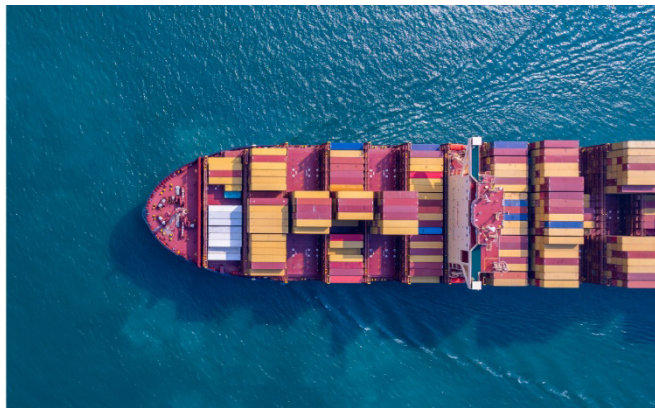


SCIENCE & TECH SPOTLIGHT:

GEOGRAPHIC ORIGIN OF FOOD AND OTHER IMPORTS

GAO-26-109131, July 2026



WHY THIS MATTERS

Bad actors may falsify the geographic origin of products to illicitly sell goods or substitute premium products with cheaper products, which can threaten our economy and consumer safety. In 2021, the U.S. International Trade Commission estimated that U.S. commercial fishing may have lost nearly \$61 million in operating income due to illegal, unreported, and unregulated seafood imports. Technologies that verify the origin of imported food and agricultural products, like seafood or wood, may help prevent fraud.

KEY TAKEAWAYS

- » Maturity and adoption of origin verification technologies vary by type of technology and the product they verify.
- » Verifying geographic origin typically requires building a reference library of product samples, which can be challenging to develop and update.
- » Improved verification could deter fraud, but the technologies can be expensive and complex.

THE SCIENCE

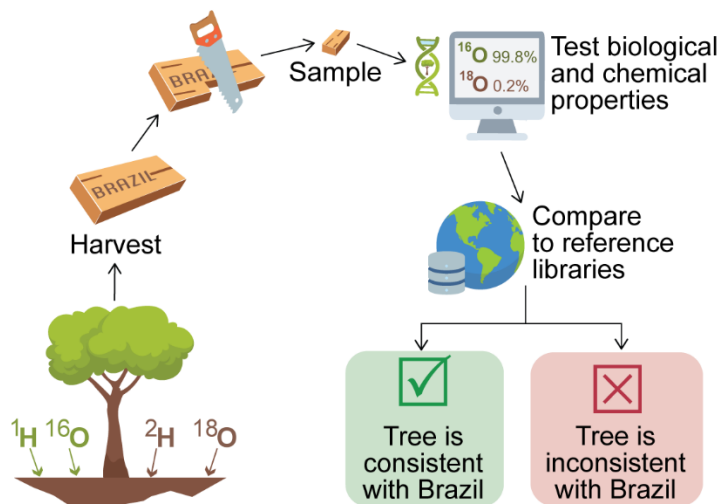
What is it? Digital and analytical technologies can be used to track and verify the origin of food and agricultural products. For example, shrimp can be tracked by digitally documenting the path from initial harvest to final sale and verified by testing that the DNA matches the species from a certain source. Verifying where products come from can help ensure regulatory compliance, assess tariffs, and improve consumer safety.

How does it work? Digital tracking technologies log product data, including geographic origin, throughout the supply chain. Blockchain, for example, could improve the reliability of these

data by creating a tamper-resistant record. The blockchain data are distributed across multiple parties and changes must follow digital protocols, helping to deter fraud.

Analytical testing with laboratory or field-deployable technologies detects a product's chemical or biological properties, which are compared to reference libraries containing sample properties from known locations (see figure). For example, trees take up elements from the environment where they grow, so different elements in a wood product can indicate where the tree was sourced. In addition, machine learning could improve accuracy by recognizing patterns in analytical testing.

Figure 1. Example of Origin Verification for a Wood Product



Source: GAO analysis; Cali6ro/stock.adobe.com (trees, DNA, computer, saw); Comauthor/stock.adobe.com (globe). | GAO-26-109131

Analysis of biological properties can verify the species of a product, which is compared to reference libraries of samples from where that species lives. For example, DNA analysis could indicate if a shrimp species is consistent with a claimed source. The effectiveness of chemical or biological analyses can vary depending on the product, and in some cases combining multiple analyses can improve geographic origin accuracy.

How mature is it? Maturity and adoption of origin verification technologies vary by type of technology and the product they verify. Where fraudulent or illegal activities are common, like the seafood industry, companies offer digital supply chain records to help importers and retailers track where seafood was caught or testing services to verify whether the species matches the label. In other cases, such as for processed products like canned seafood, testing is more challenging because processing can alter chemical and biological properties.

Development of more portable and more accurate analytical testing methods is ongoing, as are globally coordinated efforts to improve reference libraries for enforcement and fraud detection. For example, to help counter illegal wood harvests, various organizations are working to gather and test wood samples from forests worldwide. To improve detection of import fraud, Customs and Border Protection (CBP) is enhancing its laboratories and the National Oceanic and Atmospheric Administration is piloting a new field-based testing technology.

OPPORTUNITIES

- **Deter fraudulent activities.** Technologies could improve the detection of fraudulent activities, making such actions riskier and less lucrative. For example, in 2020, CBP reported it was developing new testing technologies to identify Chinese honey imports, which could pose a threat to consumers due to the presence of unapproved antibiotics.
- **Improve compliance.** Technologies that are cheaper or easier to use could help companies ensure their products meet applicable legal requirements. For example, in the U.S., importers are required to report specified data on certain seafoods from catch to U.S. entry and may not import certain goods from specified countries. Verifying origin can help ensure that companies are compliant.

GAO SUPPORT:

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CHALLENGES

- **Lack of reference libraries.** Efforts are underway to develop reference libraries in certain industries, but they require significant resources to build and maintain. Some libraries may be proprietary, limiting their widespread use.
- **Complex implementation.** Digital tracking relies on accurate information at each step in the supply chain, which can be falsified. Automated data collection, such as by sensors, could reduce errors and location falsification. These technologies may be difficult for smaller companies to implement or in regions with less digital infrastructure.
- **Costly analysis.** Laboratory-based technologies can require expensive equipment and complex analyses by skilled staff. Testing may require multiple samples to accurately assess origin. Cost can restrict how often companies or agencies test products, limiting testing to only certain high-risk products.

POLICY CONTEXT AND QUESTIONS

- Should the federal government support coordination throughout the supply chain to help industry more readily track and verify product origin?
- How might policymakers determine whether to support the development, maintenance, and sharing of reference libraries to more accurately verify product origin?

SELECTED GAO WORK

Blockchain: Emerging Technology Offers Benefits for Some Applications but Faces Challenges, [GAO-22-104625](#).

SELECTED REFERENCE

Rossi, S., Gemma, S., Borghini, F. et al. "Agri-food traceability today: Advancing innovation towards efficiency, sustainability, ethical sourcing, and safety in food supply chains." *Trends in Food Science and Technology*. vol. 163 (2025) <https://doi.org/10.1016/j.tifs.2025.105154>.

This document is not an audit product and is subject to revision based on continued advances in science and technology. It contains information prepared by GAO to provide technical insight to legislative bodies or other external organizations. This document has been reviewed by Sterling Thomas, PhD, the Chief Scientist of the U.S. Government Accountability Office.

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