Whitepaper

How can we restore consumer **trust in the food industry?**

Innovations for a **better world.**

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How can we restore consumer trust in the food industry?

Transparency is key to confidence.

As the complexity of food supply chains increases with globalization, so do the risks of contamination and the opportunities for fraud. Effective partnerships and maximum transparency along the entire value chain are crucial to restoring trust in the food sector, and fast-developing digital technologies could hold the key.

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Recent years have seen people losing trust in the food industry. A series of high-profile food safety incidents shook consumer confidence, with the BSE ("mad cow disease") and horsemeat scandals making headlines across Europe. A 2018 study by the Center for Food Integrity, meanwhile, found that only a third of US consumers "strongly" agreed that they were confident their food was safe compared to almost half just a year before.[1]

This lack of trust is understandable. According to the World Health Organization around 600 million people fall ill every year through eating contaminated food – almost one in ten of the global population. Of these, 420,000 will die.[2] It's also a problem that disproportionately impacts children, with 40% of the food-borne disease burden affecting the under-5s and accounting for 125,000 preventable deaths a year.[3]

At the same time, globalization has meant that food supply chains are becoming increasingly complex and fragmented, a challenge that will intensify as growing middle class populations in the developing world expand markets for western food products. Complex supply chains increase the risk that food is lost or wasted – a fate that befalls a third of all food produced globally according to the UN's Food and Agriculture Organization[4] – while lack of traceability also increases the risk of food-borne illnesses. There were more than 450 food safety recalls in 2017 alone[5], with the average cost to the industry US USD 10 million – that's before issues of brand damage and associated revenue loss are factored in.[6] The impact of a food safety incident can be enormous. An outbreak of Salmonella in 2009 resulted in one of the largest recalls in US history, and although it was limited to one peanut processor responsible for less than 2% of the country's supply, the nuts were used as ingredients in almost 4,000 other products.[7] A decade on, the European Food Safety Authority reports nearly 100,000 EU cases of salmonellosis in humans every year, a problem that scientists believe will worsen with the effects of climate change.[8]

Fighting fraud

Complex supply chains also inevitably increase the risk of food fraud. According to researchers from Michigan State University, it is believed food fraud cost the sector between USD 30 and USD 40 billion per year.[9] Typically, high value foods like milk, fish and meat are prone to fraud, as was the case in the 2008 baby milk scandal in China. This saw milk and infant formula adulterated with melamine, leading to the deaths of six babies, while more than 50,000 needed to be hospitalized.

In Europe in 2013, meanwhile, products being sold as beef were found to contain substantial quantities of undeclared horse meat, with the sheer size and complexity of the supply chains allowing different players to blame each other and poor intelligence sharing exacerbating the problem. But adulteration – bulking a product

with something cheaper – is only one of many types of fraud. Others include counterfeiting well-known products or adding elements to make items appear higher quality, as when a New Zealand company was prosecuted for spraying honey with a chemical to claim it was mānuka or the UK case of a dye used in wax and floor polish being added to chilli powder. False claims fraud, meanwhile, is becoming more lucrative as buying habits change and fraudsters falsely claim that products are organic, fair trade or meet high animal welfare standards.

Our globalized world and fragmented supply chains, then, present a huge challenge for the industry. The question is what are the solutions?

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>
> **Chris Elliott,**
> Professor of Food Safety at Queen's University Belfast

Transparency is vital for consumers

Consumers are increasingly demanding access to clear and reliable information to make choices about their food, not just when it comes to safety but also the sustainability of the products they buy. Not only do they vote with their wallets, they're increasingly likely to take to social media to make their feelings known. This presents a significant challenge to producers as supply chains become ever more complex. "It's unbelievably complicated, working on tiny margins, and with issues around climate change and developing new markets – China wants more food, India wants more food – so a huge amount of different things are going on," Professor of Food Safety at Queen's University Belfast, Chris Elliott explains. "All those issues around globalization of food have essentially meant that people have lost connection with where their food comes from."

As the effects of climate change continue to be felt, meanwhile, crop failures are increasingly driving fluctuations in demand. "Whenever supply and demand fluctuates it's a phenomenal opportunity for fraud," explains Elliott. But its not just climate change that's behind these variations – demand can also fluctuate significantly when a product becomes fashionable. "Suddenly pomegranate juice was seen as healthy, and then coconut water replaced pomegranates," he says. "It takes eight to 10 years for a pomegranate tree to be planted, mature, and produce fruit, and about 10 for a palm tree. So if world sales of pomegranate juice or coconut water increase 500% in a year, where did it all come from? The answer is a lot of it was either adulterated or fake product."

If the food industry is to genuinely win back consumer trust, transparency along the value chain is a prerequisite, and technology to enable this is developing fast. Drones and satellites can be used to capture data in the field, while online sensors and Internet of Things (IoT) technology are helping to revolutionize production processes. The analytical toolbox to test contamination and provenance of food has become increasingly sophisticated over the years, and classical physico-chemical and spectroscopic lab analysis are now complemented by DNA profiling to combat food fraud. Rapid and mobile testing of food based on DNA assays are also valuable tools to gain vital information on food authenticity.

In combination with smart phones as connecting portals and interfaces for displaying and analyzing results, new powerful "lab-on-smart phone" platforms are becoming available for food quality, safety and authenticity analysis.[10] But the value of analytics is limited if this information is not linked and shared between all actors within the supply chain.

