

INDUSTRY REPORT

THE COLD TRUTH:

HOW DIGITAL WORKFLOWS ARE RESHAPING
THE END-TO-END COLD CHAIN

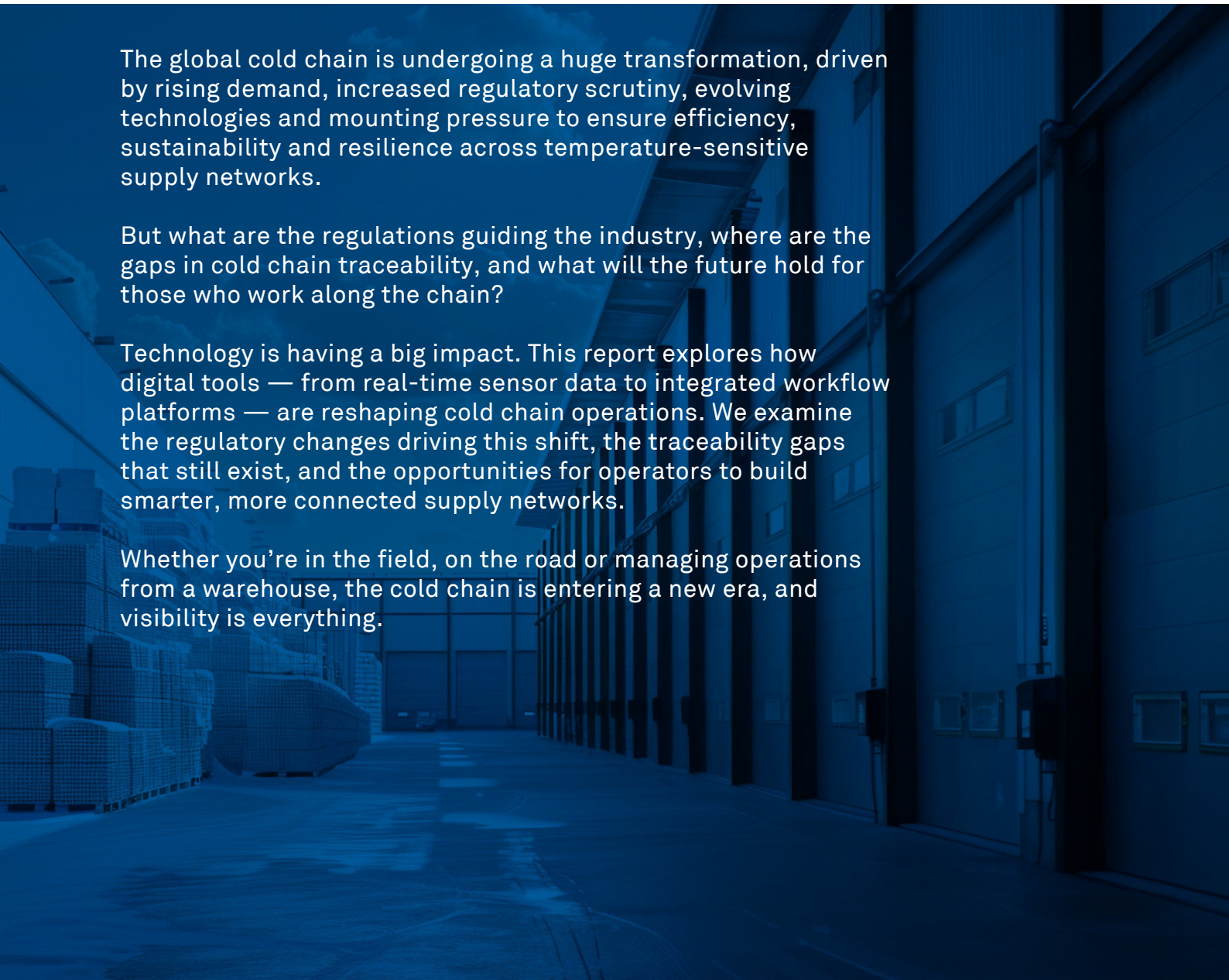
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The global cold chain is undergoing a huge transformation, driven by rising demand, increased regulatory scrutiny, evolving technologies and mounting pressure to ensure efficiency, sustainability and resilience across temperature-sensitive supply networks.

But what are the regulations guiding the industry, where are the gaps in cold chain traceability, and what will the future hold for those who work along the chain?

