The impact of improved traceability on the safety of food

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Lloyd's Register Foundation

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RS Standards is at the forefront of chain standards development and improvement frameworks and is leading initiatives in sustainability, fisheries management, fishing and supply chain standards internationally with leading organisations.

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Contents

Executive summary

Traceability is a fundamental cornerstone of any robust food system, underpinning the claims and labelling on the product. In the context of food safety, traceability has been introduced to enable the food industry to meet regulatory requirements and provide food assurance, as well as having effective systems in place to enable prompt product recalls if required. Following major reputational issues involving food safety or adulteration, the requirement for traceability has increased significantly across all food groups.

'Traceability' is a very broad term. At the simplest level it can refer to the 'internal traceability' of a product within an organisation or 'external traceability' of products between businesses or across the whole value chain. Full chain traceability, which provides information for all the stages involved in the development of a product, addresses the growing interest from consumers in the environmental and social credentials associated with the products they buy.

This review first set out to map the different types of traceability techniques and the gaps, limitations, benefits, and risks associated with these different techniques. Four groups of traceability technologies were identified; software, Internet of Things (IoT), food sensing technologies, and physical testing. The particular focus was on the various types of software that are claiming to provide a full chain traceability solution, some of which are blockchain based.

The second part of the review focused on a number of different industries as case studies to explore how technology was being used. These industries (seafood, beef, dairy, baking, cereal, and spice) were selected as they provided a range of examples of food safety risks where traceability is seen as a key solution to reducing or avoiding those risks.

Key findings

From the case studies, only a limited number of supply chains were identified where full chain traceability have been demonstrated. These were all for high-value and premium products (e.g. grass-fed beef, line caught tuna).

In many examples where full chain traceability have been demonstrated the supply chains themselves are relatively simple and, because of this, present less risk. In addition, entities in a fully vertically integrated supply chain – with producers, processors, and retailer under the same ownership – crucially makes the co-operation and sharing of data between supply chain entities much easier, as there are no commercial incentives to restrict data access. Challenges exist with more complex supply chains, for example, those with many intermediaries or with a multi-ingredient nature (e.g. baking products) or where items are transported as a bulk commodity such as grains and cereals.

While small-scale producers have been shown to participate in some traceability initiatives this has often required facilitation by NGOs. One of the biggest obstacles in implementing digital sustainability tools in many ingredient-producing

parts of the world is the limited infrastructure and lack of technology. A challenge for the industry is to develop traceability solutions that can be used in facilities where the work is seasonal and where workers may have low digital literacy. Small-scale producers will likely need training on how to use technology as well as support with upfront capital costs and ongoing operating costs.

All the separate stages of the food chain pay for traceability, regardless of whether it includes physical testing or investment in a technologically advanced system. Resource implications can be significant, depending on the scale of the system, and can be a barrier to further development, for example with introducing new solutions or for supplying into new markets or suppliers. Ultimately the consumer will have to pay in the price at point of sale.

Notwithstanding the costs of implementing new technology, including measures around cyber security, there are practical and logistical challenges that will need to be overcome so that the potential of new technologies can be properly realised. For example, traders and supply chain intermediaries can play a key role in linking small-scale producers with global markets, and it will often be in their own interest to keep their onward relationships with buyers separate from their suppliers. This means that full chain traceability will be difficult to realise in such circumstances. A technology roadmap tailored towards small-scale producers in different sectors might help facilitate dialogue on the unique traceability challenges experienced in the production of different types of products and help overcome existing barriers to achieving traceability in the first mile of the supply chain.

Most businesses cannot make improvements in full chain traceability without the collaboration of their wider supply chain. Standards, such as Global Standards (GS1) barcodes and the Global Dialogue on Seafood Traceability (GDST) seafood traceability standard, are critically important for traceability infrastructure and interoperability. They help ensure that data requirements for different markets are better harmonised, meaning the same data point has to be only input once into a standardised universally accepted format.

Improved traceability will certainly empower consumers to make buying-decisions that are based on their own needs and beliefs. Whether consumers are prepared to pay more for products with better information is unknown, and will be dependent on market factors e.g. ‘uniqueness’ of the traceability attributes, reduction of perceived risk (increasing trust), and whether traceability further bolsters a product claim (e.g. organic, Halal, etc).

Verification and third-party assurance will also still be required to underpin the veracity of the traceability claims being made. Data entry validation irrespective of the technology (blockchain or otherwise) will become increasingly important. Manual data entry will be susceptible to human error whether it has been entered into an online app or spreadsheet. Automating data-entry processes and developing foolproof ways of avoiding erroneous data entry will be key to ensure the adage of ‘garbage in = garbage out’ is minimised.

Recommendations

Based on the case study findings and review of traceability technologies, the following activities have been identified as a starting point for discussion with other organisations with an interest in food traceability. These recommendations are focused at building capacity into traceability methods and use, advocating and communicating, and strengthening the evidence base that traceability improves food safety.

Capacity building

- Ensure latest technical innovation in traceability informs any food safety activities planned.
- Provide guidance / support to low- and middle-income countries (LMICs) in ensuring food sectors can meet evolving regulatory and traceability demands of export markets.
- Collaborate / partner with existing traceability initiatives (e.g. GDST) or establish new initiatives in specific sectors of interest.

Advocacy and communications

- Develop a technology roadmap for businesses to better understand the opportunities, risks (data security) and cost implications around using new types of traceability technology (e.g. blockchain) in different food sector supply chains.
- Develop guidance for consumers to better understand the benefits of food traceability.

Evidence building

- Undertake market research to understand the needs and 'willingness to pay' by consumers for improved traceability information on the origin of food / drink products to generate trust / confidence.
- Assess the interoperability of new technologies with existing stock control traceability systems and accessibility of these new technologies to suppliers that operate in developing markets.

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