



Trusted traceability: producer-centred information for sustainable supply chains

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Introduction

With financial support from the ISEAL Innovations Fund, Fairtrade International researched, developed and tested practical approaches to trusted sustainability information exchange. In response to the immediate challenge of the EU Deforestation Regulation (EUDR), applicable to coffee and cocoa as major Fairtrade products, we asked how Fairtrade producers and cooperatives could securely and efficiently share trusted geolocation and deforestation data with commercial partners, whilst maintaining visibility and control over how their information was used.

As a starting point, we examined the roles of Plot Insights (Fairtrade's newly-launched digital geolocation system) and Fairtrace, the transaction data platform for all Fairtrade-certified supply chain actors. Could we connect these platforms to form the basis of a trusted traceability system?

Our research included extensive interviews with producers, exporters, traders, importers, manufacturers, retailers, national institutions and other sustainability initiatives across coffee, cocoa and banana supply chains.

We were also guided by Fairtrade International's newly-adopted Global Data Governance Policy and took the opportunity to translate those governance principles into practical action.

Our proposal for a Fairtrade trusted traceability model is not a blueprint for all supply chains or all commodities. It is an experimental approach and a set of emerging principles, tested through our own systems and commodity research. We hope it provides a model for trusted information exchange which goes beyond EUDR requirements — for example, the same approach could potentially support the future exchange of supply-chain-specific greenhouse gas (GHG) emissions data and other sustainability information.

We invite other voluntary sustainability standards (VSS) to test, challenge and adapt our proposals. If, as we believe, this model proves useful across different systems, commodities and organisations, it could eventually provide the foundation for a shared collaboration framework.

Why information governance matters for trusted interoperability

Connecting systems and exchanging information is only part of the challenge. For information exchange to be trusted, there also needs to be clear governance of how information is collected, accessed, shared and used.

Other considerations include who can access it, for what purpose, and how the interests of those providing the information are protected. Fairtrade International's Global Data Governance Policy provides the principles that guide this approach:

- Data use and sharing contributes to equitable value sharing.
- Data providers and subjects remain in control of their information.
- Data is only used for transparent, mutually-agreed purposes.
- Accurate, reliable and high-integrity data streams are maintained.
- International privacy frameworks and local data protection laws are adhered to.

Poor data governance can cause costly disruption to supply chains and undermine trust in sustainability reporting.

Trusted, traceable data enables everyone in the supply chain to prove ethical sourcing, comply with environmental and human rights legislation, and meet customers' and regulators' expectations.

It helps prevent fraud, greenwashing and 'fairwashing' whilst identifying risks, weak spots, supplier disruptions or sustainability threats before they damage operations.

Fairtrade believes that producers should have visibility and control over the information they generate and manage. As sustainability reporting and due diligence requirements grow, they are increasingly asked to share information with buyers, traders, retailers, certification schemes, regulators and other partners.

Yet information about their farms and sustainability risks may sometimes be analysed or used downstream before producers themselves have had the opportunity to see and understand the results. Producer-centred information governance means changing this dynamic: producers should be the first to access and benefit from their information, and retain visibility over what is shared, with whom, for what purpose, and in which version.

Principles of fair data management

Producer-led information management starts with fair data standards to govern how data is handled.

- Producers should know what data is being collected, why it is being collected, and who can access it.
- They should retain control over how their data is used, shared and stored, with the ability to withdraw consent where appropriate.
- Data collection and use should be explained in clear, accessible language.
- Producers should provide informed consent before data is collected or shared, understanding both the potential benefits and risks.
- Data should deliver tangible benefits to producers as well as others in the supply chain.
- Common standards and interoperability should make it possible to reuse trusted information across different systems and relationships where appropriate, rather than requiring producers to recreate or manually re-enter the same information each time.
- Producers should be able to move or share their data easily between trusted platforms and service providers.

- Data should be stored securely and protected from misuse or unauthorised access.
- Clear governance arrangements should define responsibilities, accountability, data quality standards and mechanisms for addressing grievances or misuse.

Fairtrade producers already have more of a say over how their data is managed because the Fairtrade system is 50 percent co-owned by farmers and workers themselves. This co-ownership structure means producer organisations have an equal voice when it comes to setting prices, standards and global data governance.

