

The Future of Food Fraud



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Introduction

The challenge of ensuring that a consumer enjoys safe and authentic food has been present since food has been traded. From the earliest civilizations to present day, unscrupulous traders have sought to further their wealth at the cost of the unsuspecting consumer. There are many types of food fraud: mislabelling, adulteration and dilution are just a few and previous BSI articles have covered different aspects of food fraud and country of origin labelling in more detail.

Megatrend-based modeling

How food fraud has changed and will change depends on how the world changes. Megatrends are defined as “important shifts in the progress of a society or of any particular field or activity” and something that is expected to occur with a high degree of certainty¹. This makes megatrends, the significance of their implications on the food supply chain and their potential impact on food production, an appropriate lense to view how food sector challenges will evolve in the decades ahead. As with any horizon scanning activity, some assumptions and predictions of future events have been made.

Megatrend: disease burden and pandemics

Increasing population and changing demographics are highly correlated with changes in mortality. As medicine and medical understanding improve, life expectancy is increasing and the expected causes of mortality and disease will change. Diseases can be broadly categorized into two distinct groups, communicable and non-communicable. Non-communicable diseases are those that cannot be directly transferred from one individual to another such as cardiovascular and respiratory disease as well as cancer. Conversely, communicable diseases are those that can be directly transferred and include HIV, COVID-19 and tuberculosis.

Non-communicable diseases are globally the highest cause of death, accounting for approximately 70% of all global deaths² in 2018. The leading global cause of death worldwide is cardiovascular disease. However, when countries are examined individually, it's not the highest cause of mortality in all countries. For example, the data shows that countries with a high gross national income per capita have a higher incidence of cancer³. Diet is clearly an important risk factor in many non-communicable diseases, and health claims associated with diets will increase as further research is undertaken. Within the EU, Commission Regulation (EU) No 432/2012 governs permitted health claims and labelling rules, but a system that is globally recognized is required

to ensure claims are scrutinized adequately throughout the world. Health-promoting foods and diets will increase and, as described for food tailored to specific demographics, these claims will need validation.

In the case of non-communicable diseases, incident rates and mortality are not typically impacted by food choices although healthy claims are often associated with foodstuffs and diets providing boosts to the immune system. Without unbiased scientific evidence, health claims cannot be verified and therefore, as already discussed, robust independent validation is needed for claims. Communicable diseases, specifically pandemics, will significantly affect food supply chains. As witnessed during the COVID-19 pandemic, huge impacts to supply and demand can occur. Demand is fractured, as enforced lockdown measures are enacted to prevent unnecessary human contact, the catering and eat-in restaurant trade hugely diminishes. Conversely, food producers, retailers and takeaway businesses see an associated increase in trade. Foodstuffs for these different routes to market are not totally transferable and this results in disruption. Supply is also influenced. as a pandemic spreads it may impact specific countries or processes more heavily than others effecting the supply either from specific countries or from specific commodities.

Megatrend: rapidly changing demographics

The United Nations states that the population of the planet will increase by 25% to approximately 10 billion by the year 2050⁴. The increase of almost 2 billion people will not happen equally across all regions; as an example, the population of Europe will stay at current levels while Africa's is expected to double. These regional differences will change the average age of the consumer, drive different nutritional needs and different generational expectations. Furthermore, a tipping point was reached in 2018 where it was shown that over half of the global population is middle class⁵.

The trend of increases in the overall wealth and purchasing power of the average global citizen will continue and will have significant implications for food choices and global food prices.

The global middle classes, a group with increased purchasing power, will drive demand for premium foodstuffs, in particular meat or meat substitutes. In contrast, while efforts are being made to reduce world poverty, it's estimated by the World Data Lab that approximately half a billion people will still remain in extreme poverty in 2030 and there will be a need to provide them with safe, nutritious and affordable food⁶.

To prepare for these changing demographics, large multinational companies are developing nutrition specifically designed for an aging population with specialized formulations. These formulations are fortified to optimize the adsorption of key components and command a premium price. As these concepts are developed and become mainstream, they will be replicated. Verification of the content of the food is likely to become straightforward, but verification of the claims made about the food will need to be validated in a rigorous manner to ensure that health claims are true and fortifications are not, in fact, detrimental to health.

Considering the United Kingdom, those born in Generation Z (between 1995 – 2010) have significantly different expectations, values and technical knowledge than their parents and grandparents. This generation, and their global equivalents embrace technology and are more health-conscious. If this is realized as a continuing global trend for future generations, then food will undoubtedly be significantly different than it is now with consumers expecting to be informed in great detail about their food purchases. This will go further than full traceability of their foodstuffs and is based on the desire to ensure that choices are functional, ethical and environmentally sound. Consumers will demand that it can be demonstrated that the premium foodstuffs they have purchased have not caused human or animal suffering or damaged the environment.



