were convicted for illegally importing and selling the oil.

Source: sciencedirect.com and aniversario.elpais.com

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

OILS (OTHER THAN OLIVE OIL)

IFS Food

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for vegetables oils (no olive), the main vegetable oils producers and a historic fraud case.

MAIN REASONS FOR ADULTERATION

MISLABELLING

Process of putting false claims on packaging for economic gain which includes expiry date modifications or low-quality oil sold as high-quality oil.

Examples of media reports:

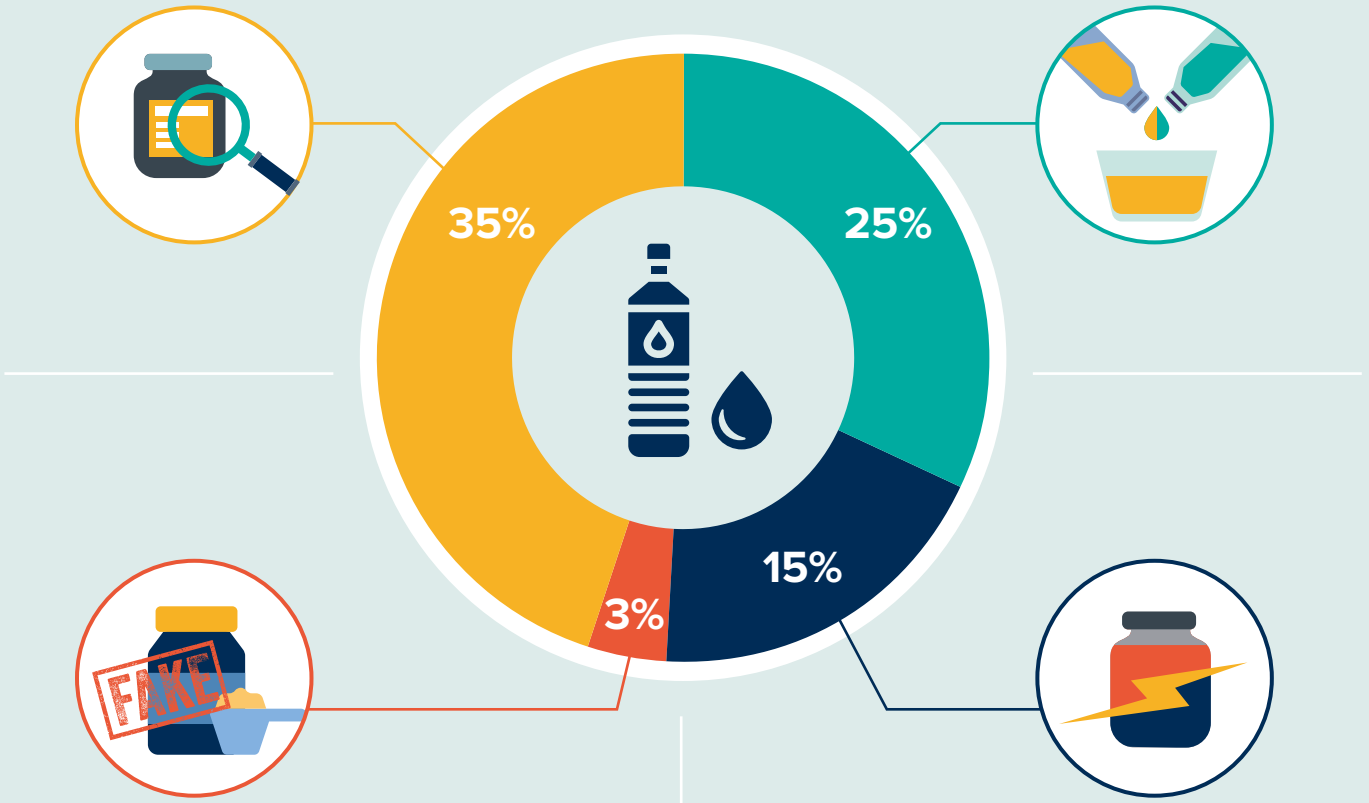
- Essential oil sold as organic (South Africa, 2017)

DILUTION

Mixing a liquid ingredient of high value with a liquid of lower value which includes oil mixed with another ingredient or another type of oil.

Example of media reports:

- Coconut oil diluted with palm oil (India, 2018)



COUNTERFEIT

Copying the brand name, packaging concept, recipe, processing method, etc. of food products for economic gain.

UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to food products to enhance their quality attributes. This includes the addition of colours to vegetable oil to enhance the product.