Technology is having a big impact. This report explores how digital tools — from real-time sensor data to integrated workflow platforms — are reshaping cold chain operations. We examine the regulatory changes driving this shift, the traceability gaps that still exist, and the opportunities for operators to build smarter, more connected supply networks.

Whether you're in the field, on the road or managing operations from a warehouse, the cold chain is entering a new era, and visibility is everything.



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SECTION 1

Why cold chain traceability is under the microscope



As the global cold chain strains under the weight of rising consumer expectations, food safety concerns and growing international trade, traceability has emerged as a critical focal point in ensuring the integrity and reliability of these supply systems.



Changing regulations

The US Food Safety Modernization Act (FSMA) represents a major shift in food safety regulation. Created in response to the high rate of foodborne illness and a rapidly changing global food system, the FSMA is designed to prevent contamination rather than respond to it.

Central to this effort is FDA Rule 204, which introduces new traceability requirements for high-risk foods such as leafy greens, cheeses and seafood. The rule mandates detailed recordkeeping of key data elements and critical tracking events across the supply chain, allowing for faster responses to foodborne illness outbreaks.

While it is a US regulation, FSMA's effect is global — exporters to the US must comply, and it sets a precedent that is likely to influence food safety standards in Europe, Australia and other markets.

FDA Rule 204 also marks a turning point in cold chain traceability, pushing the industry toward digital, real-time visibility and increased accountability.

Ashleigh Evans, General Manager of Game Farm, says she's seeing similar shifts in the Australian market. "There's a growing focus on consumer health, animal welfare, environmental impact and the need for transparency," she explains, adding that these factors are driving stronger traceability requirements and lifting expectations across the board.



Globalization and rising consumer expectations

Globalization and growing demand for fresh, perishable foods continue to stretch supply chains, adding pressure to cold chain logistics. Regulators are paying closer attention, and consumer expectations are rising just as fast. Many in the industry note a growing disconnect between the visibility offered in B2B logistics and the transparency consumers experience in eCommerce.

Today's retail customers can track a cheap online purchase minute by minute, yet real-time location and temperature updates for temperature-sensitive goods are still not the norm. Tolerance for that gap is shrinking, and operators in the cold chain face increasing pressure to close it and stay competitive.

Industry insight

Real-time visibility is no longer a nice-to-have in the cold chain. Customer tolerance for blind spots is shrinking fast.

SECTION 2

What do heightened regulations mean for the industry?

The US Food & Drug Administration reports that in the US, 48 million get sick each year from foodborne diseases. Almost 128,000 of those are hospitalized, and 300 people will die. With a clear focus on preventing rather than responding to foodborne illnesses, the FSMA's Rule 24 (d), or Traceability Rule, is designed to ensure faster identification and removal of contaminated food from the market. It applies to businesses involved in the production and distribution of a range of foods, including cheese, eggs, fish and certain fruits and vegetables.

The Traceability List has four key features:

Critical tracking events: Businesses will be required to capture and maintain data at specific points, including harvesting, cooling, initial packing, shipping and receiving, to allow products to be accurately traced.

Traceability lot code: This unique identifier is assigned at key moments in the food journey. It links all records across the chain and travels with the product so that it can be traced quickly and accurately in the event of a food safety issue.

Traceability plan: Businesses must develop a plan that details how they manage records, assign lot codes and identify foods. Maps and points of contact are required as part of these plans.

Additional requirements: Businesses must keep all traceability records in a specific format and make them available to the FDA within 24 hours of a request.



On 20 March 2025, the FDA announced plans to extend the compliance deadline for the Food Traceability Rule by 30 months, giving the industry more time to prepare thoroughly. The rule itself will not change, but by extending the deadline, the FDA recognizes the coordination that is needed to implement these rules, especially for businesses that rely on external partners who may lack visibility.

In Australia and New Zealand, traceability requirements are set by Food Standards Australia New Zealand (FSANZ). The requirements mean that producers, processors, logistics providers and carriers must have strong traceability systems in place that identify producers, suppliers, customers, and products, as well as lists of suppliers, customers, and transactions.

Traceability throughout the entire food supply chain is also mandatory under the EU's General Food Law Regulation. Food operators in the EU must be able to track food products from production, processing and distribution right through to the end consumer.

These developments reflect the global trend of more stringent traceability and compliance obligations in the cold chain sector.