The role of VSS in trusted interoperability

Voluntary sustainability standards (VSS) occupy a unique position connecting producers, supply chains and assurance systems. VSS can leverage established relationships with cooperatives and commercial buyers to bridge the gap between producers' sustainability data, independent technology providers such as software vendors or buyer platforms, and commercial supply chain actors.

VSS have the potential to foster consistent, trusted and decentralised information exchange across the entire supply chain ecosystem. Rather than centralising control on a single platform or trying to replace existing systems, VSS serve as trusted data governance orchestrators.

They create an enabling framework that allows different platforms to connect and interact seamlessly. They also work with producers to develop key governance principles, data requirements and interoperability standards built on existing realities, including capacity and access.

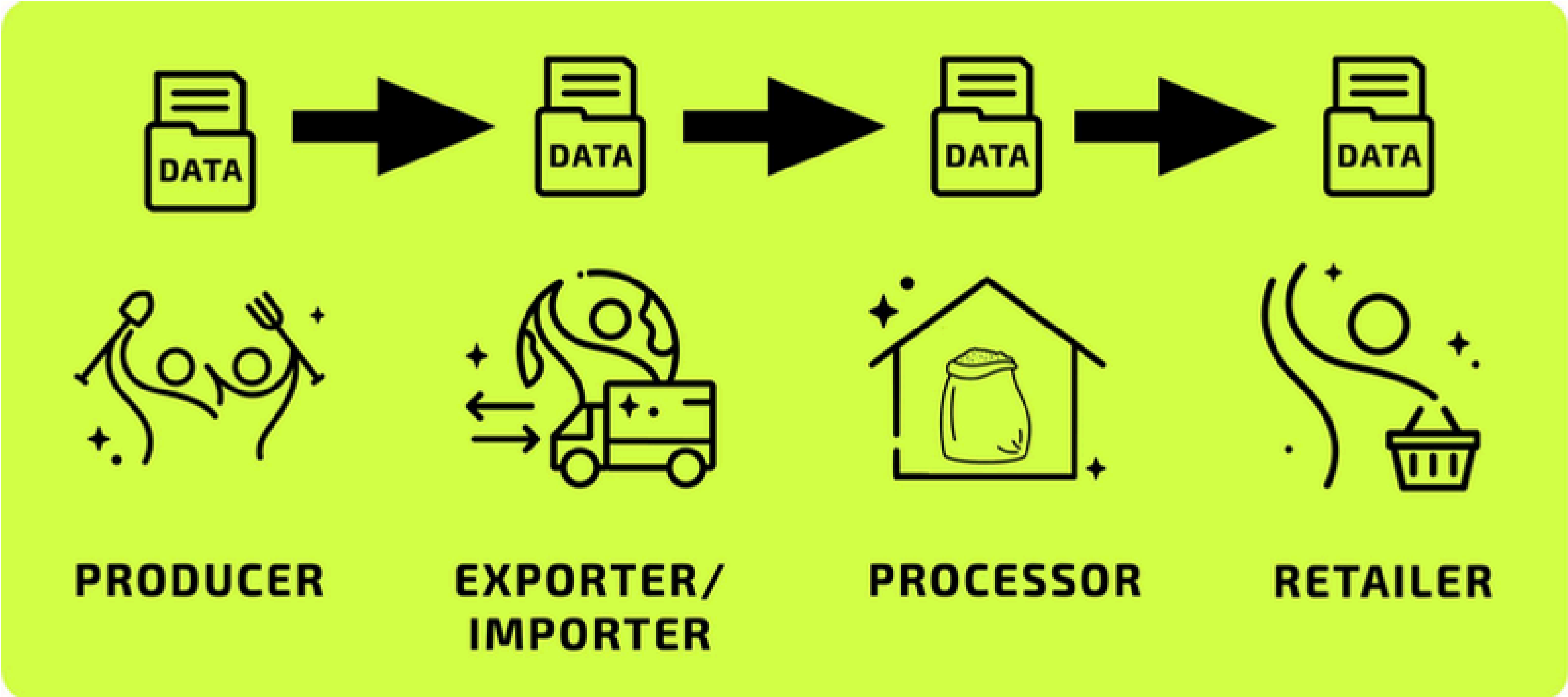


Figure 1: Today's reality (above):
A producer organisation is simply the first stage in the supply chain, providing a one-way flow of information to other supply chain actors with little or no say over who has access, how it is used and where it ends up.