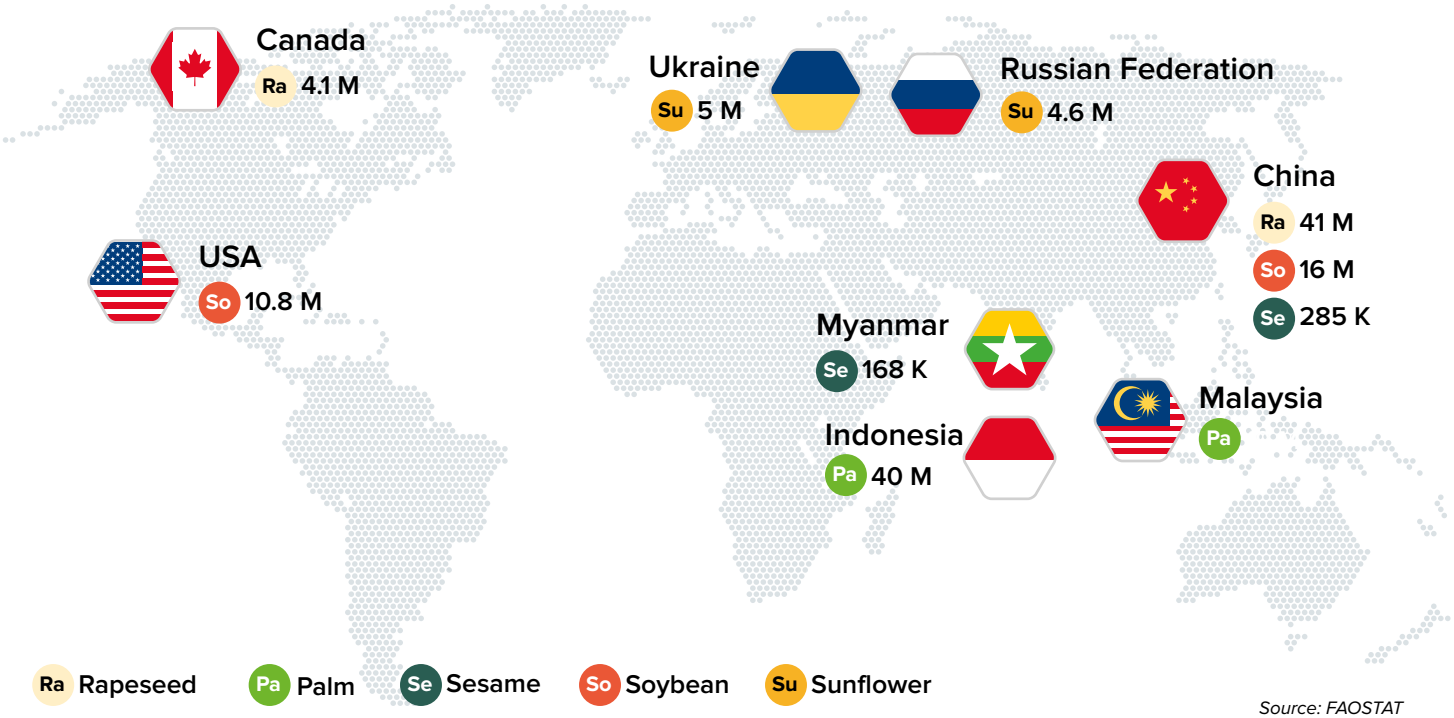
Example of media reports:

- Palm oil adulterated with Sudan dye (Ghana, 2019)

Source: © IFS, media reports from Jan 2000 to May 2021

MAIN OILS (OTHER THAN OLIVE OIL) PRODUCERS WORLDWIDE

in tonnes



Source: FAOSTAT

METHODS OF ANALYSIS

The legislation Directive 76/621/EEC states the limit level of erucic acid permitted in oils and fats intended for human consumption and Directive 80/891/EEC describes the method for the analysis of erucic acid.

Fatty acid profile by Gas Chromatography

Differential Scanning Calorimetry for the detection of animal fat in sunflower seed oil.
Tocopherol content by HPLC for the detection of soybean oil in sunflower seed oil or the detection of soybean oil in groundnut oil.

Carbon number triglyceride composition by HPLC for the detection of sunflower seed oil in safflower seed oil or the detection of stearins or oleins in palm oil.

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

In November 2015, a high incidence of adulteration of groundnut oil was reported in India by authorities. The adulteration was led by the increased demand for this oil which subsequently saw prices soar. The Consumer Association of India found that most of groundnut oil samples were adulterated with palmolein and cottonseed oil. Some samples contained as little as 10% groundnut oil and 43% of the samples contained lass than 20% of the declared oil.

Source: FoodIntegrity Handbook

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

SCOPE 10

DRY GOODS, OTHER INGREDIENTS AND SUPPLEMENTS

IFS FOOD FRAUD FACT SHEET

SPICES

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for spices in general, and a historic fraud case.

MAIN REASONS FOR ADULTERATION

SUBSTITUTION

Process of replacing a nutrient, an ingredient or food with another nutrient, ingredient or food of a lower quality or value. In this case, the adulterant is a bulking agent.