Megatrend: rapid urbanization

The human population is rapidly moving from rural to urban cities and by 2050 70% of the population will live in cities, with a significant portion living in cities with a population of over 10 million (megacity).

These cities will provide high employment levels, increased salaries and importantly for food fraudsters, hungry, rich inhabitants with busy lifestyles.

Feeding city inhabitants will require vast amounts of food and will include large numbers of restaurants. A range of food fraud can occur in restaurants, such as substitution of meat species, origin mislabelling and omission of expensive ingredients.

Therefore, verification of such an array of establishments, especially those that are uncontrolled (pop-up restaurants, home cooks advertising foods through social media, etc), will be difficult. The technological advancements and the interconnected world will offer some respite against this for unsuspecting patrons (see technological advancements), but for the unsuspecting there will need to be a separate solution. It's not practical to suggest government-led survey work for such a large number of restaurants, but controls will be needed.

For those who cook their own food, local crops will be grown in vertical farms; giant enclosed and controlled environments. The crops grown will be designed to maximize nutrition and taste. And, to satisfy those who enjoy meat, synthetic meat will be grown as an alternative in vats; again modified to maximize taste and nutrition while minimizing or eliminating the presence of harmful chemicals.

Megatrend: technological advancement

Technology has historically been a revolutionary force and will be a significant influence in the future. Today, DNA sequencing can be done using tools that fit in a user's pocket. By 2050, the ability to completely profile and interpret the atomic, chemical and biological components of a food in almost real time may be possible. This will provide users with the ability to verify the food on their plate is what they expect in terms of composition and therefore, in theory, has the potential to stop the majority of food fraud. Some consumers may not see the advantage of testing their food and practical issues like access to technology will allow for food fraud to remain a serious crime. Furthermore, some foods that are fraudulent are physically identical to non-fraudulent foods; making differentiation impossible.

Personalized medicine, which customizes therapies and treatments based on a consumer's unique genetic profile, will expand to personalized food.

Personalized food will be augmented to provide optimum nutrition for an individual consumer. This could help control current food-based diseases such as diabetes and obesity, and also ensure immunoresponsive individuals are not exposed to allergens.

A new method of food preparation will develop to allow the preparation of these personalized foods in the form of 3D-food printing. A selection of "food inks", based on food feedstocks produced using a variety of production methods will form the basis of building blocks for a limitless variety of foods. Recipes for popular branded foods will be printed on these devices. This will change the revenue streams for brand owners from retailing products to accepting micro payments for printing patented meals or through the sale of branded "food inks".

Advanced robotics will replace humans in most manual repetitive tasks throughout the food production chain. The sensors necessary to inform, guide and control these robots will produce continuous data streams that will be accessible to regulators, auditors and even consumers in a format that allows traceability and transparency of foodstuffs. Such information, which will be easily available and verifiable, coupled with the wish for ethically produced food has the potential to significantly reduce modern slavery in agriculture.

Megatrend: depleting resources and climate change

The fact that climate change is impacting the globe cannot be disputed and the impacts that are being observed now such as extreme weather will be more prevalent by 2050. Concurrent to climate change will be the impact on resources such as water and energy. Water scarcity is forecast to continue to impact at least half the global population for at least one month a year in 2050⁷.

Given that estimates currently attribute 70% of freshwater usage to food production and that food production needs to increase by 70% to feed the population in 2050, food production will change.

This will impact either production methods or what makes up the average global plate of food; or most likely both.

Meat production impacts the environment through emissions, water and energy usage. The most simple solution is that it should be reduced, yet there is an expectation that meat will be available. As already discussed, the majority of the population will be in the global middle class and will expect to be able to eat meat. The rise of synthetic meat products, conceptually identical to conventional meat, is inevitable. Warming oceans will fundamentally alter ecosystems, jellyfish have been shown to thrive in warmer oceans so their numbers will rise significantly. New food sources such as these will need to be considered if animal-based products remain as a significant portion of the human diet.

Either driven by social choices, increasing prices or product availability, plant-based diets will be predominant with alternative meat products well beyond the scope of what's available today being sold. To counter the instabilities brought on by climate change, crops that are grown on the land will also need to be modified to offer increased resistant traits and optimized yields.