Ideally, full traceability is not limited to food origin, but includes the full history of food processing through multiple steps. Blockchain offers the potential for end-to-end documentation of every stage in the value chain, and is widely regarded as being able to deliver advances in terms of transparency and traceability. The potential to record and verify every stage of a product's journey from "farm to fork" is huge, and with it the opportunity to provide consumers with everything they need to know about the origin, processing and sustainability of their food.

Blockchain removes the need for manually kept records, with their vulnerability to human error and potential to slow down response times if a food safety incident does occur. Instead it provides an almost instant record of events, with the ability to trace the flow of a product to quickly and accurately pinpoint the source of the incident and mitigate risks. As well as making it easier to respond to food-borne illness outbreaks, blockchain is a key potential weapon against food fraud. The technology could well become a game changer for the food industry.

Conclusion

— **Globalized and expanding markets mean increasingly complex supply chains.**

— **This in turn increases the risk of contamination, loss and waste.**

— **It also increases the potential for food fraud – a growing criminal activity.**

— **Maximum transparency throughout the value chain is vital to tackle all of these.**

— **Digital technologies offer immense potential, but effective partnerships are key.**

Food is a heavily regulated product, but increasingly complex supply chains can make it difficult for legislation to keep up, and recent years have seen a marked shift towards self-regulation. While this is not a problem with the sector's major players, who frequently go beyond what is required, smaller companies often don't have the resources or ability to do that. This means that effective enforcement – with good quality auditing throughout supply chains – is essential. Lack of rigorous enforcement in areas of the developing world increases the potential for corruption, and there are worse issues at play. Parts of the food supply chain such as fishing and agriculture involve bonded labor and modern slavery – a growing problem in Europe

Digital technology is revolutionizing the industry and opening up enormous opportunities to improve transparency. Documentation of each step along the value chain means that consumers can make informed decisions about what to buy, and producers can maintain their trust – as well as react effectively when things go wrong and analyze the problem to avoid it happening again.

Blockchain – or DLS (distributed ledger technology) – is essentially a ledger that's able to record every event in time-stamped blocks, which are stored in a network of computers in multiple locations. This makes it virtually impossible to tamper with, as changes must be linked to the preceding block of information in the chain. It also means that partners can easily exchange data, with an unchangeable record of every transaction. When a label says 'fair trade', blockchain should be able to prove that is actually the case. "I was in India recently looking at some spice companies that have adopted blockchain, and it was incredible," says Elliott. "I was fairly certain that the information they were providing was accurate because I tried to verify it. If it's done right, the ability to transform the consumer's connection with where they get their food from is phenomenal."

While technology is developing at a rapid pace, it's important not to overlook the human element, however. "Blockchain will give you the ability to look down through supply chains – so you can see if a farmer gets a living wage for his coffee, for example – and if I upload a document onto blockchain nobody else can tamper with it," he continues. "But who's going to test that the document I uploaded is genuine? You need ways to verify that the information going into the blockchain is accurate and trustworthy. The vast majority of people do things correctly, but some do not." One vulnerable point is bridging the physical and digital worlds, and crypto anchors – tamper-proof tags embedded into products – could in combination with blockchain help bring about new levels of security and trust.[11]

Everyone should do their part

Bühler is working with Microsoft on solutions to explore the potential of blockchain, following their successful collaboration on the Bühler Insights platform.[12] Ultimately, it's in the interests of all consumers and producers to make the most of data intelligence to ensure maximum traceability and transparency. This means that everyone in the value chain needs to play their part. The challenge of returning trust to the food industry won't be solved by technology alone – truly effective collaboration and a genuine multi-stakeholder approach are just as vital.

"Food fraud has to be tackled from a number of different ways," Elliott says. "It's about good auditing – that means auditing for fraud, not just for compliance. It's about having really good traceability systems in place, be those blockchain or otherwise, and it's about having verification that those traceability systems absolutely work through sufficient amounts of laboratory testing. It's about partnerships, it's about industry and government working together. If you can get all of those right then it becomes really difficult to cheat."

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Chris Elliott

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Chris Elliott is Professor of Food Safety and founder of the Institute for Global Food Security at Queen's University Belfast. He has published more than 400 peer review articles, with his main research interests including innovative techniques to provide early warning of threats across complex food systems and protecting the supply chain from fraud. He led the independent review of Britain's food system following the 2013 horsemeat scandal and is a visiting professor at the China Agriculture University in Beijing. He also coordinates a flagship EU Horizon 2020 food safety project involving 33 international partners.

Stuart Bashford

Digital Officer at Bühler Group

As Digital Officer at Bühler Group, Stuart Bashford is responsible for setting and delivering the company's digitalization strategy. He began his career at Bühler in 2013 in London, as Head of Software and Hardware Development. Prior to joining Bühler, he worked at a high-tech start-up company for 10 years designing lasers for sales into the solar panel manufacture business and also in the semiconductor industry for applied materials. He is MBA qualified and has a background in hardware and software design.

Béatrice Conde-Petit

Group Expert Food Science & Technology at Bühler

Béatrice Conde-Petit holds the position of Group Expert Food Science & Technology at Bühler. She drives strategic innovation projects at the interface between science, technology, and business around the world. She is responsible for the Future of Food Program with a focus on sustainable food processing, leveraging collaborative innovation with customers, academia, startups, and suppliers. Conde-Petit holds a Diploma and PhD in Food Science & Technology from ETH Zurich. Before joining Bühler in 2008, she worked at ETH Zurich for 20 years as researcher, lecturer, and consultant to the international food industry.

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