"We're always looking at ways to prevent issues rather than contain them," says Ashleigh, adding that businesses like hers are proactively exceeding compliance standards and using risk-based approaches to prepare for stricter regulations.

SECTION 3

A role-by-role look at the cold chain

Ensuring the integrity of the cold chain isn't the job of a single sector, industry, or actor in the chain. Visibility and traceability stretch from the farm to the end customer and can include multiple stakeholders along the way. Each of those has a responsibility to track and capture data, ensure compliance, and transfer that information to any other player along the chain.

Let's explore the role of key roles along the chain to ensure visibility, traceability, compliance and, ultimately, food safety.

Farmers and producers: recording at the source

At the start of the chain, farmers are responsible for capturing important environmental and product data. For crop producers, this includes logging harvest time, temperature at the time of harvest and lot codes for raw commodities. For livestock producers, traceability begins with animal identification, on-farm temperature logging, and timely data capture during processing, such as slaughter or milking.

Even with strict protocols in place, Ashleigh notes, environmental variables can affect facilities' temperature and conditions, so adaptability is critical to remain compliant.

Packaging facilities: linking product to data

Packaging facilities take on the next link in the traceability chain. Their role is to log packing events, assign or maintain product identifiers and hand over accurate data to partners further down the chain.

In addition to traceability, they play a key role in ensuring products remain within required temperature thresholds. Robust internal systems and accurate recordkeeping to link each lot to its source, condition and environment are needed to achieve traceability and compliance at this stage.



Logistics partners: maintaining the cold chain in transit

Refrigerated truck drivers and logistics managers are the frontline protectors of cold chain integrity during transportation. They're responsible for in-transit temperature monitoring, geolocation event logging and triggering alerts if thresholds are breached. These data points are essential for accountability, especially over longer distances, where risk increases.

Warehouse and distribution: another key link in the chain

Warehouse managers must ensure the integrity of products that enter and then leave their facilities. Their role is to capture data related to receiving logs, cross-reference the data they have received from those further up the chain and flag any discrepancies in the condition of products or documentation. They're responsible for the integrity of the product while it is stored with them and then ensuring appropriate handover.

End customers: ensuring proof of provenance

At the end of the chain, retailers and restaurants increasingly demand more visibility from their suppliers and logistics partners and carriers. "Consumers are demanding more transparency and fresher, higher-quality products, placing pressure on retailers and restaurants to deliver — pressure that ultimately shifts to producers like us," Ashleigh notes. "This makes a fully transparent supply chain more important than ever."

Food producers and sellers must be able to prove provenance and demonstrate temperature compliance. "Quality is paramount, so implementing a robust supplier program is essential," Ashleigh adds. "Ensuring that every link in the supply chain maintains proper accreditation and full compliance is key to preserving the integrity of our products."



SECTION 4

The gaps in current systems



Despite the growing demands for traceability and compliance, many cold chain operators still rely on siloed systems that don't share data and on reactive rather than proactive processes. Here, we explore the current challenges in cold chain visibility that can lead to increased risk of spoilage, compliance breaches, financial loss and reputational damage.

Data gaps and siloed systems

Very often, cold chains don't fail due to a lack of data; they fail due to disconnected data. Businesses and operators can collect extensive data on asset location, condition and operator behavior, but without integration across systems, that information becomes fragmented, inaccessible and unused.

Manual and ad hoc systems

Many businesses still rely on spreadsheets, PDFs and manual logs. Even when digital systems are adopted, they're often implemented piecemeal, with little thought for integration. This can leave operators managing multiple platforms that don't communicate, each providing partial visibility for different parts of the journey.

The result is a fragmented data landscape (inconsistent, disconnected and difficult to scale) making it nearly impossible to achieve true end-to-end traceability.

Industry insight

Fragmented systems leave operators piecing together traceability data manually, a risky and unsustainable approach.



Reactive rather than proactive responses

Many companies are still working backwards from incidents rather than preventing them in the first place. Short-term logistics contracts often discourage long-term investment in advanced technologies, leaving operators patching issues after they've already caused delays or losses.

A recent [Maintain X report](#) found that while the use of predictive maintenance is increasing, organisations still heavily rely on run-to-failure maintenance for their assets. This reactive approach slows progress toward true end-to-end traceability.

Regulatory responses have also tended to be reactive rather than proactive, with regulatory bodies responding to incidents after they have occurred rather than implementing measures to prevent issues.