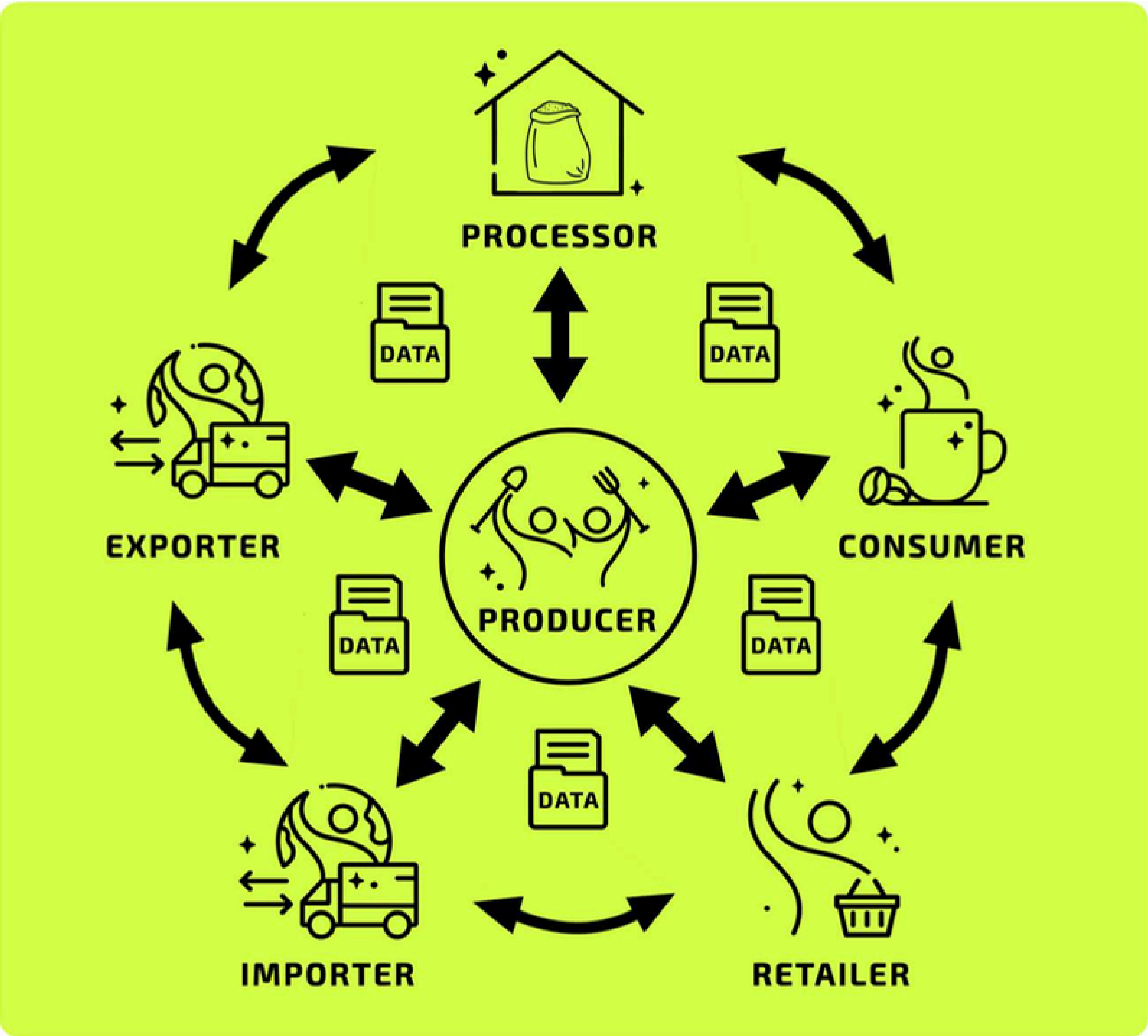


Figure 2: Tomorrow's vision (left):
A producer organisation is at the centre of a multi-way shared data ecosystem, retaining oversight of tracking, data, access, management and exchange of data, whilst benefiting from market insights.