Reversing the trend of utilizing food crops for non-food uses, the food production requirements will exploit technologies that have initially been developed for the energy industry. In particular, the ability of microorganisms to survive in a range of extreme conditions with limited resources will make them targets for production of foodstuffs or food inputs. Microscopic food factories, converting a variety of inputs directly into foodstuffs, or as a feedstock for other industries or even food printers, will be synthesized using gene editing and wholesale synthetic biology.

The use of insects as a foodstuff is currently not globally accepted but will be fundamental as a global food source by 2050. The ability of insects to perform tasks such as bioremediation will be exploited, as foodstuffs or as feedstocks for other industries.

Novel processing technologies and increased understanding of flavour chemistry will intrinsically alter the diet available. Therefore, a combination of substitute foods, replicating those that are loved today, will be prepared from the novel sources above. Most excitingly, the novel processes will deliver tastes, textures and designs that are simply unimaginable today.



The way forward

The need to feed the world in 2050 will drive new innovations in food sources. This will evolve directly, through the adoption of different foodstuffs and indirectly through changing sources of feed and input for conventional foodstuffs and crops. The food that's eaten will consist of choices radically different to what's available today and those choices, as ever, will be a target for fraud.

Virtual inspectors, existing only as a computer algorithm will peruse the menus of restaurants and the shelves of supermarkets. They will check the claims being made, validate manifest records to ensure the correct goods were available and purchased, ensure the right price is being charged and, ultimately, direct physical inspectors to investigate when data suggests something isn't as it should be.

Long supply chains and the transport of food will be significantly reduced in favour of local production. Some foods will still require longer supply chains and these will command significant prices. There will be an increased incentive to commit food fraud for these commodities and therefore advanced analytical techniques and traceability solutions will be required.

Given the clear impact of specific processes in the food supply chain on the environment, governments may penalize those products that impact on the planet most severely through tariffs and taxation. The avoidance of these penalties would create significant incentive for fraudulent certification.

Food printing at home will lead to food copyright fraud, where recipes are recreated and used outside of license such as copyright infringement or through counterfeit feedstock material. And, personalized food, tailored to the needs of an individual consumer will be at risk of inferior versions, either produced in illegal facilities or simply adulterated with conventional produce.

To counter these frauds, physical, chemical and digital analysis of food throughout its journey from farm to fork should be achievable and possibly performed by consumers themselves. Data-driven solutions will provide confidence to consumers that the physical and the analytical checks do not need to be performed.

A rise in fraud for non-analytically verifiable claims (e.g. produced without modern slavery) is possible so systems and standards will need to be developed that robustly verify these claims. Arguably one of the most impactful technological advancements of the present day is the rise of the internet and the associated interconnectedness; the Internet of Things. The future will further embrace this, making food provenance instantly available.

Just as the threats to the food chain will evolve with these megatrends, so too must the organizations that support the delivery of safe, sustainable and socially responsible food. The responsibility of verifying claims in a global marketplace will need an independent, multinational, trusted entity. Assurance and verification schemes are currently used globally, but these schemes are often localized and only typically recognized within the food sector. To earn the trust and confidence of consumers and the food industry, future schemes will have to be globally recognized and encompass food safety, authenticity and welfare claims; as well as be able to act as credible and secure brokers of digital information.

Historically, advancements like artificial refrigeration and industrialization have changed how the food industry operates and the types and variety of foods available to consumers around the world. Today, innovations are increasingly being driven by consumer values as being able to trust food claims is becoming as important as enjoying the taste. Whether mega or mini, every trend can deliver benefits, but they can also open windows of opportunity for fraudsters; particularly as the digitization of the food chain increases. Therefore, it will always remain the responsibility of the entire food sector, to improve their operational and supply chain resilience to mitigate food fraud risk.



References

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Why BSI?

BSI believes the world deserves safe, sustainable and socially responsible food. We offer a broad range of certification and risk management services to help organizations in the food and retail supply chain mitigate risk, protect their brands and build resilient supply chains.

With 90 offices around the world, we are a leading food safety and certification provider with the capacity and capability to provide integrated services for a wide range of food safety and business improvement standards across the entire food and retail supply chain; including GFSI-recognized standards.



Our products and services

Knowledge

The core of our business centres on the knowledge that we create and impart to our clients.

In the standards arena we continue to build our reputation as an expert body, bringing together experts from industry to shape standards at local, regional and international levels.

Assurance

Independent assessment of the conformity of a process or product to a particular standard ensures that our clients perform to a high level of excellence. We train our clients in world-class implementation and auditing techniques to ensure they maximize the benefits of standards.

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To experience real, long-term benefits, our clients need to ensure ongoing compliance to a regulation, market need or standard so that it becomes an embedded habit. We provide a range of services and differentiated management tools which help facilitate this process.

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