Device malfunctions

[IoT device failures](#) create visibility blind spots. A single malfunctioning sensor, say on a transportation unit, can cause temperature data to drop out, risking product integrity. Without full visibility and connectivity, these blind spots may go unnoticed until it's too late. The risk is delayed deliveries and compliance gaps, inviting unwanted disputes with suppliers and customers.

Across the cold chain, visibility isn't just about gathering more data; it's about connected, reliable and actionable data. Until systems are integrated and designed for resilience, compliance gaps will persist.

Human error and lack of training

Even with the right systems in place, human error can derail efforts. Ashleigh explains: "Sometimes you have processes and traceability, but the staff haven't been upskilled to match the compliance requirements. Things can still fall through."

Retaining and training the right people is critical to building a strong food safety culture that can act on data and not just collect it.

Even with the right systems in place, human error can derail traceability efforts. Missed scans, incorrect settings on refrigeration units or incomplete handovers can all undermine data accuracy. Building strong food safety cultures, supported by training and clear processes, is essential to turn collected data into reliable, actionable insights.

Perception of cost

While larger logistics providers and carriers are consolidating systems, many still hesitate to invest in advanced visibility tools due to perceived high upfront costs.

This perception often prevents businesses from pursuing solutions that could improve efficiency and compliance. But smart platforms like [Perspio™](#) help lower the barrier by tailoring solutions to business needs, avoiding unnecessary spending and making it easier to start small, and allowing scaling up in the future.



SECTION 5

The opportunity: How digital workflows support traceability and compliance

Sure, digital workflows improve efficiency, but when done right, they also become the foundation for reliable traceability and easier compliance in the cold chain. Here is how:

Real-time sensor data:

Capture temperature, location and event data as they happen. This allows for both preventative action and rapid response.

One source of truth:

Link data across the entire journey — from harvest to final delivery — for clear, continuous traceability.

Digital audit trails:

Automatically generate records for compliance and say goodbye to manual reporting or gaps.

Exception alerts and workflows:

Flag issues like temperature spikes immediately, trigger investigation steps and notify the right people.

Recall-ready:

With digital records and timelines, tracing issues back to the source is faster, more accurate, reduces risk and improves trust.

Customer service dashboards:

Give stakeholders central access to key metrics so they can plan around delays or disruptions.

Looking ahead:

Greater visibility unlocks new automation, like ETA updates and proactive alerts to drivers or rental fleets.

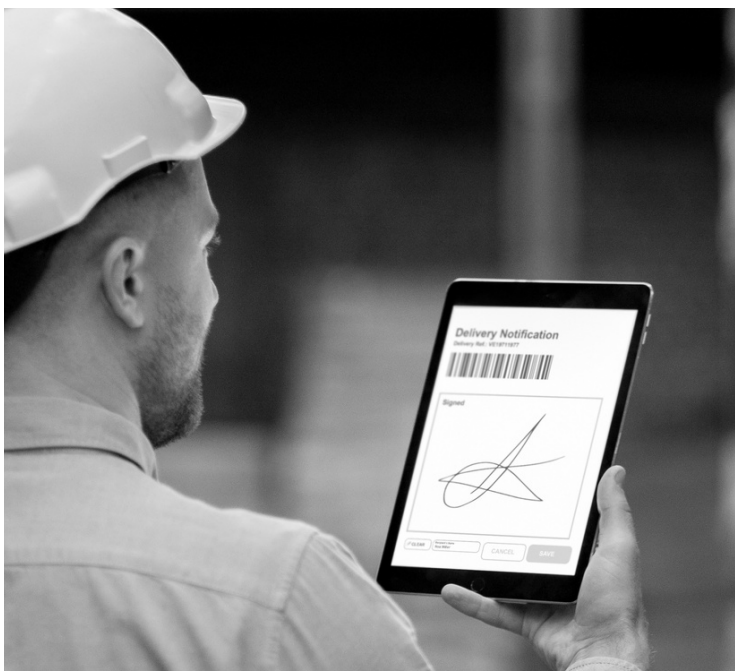
Perspio™ plays a critical role in stitching together data from fragmented systems, especially during busy periods or when subcontractors are involved. It ensures that every asset, sensor, and system is talking to you, and each other.