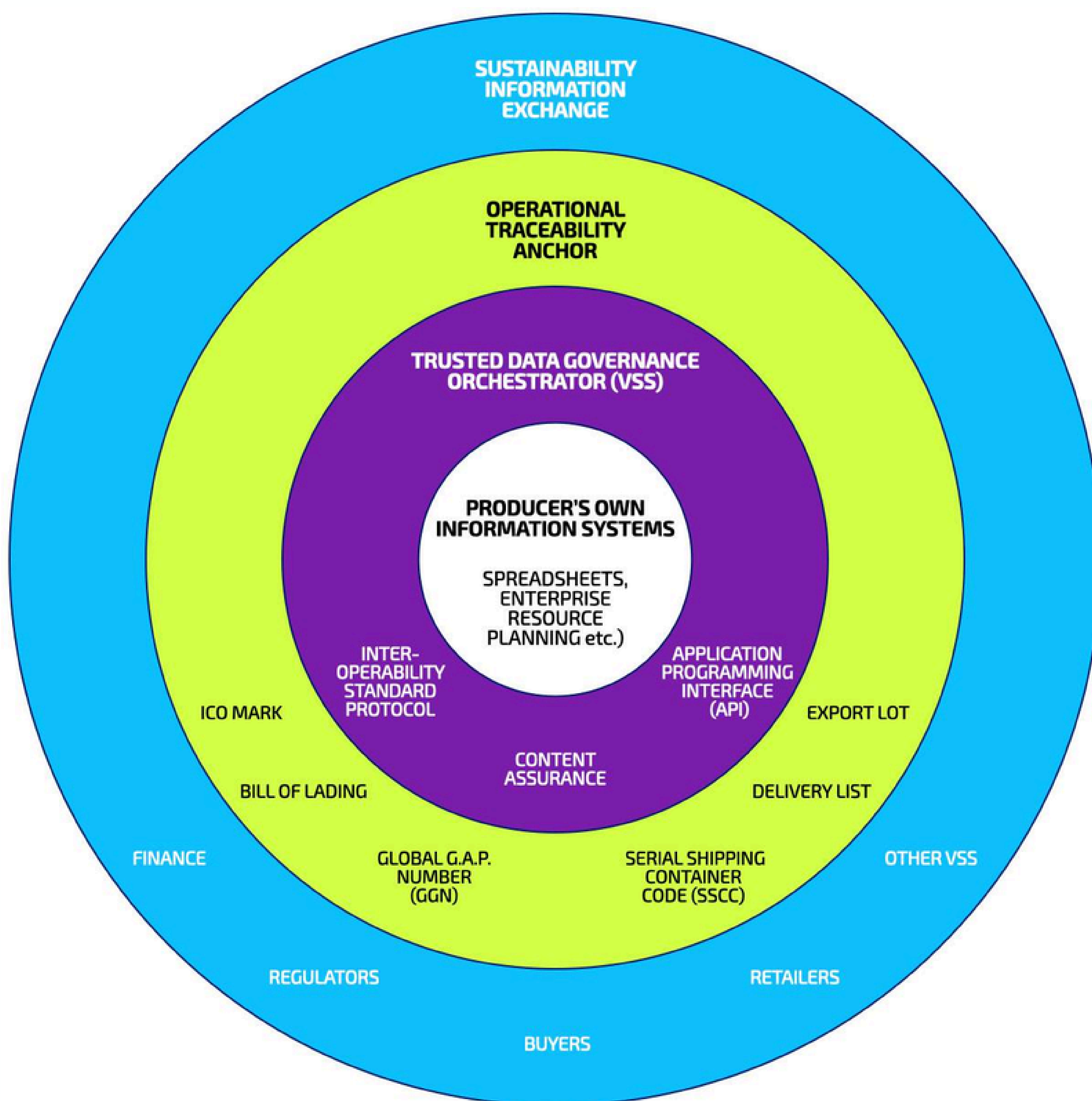


Figure 3: The role of VSS in connecting producers' information systems with external actors through trusted governance and Operational Traceability Anchors.