Examples of media reports:

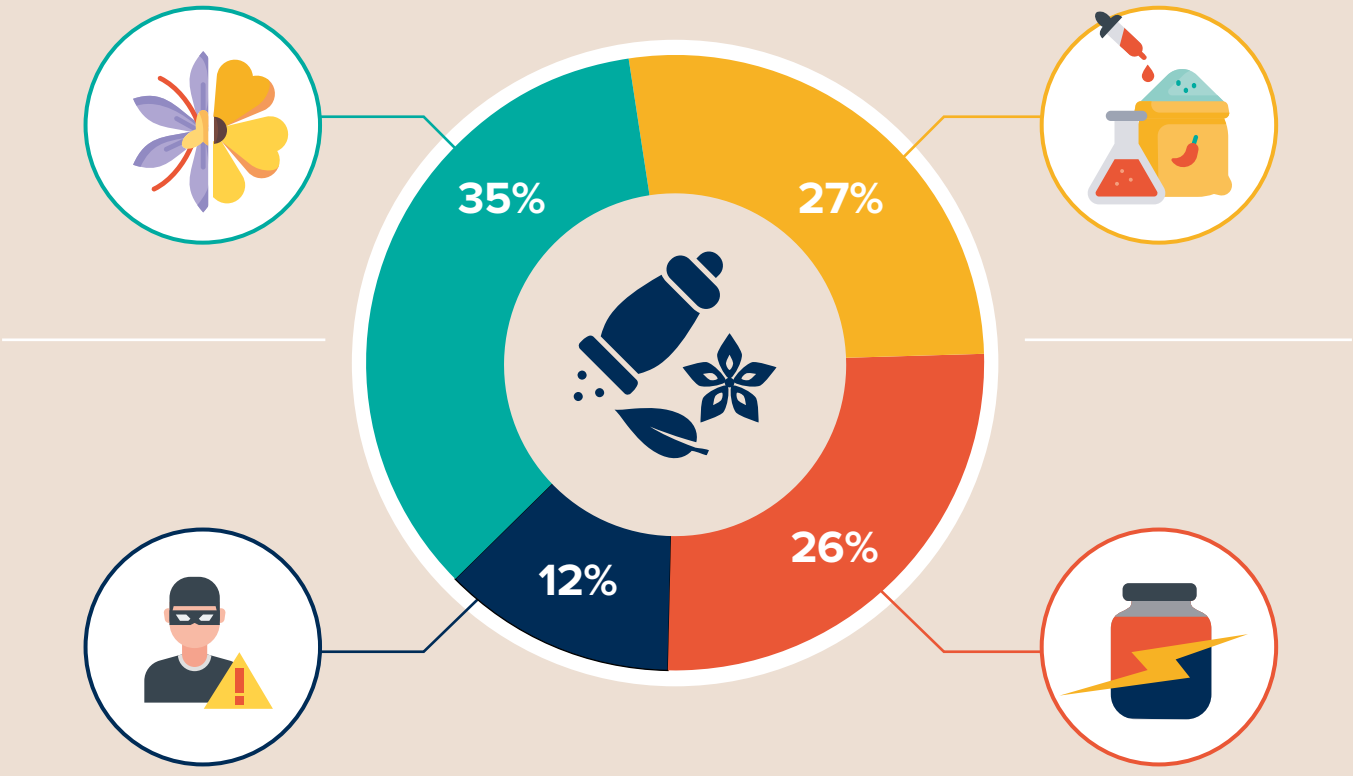
- Adulterated cumin factory busted. 19,400 kilograms of cumin were seized (India, 2019)
- Adulterated saffron worth up to £750,000 at a clandestine factory (Spain, 2019)

UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to the product to enhance its quality attribute. In this case, the adulterant is a colour such as dyes.

Example of media reports:

- Enhanced saffron with industrial colour (Saudi Arabia, 2019)
- Sulphur and calcium hypochlorite (bleaching powder) was used to enhance brightness of ginger (India, 2017)



OTHERS

CONCEALMENT

Process of hiding the low-quality of food ingredients or products, which includes the addition of preservatives to extend shelf life or in this case, adding bulking agents and colour to the product.