SECTION 6

Perspio™ in action: What a connected cold chain looks like

Cold chain logistics isn't just a matter of tracking your assets; it's also about understanding how they're performing at every point in the chain. From refrigeration status and asset handling to external environmental factors, Perspio™ gives businesses complete visibility across both owned and third-party fleets.

By unifying data from diverse devices and platforms, Perspio™ centralizes fragmented information into one clear operational view. Whether assets are running on your own systems or your partners', the platform adapts. There's no need to overhaul your operations — Perspio™ integrates with how you already work, enhancing visibility without disrupting workflows.



“

We plug into your world, not
the other way around

*Inauro Chief Commercial
Officer Max Girault*

Perspio™ brings together
assets with varied tools and
protocols, consolidating
everything into one system.

This makes it especially
suited to cold chain
applications, where control
over the entire logistics
chain is rare, but visibility is
non-negotiable.

“

“Cold chain visibility
requires more than just dots
on a map,” says Max. “True
visibility requires real-time
data, event-based alerts and
context you can act on.

Case Study: Scully RSV and Perspio

For Scully RSV, a national fleet operator with both rental and sales customers, Perspio™ became the backbone of a new level of operational transparency. Inauro integrated the AI-powered platform with the company's existing telematics systems and sensor hardware, collecting live data on temperature, driver behavior and vehicle usage.

The result? A connected ecosystem that supports compliance and customer experience. As Scully RSV grows and evolves, Perspio™ grows, too.

"Every client has different systems, devices and assets, but they all want one thing — clarity," says Max. "That's what Perspio™ provides."

Connect what you have. Grow where you need

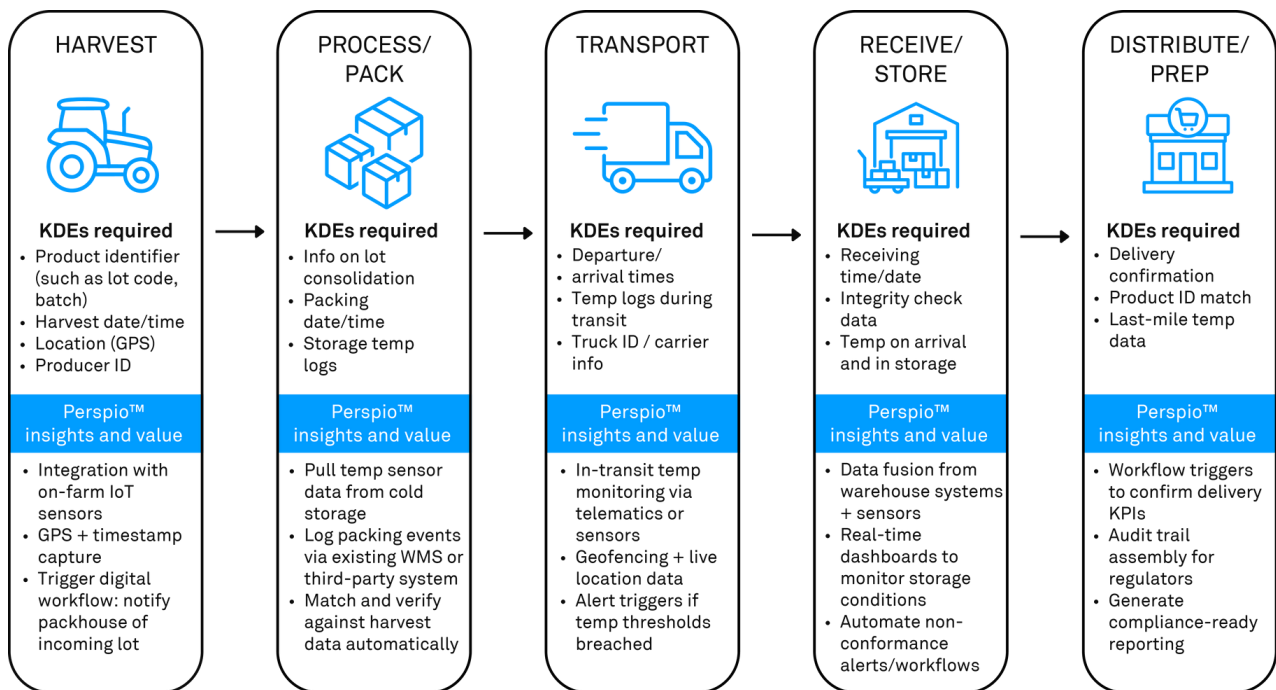
Perspio™ supports role-based access and scalable deployments. Its flexible integration model allows businesses to ingest data from almost any source, whether an existing system or a new device, without compromising security or operational integrity.