Under our proposal, the VSS acts as a trusted data governance orchestrator, linking data with commercial partners and protecting sensitive data by aggregating insights from across the supply chain.

Responsibilities include:

- Purpose and access (who can use what information and why).
- Confidentiality (appropriate information only reaches authorised actors).
- Integrity and version management (information quality and versions are managed).
- Authenticity/assurance (information is associated with a verified producer source).
- Accountability (information exchange happens within governed and auditable relationships).

- Reciprocity (the information creates value which is returned to producers).

Our research showed that producers do not oppose data sharing: they simply want better visibility over its use, and reciprocal access to insights such as deforestation risks and market trends. Our aim is not to replace the buyer-controlled platforms with one controlled by the VSS, but to enable producers to connect verified data across diverse systems without duplicating efforts or giving up data ownership.

This model also enables trusted information to be reused across different sustainability frameworks and national traceability schemes, laying the foundations for shared interoperability principles which allow producers, VSS, national systems and commercial partners to exchange trusted information.

Fairtrade data systems and data exchange

Fairtrade data systems are built around fair data management principles (p. 5), which we followed when developing the geolocation information-sharing architecture. They include:

Plot Insights - where Fairtrade coffee and cocoa producer organisations manage their members' plot geolocation data and receive deforestation risk analysis.

Fairtrace - where sales of Fairtrade products are tracked throughout Fairtrade supply chains, recording transactions including volumes traded and Fairtrade Premium paid, accessible to Fairtrade traders.

GeoLink - the Application Programming Interface sending data securely between Plot Insights and Fairtrace.

Exporters create a contract in Fairtrace, creating a commercial

relationship between a producer organisation, exporter, and importer. Cooperatives access the contract in Plot Insights, where they attach a list of plots and associated geolocation data. This is securely sent to Fairtrace via GeoLink where the trade partners can access it. Operational references — e.g. an export lot or International Coffee Organisation (ICO) Mark — could be used to link that data with subsequent product movements and transactions.

The result is a governed connection between producer information, commercial relationships and operational traceability, without requiring use of the same digital system. Producers also get greater visibility over what information is shared and in which commercial context, while allowing others in the downstream supply chain to access the information they need.