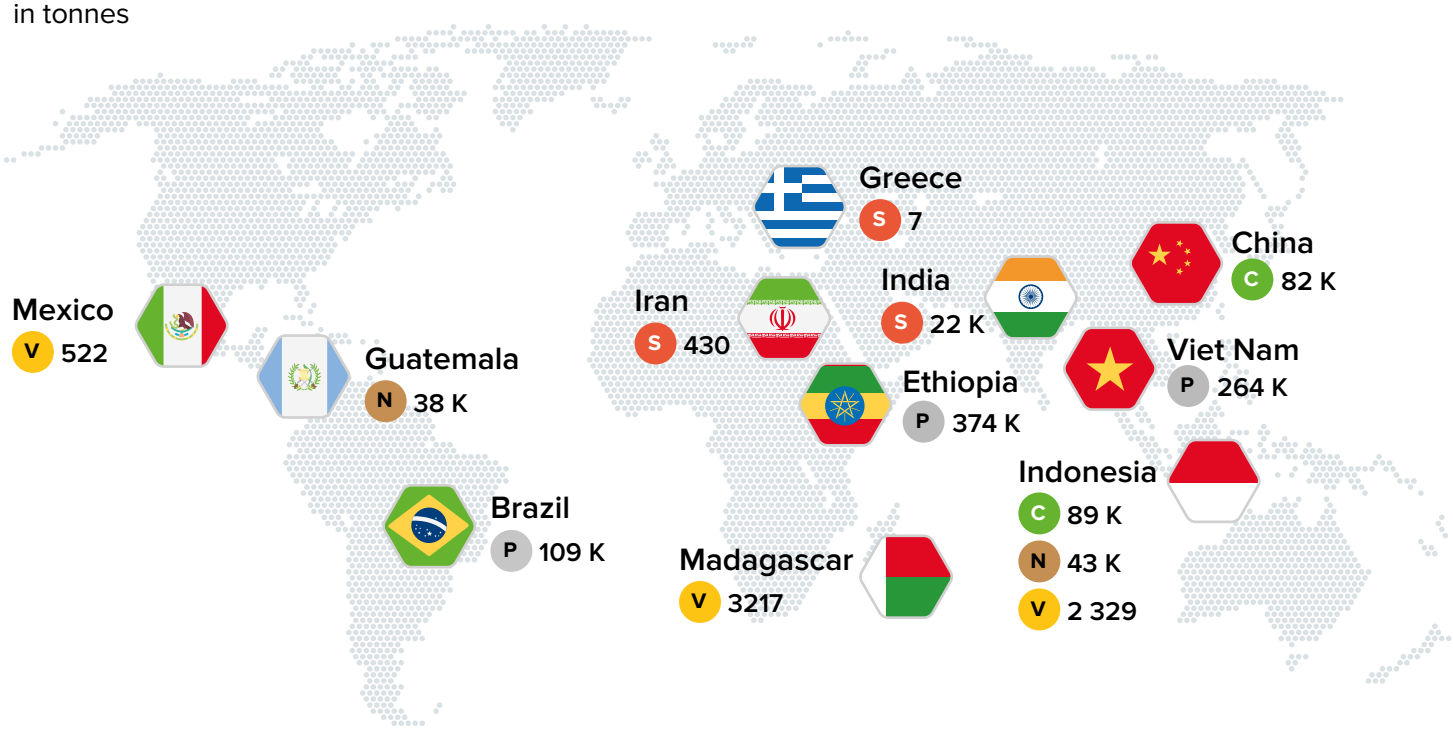
Example of media reports:

- Police raid factory making adulterated spices with acid, animal feces, color and hay (India, 2020)

Source: © IFS, media reports from Jan 2000 to May 2021

MAIN SPICES PRODUCERS WORLDWIDE (2019)

in tonnes



P Pepper C Cinnamon (Canella) N Nutmeg, mace & cardamoms S Saffron V Vanilla

Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Colours (Synthetic, Non-Permitted):
- PCR-SCAR markers or UV-Vis Spectroscopy with chemometricsT

Sudan IV and I detection:
- UHPLC-HRMS

Dyes in general:
- HPLC-ESI-MS/MS for detection of adulterants

Bulking agents such as plant fibres:
- Microscopy

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

In May 2021, Spanish authorities supported by Europol, dismantled a criminal organization selling adulterated saffron. 500 kg of adultered saffron were seized. The spice, mainly imported from Iran, was adulterated with floral remains, styles and stamen, treated with unsafe colorants not authorized for human consumption and was sold as a Spanish PDO. Therefore, this could be considered a case of substitution, mislabeling and unapproved enhancement at the same time. 17 people were arrested, and 13 additional suspects investigated.

Source: guardiacivil.es and theguardian.com

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

TURMERIC

IFS Food

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for turmeric and some additional information.

MAIN REASONS FOR ADULTERATION

CONCEALMENT

Process of hiding the low-quality of food ingredients or products, which includes the addition of preservatives to extend shelf life or in this case, adding bulking agents and colour to the product.