From real-time alerts and automated reporting to workflow automation across the supply chain, the platform enables faster decision-making and smoother operations.

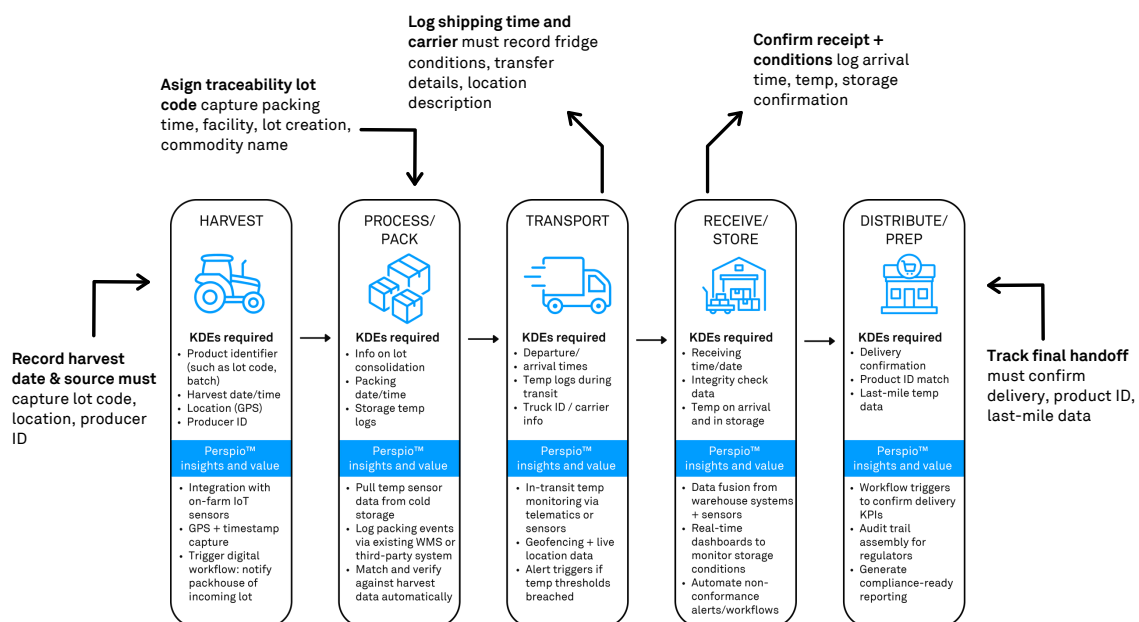


SECTION 7

End-to-end digital traceability



End-to end digital traceability: FMSA focus



SECTION 8

Ready to close the cold chain visibility gap?

Achieving end-to-end cold chain traceability is no longer optional and doesn't have to be complex. The key is real-time data, seamlessly integrated across systems and partners.

That's where Perspicio™ comes in. Developed by Inauro, Perspicio™ is a powerful, AI-powered data integration platform that connects assets, sensors and software to give you complete operational visibility, whether you're managing your own fleet, working with subcontractors, or both.

With Perspicio™, you can:

- Monitor temperature, location and compliance in real-time.
- Automate alerts and workflows to respond fast when something's off.
- Build digital audit trails that support regulatory compliance.
- Connect data from multiple systems with no need to rip and replace.
- Scale traceability with minimal friction and maximum flexibility.

Unlike off-the-shelf IoT tools, Perspicio™ adapts to your workflows. We start with how you operate, then tailor the technology to support it, not the other way around.

So whether you're a grower, a packer, a warehouse manager or a fleet operator, we're here to help you transform how you track, protect and deliver what matters most.



Ready to connect your cold chain?

Let's talk!



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Regulatory and government sources

US Food and Drug Administration (FDA)

[Food Safety Modernization Act \(FSMA\) – Food Traceability Rule \(Rule 204\).](#)

Food Standards Australia New Zealand (FSANZ)

[Traceability Requirements for Food Businesses](#)

European Commission

[General Food Law Regulation \(EC\) No 178/2002](#)

Expert commentary and interview

Ashleigh Evans, General Manager, [Game Farm](#) – comments on compliance trends, pathogen risks, process gaps, and increasing customer expectations.