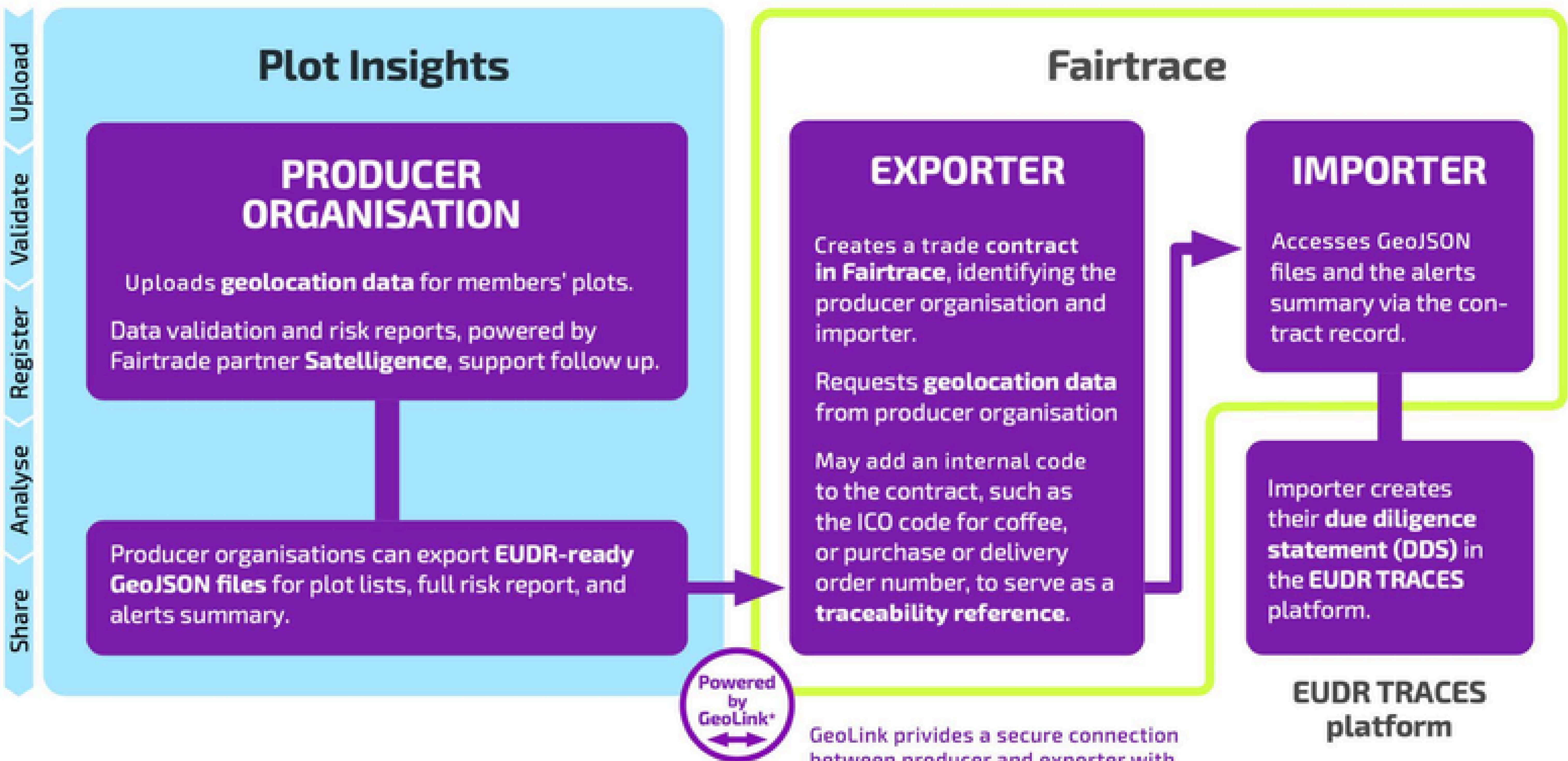
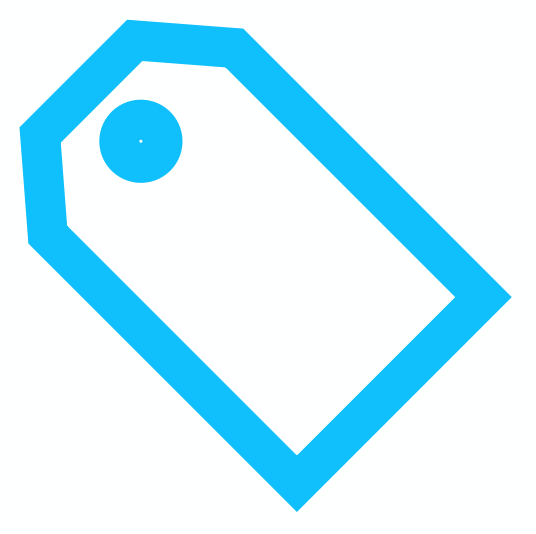


Figure 4: Fairtrade geolocation information-sharing architecture, including Plot Insights, Fairtrace, and GeoLink.



Trusted interoperability and Operational Traceability Anchors (OTAs)

Governance alone does not solve the challenge of practical traceability: how can producer-originated sustainability information remain connected to the relevant product or commercial transaction as it moves through different stages of the supply chain using different digital systems?

Fairtrade explored this challenge through the concept of key tracking events along the supply chain from origin to market — for example, when products are aggregated, processed, packed, shipped or received. These events often generate operational references such as lot numbers, shipment references, container numbers or pallet identifiers. Rather than creating another identifier or requiring everyone to adopt the same traceability platform, we realised these existing operational references could be reused as connection points between different systems.

OTAs are existing references associated with a product, commercial transaction or key tracking event which helps preserve producer-originated sustainability data throughout the supply chain.

The OTA does not contain all sustainability information, nor does it render that information automatically trustworthy or tamper-proof. Its role is simply to provide different supply chain actors and systems with a common reference connecting relevant information. The trust comes from governance and assurance surrounding the information exchange, including who can access information, for what purpose, under which commercial relationship, and how its quality and provenance are managed.

Our research pointed to another key lesson: we don't have to reinvent the wheel. Many supply chains already contain potentially useful traceability references — in coffee, for example, the ICO Mark is created through established export processes and travels with commercial documentation.