Examples of media reports:

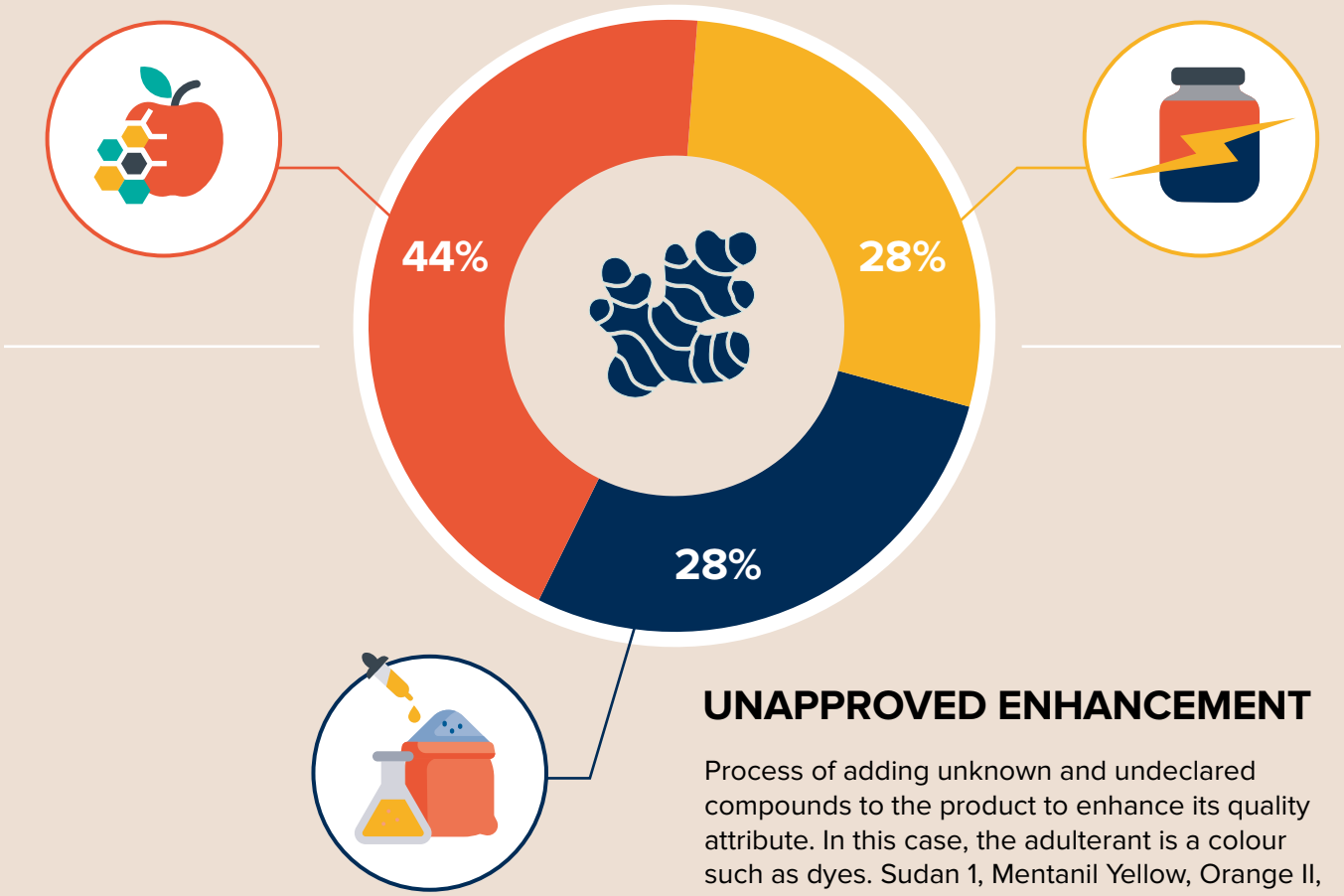
- 200 kilograms of spurious turmeric powder from India (India, 2015)

SUBSTITUTION

Process of replacing a nutrient, an ingredient or food with another nutrient, ingredient or food of a lower quality or value. In this case, the adulterant is a bulking agent, such as curcuma zedoaria, curcuma malabarica or chalk powder.

Examples of media reports:

- 1250kg tainted turmeric from Pakistan Turmeric was adulterated with rice husk (Pakistan, 2019)



UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds to the product to enhance its quality attribute. In this case, the adulterant is a colour such as dyes. Sudan 1, Mentanil Yellow, Orange II, Lead Chromate.