Rather than introducing a new Fairtrade identifier, we explored whether the ICO Mark could connect producer-originated data with transactions already reported through Fairtrade systems.

Different commodities use different traceability references. Cocoa uses producer delivery records, export lots, container numbers and shipment documentation at different stages. Bananas use box, pallet and logistics references, although these connections may change during ripening and downstream distribution. Our objective is therefore not to find one universal OTA for every commodity, but to identify which existing traceability references — or relationships between them — can practically maintain the connection between producer information and commercial activity.

What makes a good OTA?

An OTA does not need to reveal the producer's information to every supply chain actor. A trusted data governance orchestrator can maintain connections while sharing only the information appropriate for each relationship and purpose. Each potential OTA should be assessed by asking:

- **Is the OTA already used operationally?** Ideally, it should reuse data from existing business processes rather than creating new reporting requirements.
- **When is the OTA created?** It should be established at a key supply chain tracking event such as aggregation, processing, shipping or receiving.
- **Can it be connected to the producer source?** It should establish a reliable and trusted relationship with the producer(s) providing the data.
- **Is the OTA visible to supply-chain actors who need to see it?** It should travel far enough through the supply chain to connect the relevant systems or transactions.
- **Is it sufficiently unique and reliable?** It should be able to distinguish the transaction, lot or shipment without creating ambiguity.
- **Does the OTA protect commercially sensitive information?** It should connect information without revealing producer identities, sourcing relationships or other commercially sensitive information unless authorised.
- **Does it remain useful after the product has been aggregated or transformed?** It should be able to connect identifiers even if they change along the supply chain.
- **Is it operationally proportionate?** The value of the traceability data should justify the effort required to capture and maintain the reference.
- **Does it enable a reciprocal information flow between producer and commercial actors?** Producer data should support downstream due diligence and reporting, while aggregated market, risk and impact information should return to the producer.

What we learned: principles for trusted information exchange

Our research did not identify a single technical solution which could be applied across all commodities and supply chains. Instead, we have designed a set of questions to inform the design of trusted sustainability information exchange, covering purpose and governance to operational realities.

Our long-term vision is for an information environment in which producers are free to choose the systems that best support their own operations, while trusted governance and common interoperability standards allow the relevant data to flow as needed between VSS, national and commercial systems.

Rather than producers having repeatedly to input their information into disconnected downstream platforms, our aim is to make trusted information reusable across different supply chain relationships while allowing producers to maintain oversight of their data.

We have tested elements of this vision within Fairtrade. Further collaboration with other VSS, national systems and supply-chain actors would be needed to understand whether these principles could eventually contribute to a broader interoperability framework.

Eight questions about information governance in supply chains

Purpose: what is the information for? Regulation, due diligence, risk management, commercial decision-making, sustainability reporting or creating value for the producer?

Need: what information is really necessary? Could verified attributes, aggregated information, risk indicators or other trusted information be used instead of complete datasets?

Autonomy: how can producers access, manage, understand, share and benefit from their data whilst avoiding dependency on buyer-controlled systems?

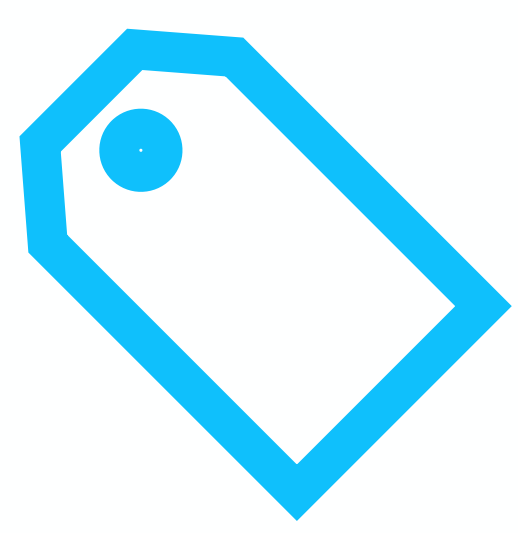
Infrastructure: do producers already have an information management system? If so, can it interact with trusted VSS infrastructure without surrendering oversight, control and value of their data?