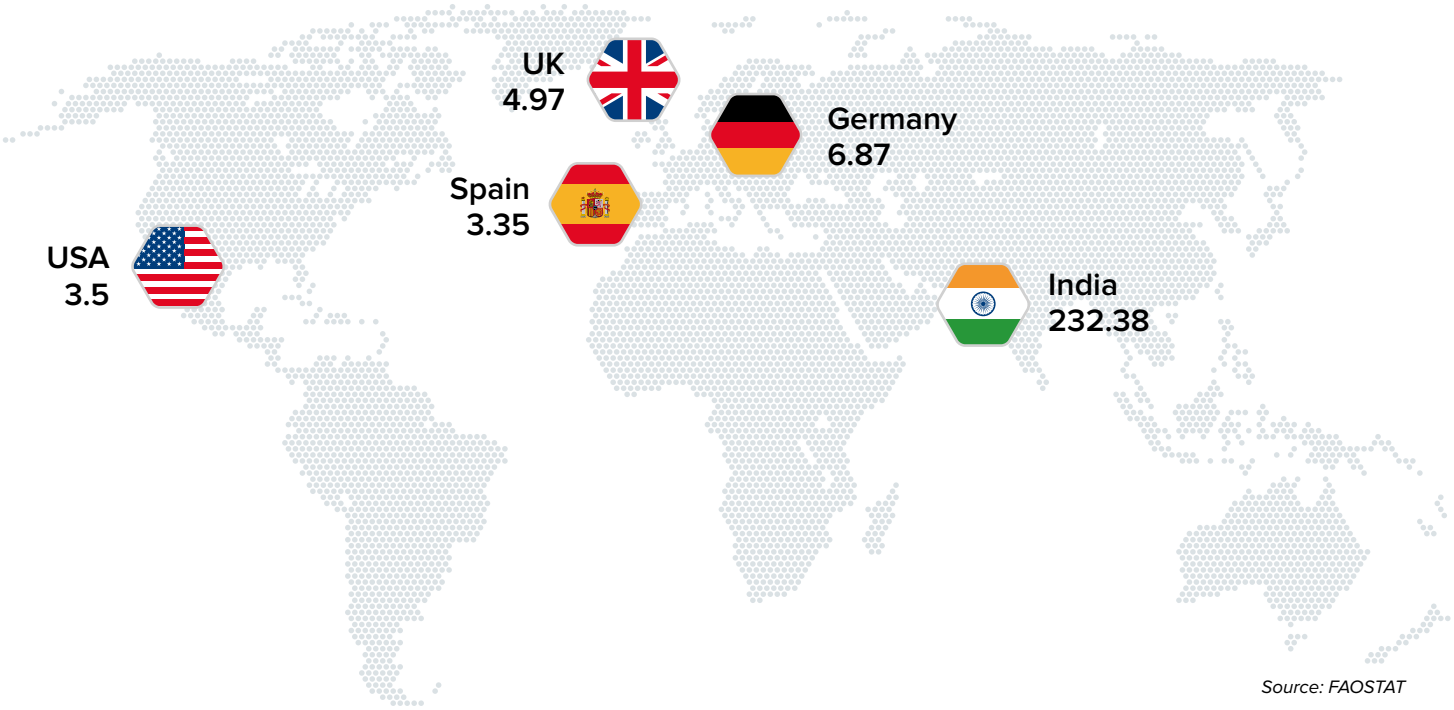
Example of media reports:

- 950.5 kg of imported turmeric and other species sold in Finland in breach of food safety regulations (Finland, 2017)

Source: © IFS, media reports from Jan 2000 to May 2021

LEADING TURMERIC EXPORTING COUNTRIES WORLDWIDE (2020)

in million U.S. dollars



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Bulking agents like flour:
- DNA Barcoding

Dyes in general:
- Raman imaging and FT-IR spectroscopy with chemometrics

Sudan I, II, III, IV, Orange G, Red G detection:
- Centrifugeless DLLME and HPLC-UV

Source: FoodIntegrity Handbook

ADDITIONAL INFORMATION

Turmeric, the product of Curcuma longa that belongs to the family of Zingiberaceae, has a documented history of 6000 years. Also known as, the “golden spice”, “yellow root” or “Indian saffron”, this spice has been used in India for medical purposes for millenniums. Nowadays, around 80 per cent of the world’s turmeric is grown in India. The European Union imported around 15 000 tonnes of turmeric in 2019 and of that, around 12 000 tonnes came from India.

Sources: CBI, 2021; Eurostat 2020; Prasad & Aggarwal (2011); Ravindran, Babu & Sivaraman (2007)

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

IFS FOOD FRAUD FACT SHEET

CHILLI POWDER

IFS Risk Management created this fact sheet to provide IFS Stakeholders with helpful information to consider in their risk management activities. It is a quick and practical reference summarising reported food fraud incidents, the main methods of fraud analysis for chilli powder, the main chilli powder producers and a historic fraud case.

MAIN REASONS FOR ADULTERATION

CONCEALMENT

Hiding the low quality of food ingredients or products. For instance, adding colouring to conceal the presence of a bulking agent.

Example of media reports:

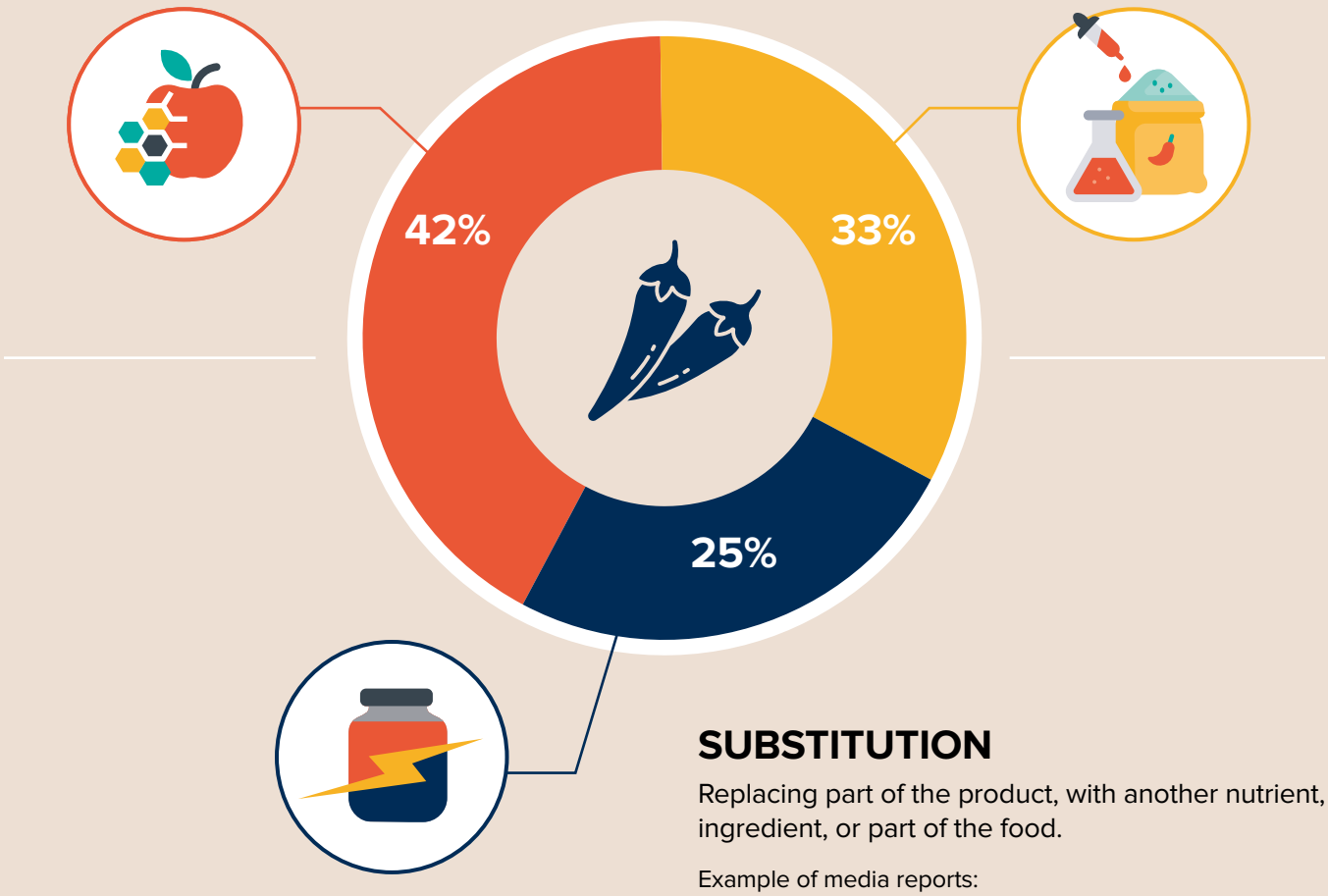
- A total of 3.09 tonnes of adultered chilli powder was seized (India, 2016).

UNAPPROVED ENHANCEMENT

Process of adding unknown and undeclared compounds, such as a colourant, to the product to enhance its quality attributes.

Example of media reports:

- Chilli powder enhanced with colours from Pakistan (Pakistan, 2019)



SUBSTITUTION

Replacing part of the product, with another nutrient, ingredient, or part of the food.

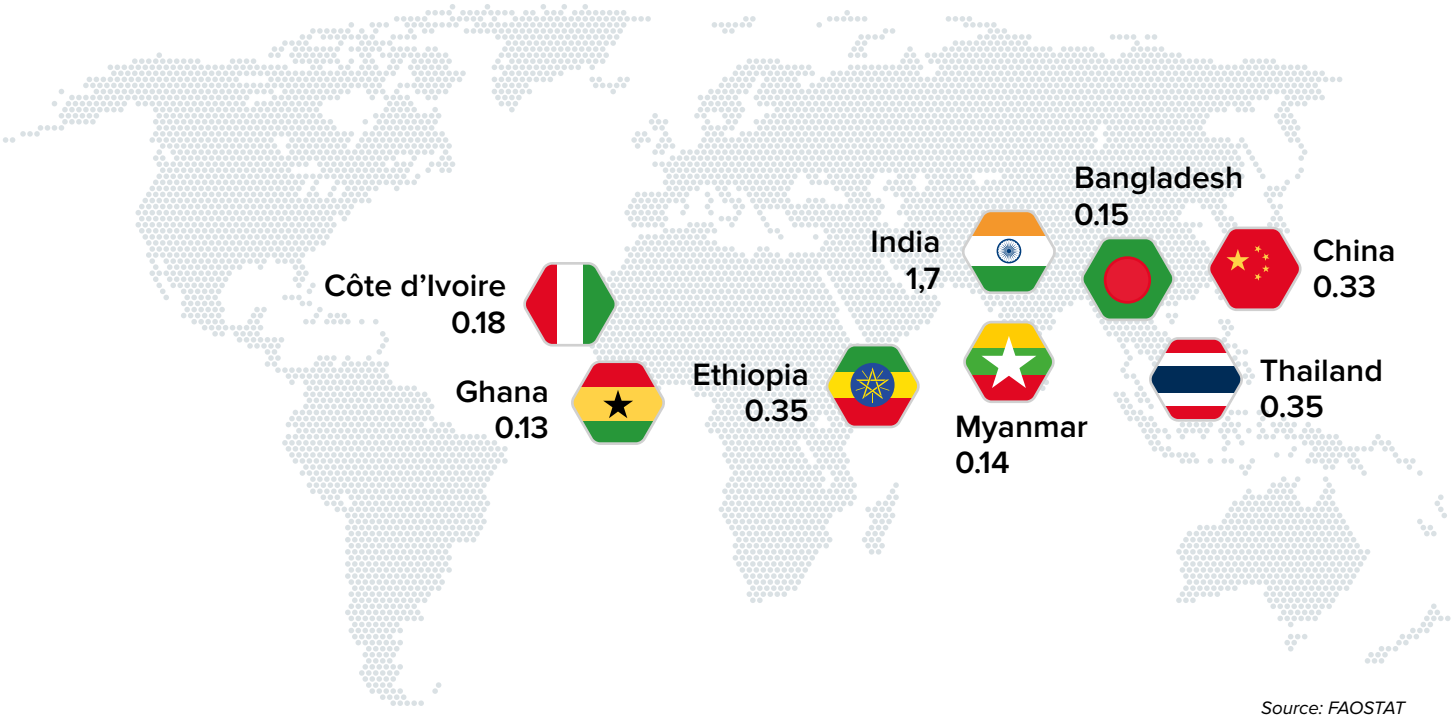
Example of media reports:

- Substitution with acid, animal feces, colour, and hay (India, 2020)

Source: © IFS, Analysis of 24 Media Reports from January 2000-2021

MAIN PRODUCERS OF DRY CHILLIES AND PEPPER WORLDWIDE (2019)

in million tonnes



Source: FAOSTAT

METHODS OF ANALYSIS TO DETECT FOOD FRAUD

Colours (Synthetic, Non-Permitted):
- PCR-SCAR markers or UV-Vis Spectroscopy with chemometrics

Sudan IV and I detection:
- UHPLC-HRMS

Dyes in general:
- HPLC-ESI-MS/MS for detection of adulterants

Bulking agents such as plant fibres:
- Microscopy

Source: FoodIntegrity Handbook

HISTORIC FRAUD CASE

Sudan dyes are considered potentially carcinogenic and genotoxic. This is why they have been banned as additives in both the EU and the United States. The UK FSA performed numerous tests in 2005 and 2006 after Sudan 1 was found to be illegally present in chilli powder in the EU in a food scandal in May 2003. As a counter measure, the European Commission Decision 2005/402/EC was put in place and member states were required to monitor high risk products and provide analytical reports for the presence or absence of Sudan dye. The European Commission Regulation No. 669/2009 repealed the previous legislation which had a less intensive testing regime.

Source: FoodIntegrity Handbook; FAIR, Agnoli et al., 2016; Falkheimer & Heide (2015), Tse et al., (2016)

IFS Management GmbH
Am Weidendamm 1A
DE 10117 Berlin
Phone: +49 30 72 61 053 74
E-mail: info@ifs-certification.com

Disclaimer

IFS Management GmbH has made every effort to ensure the accuracy and reliability of the information provided on in this brochure and on the fact sheets. However, the information is provided “as is” without warranty of any kind. The use of external links is at your own risk. We cannot guarantee that external websites are free from computer viruses or similar. The content of these third-party websites is not under our control and we will not be responsible for them nor can we guarantee that the links remain functional or accessible.

The food fraud fact sheets are an exclusive service of IFS Management GmbH for all IFS Database users. Please refrain from passing on the documents to third parties and from publishing them elsewhere.

IMPRINT

IFS Management GmbH
Am Weidendamm 1 A
10117 Berlin, Germany

Managing Director: Stephan Tromp

E-Mail: riskmanagement@ifs-certification.com
www.ifs-certification.com

IFS Contact for product fraud:
Mrs. Tina Brune
IFS Director Risk Management

ifs-certification.com

Follow IFS

Published: February 2022