Governance: which trusted VSS, national body or trade organisation — or combination — can regulate purpose, access, assurance, confidentiality, aggregation and accountability?

OTAs: are there any existing operational references which could connect the producers' original data with transactions along the entire supply chain?

Attribution: how do physical traceability, product mixing, allocation and chain-of-custody rules affect the information relationship and the claims that can be made?

Proportionality: what detail of information should be verified and reported? A granular traceability reference does not always need to be the reporting unit.



Applying the lessons of trusted interoperability in three different supply chains: coffee, cocoa and bananas

Our proposal for fair data governance principles combined with the use of Operational Traceability Anchors emerged from interviews, research, prototype testing and pilots across coffee, cocoa and banana supply chains. Each commodity revealed a different interoperability reality.

Coffee provided the clearest proof-of-concept through the ICO Mark; cocoa highlighted the importance of maintaining continuity between multiple existing operational references and national systems;

and bananas showed that extensive physical traceability does not necessarily ensure that information provided by the producer remains connected across different supply chain actors and systems.

Coffee: leveraging the ICO Mark as an existing reference

We realised that coffee does not necessarily need a new identifier. Sometimes the most useful connectors already function within existing supply-chain operations and reporting.

However, they still require a trusted governance orchestrator which allows them to work together while ensuring producers retain oversight over, and benefit from, the information they provide.

We believe that relying solely on identifiers such as the ICO Mark is not enough. Effective information exchange requires supporting governance frameworks, data-

sharing agreements and trusted institutions to manage and validate data sharing.

In 2025, Fairtrade made reporting the ICO Mark mandatory for coffee transactions wherever available. Recording ICO Marks in the Fairtrace system allows Fairtrade to link transactions of the same coffee all the way along the supply chain. By analysing these connections, we can map supply chain relationships and apply the reciprocity principle: returning aggregated data to the producer while supplying aggregated data to commercial partners in the supply chain.

Ultimately, our research shows that an existing industry reference — in this case, the ICO Mark — can connect disparate systems without the need to create a new identifier or platform.

What coffee taught us

Traceability and interoperability must be tailored to specific commodities based on their supply chain movement, physical transformation and existing identification systems.

Coffee currently offers the strongest model for trusted interoperability, with the global ICO Mark serving as a unified export identifier. Because coffee beans remain physically identifiable until roasting, the ICO Mark can track product throughout most of the supply chain, facilitating commercial links and due diligence across systems.

Cocoa

We found no common reference equivalent in cocoa supply chains to the ICO Mark for coffee. Several references may be needed instead and interoperability may depend on preserving the links between existing records as cocoa moves through different supply-chain models.

Our research found that producer delivery records, export lots, containers and shipment documents can each provide useful traceability at different stages. Rather than creating a new identifier, we suggest connecting these existing references and, where possible, interoperating with national and company traceability systems.

Whatever the approach, it needs to reflect cocoa's chain-of-custody model. In segregated supply chains, digital continuity can potentially be preserved from producer delivery to export lot to shipment. However, where cocoa enters a mass balance system, the challenge shifts from physical traceability to credible volume attribution and inventory governance.

What cocoa taught us

Interoperability does not always require one universal identifier. Sometimes the solution lies in preserving the relationships between existing identifiers and systems.

The ICO Mark

The potential use of the International Coffee Organisation (ICO) Mark as a trusted reference emerged through existing Fairtrade reporting and coffee export practices. It has been in use since the 1960s and is both a widely recognised standard protocol for coffee and a key trusted reference.

This makes the ICO Mark a promising connection point between producer information and downstream transactions, while giving producers better visibility over how their data is used.

The ICO Mark is a unique tracking code printed on green coffee bags and shipping documents. It links every traded shipment back to its origin country and exporter.

It consists of a 3-digit country code, a 4-digit producer or exporter code, and a 5-digit shipment number.

The resulting unique code is stamped, printed or attached on a metal strip on every bag in a specific shipment.

Each ICO Mark matches an official ICO Certificate of Origin issued by the exporting country's customs or certifying agency.

However, the ICO Mark only verifies data relating to country and shipment: it cannot tell you which producer grew it, the exact geolocation of origin or the crop year.

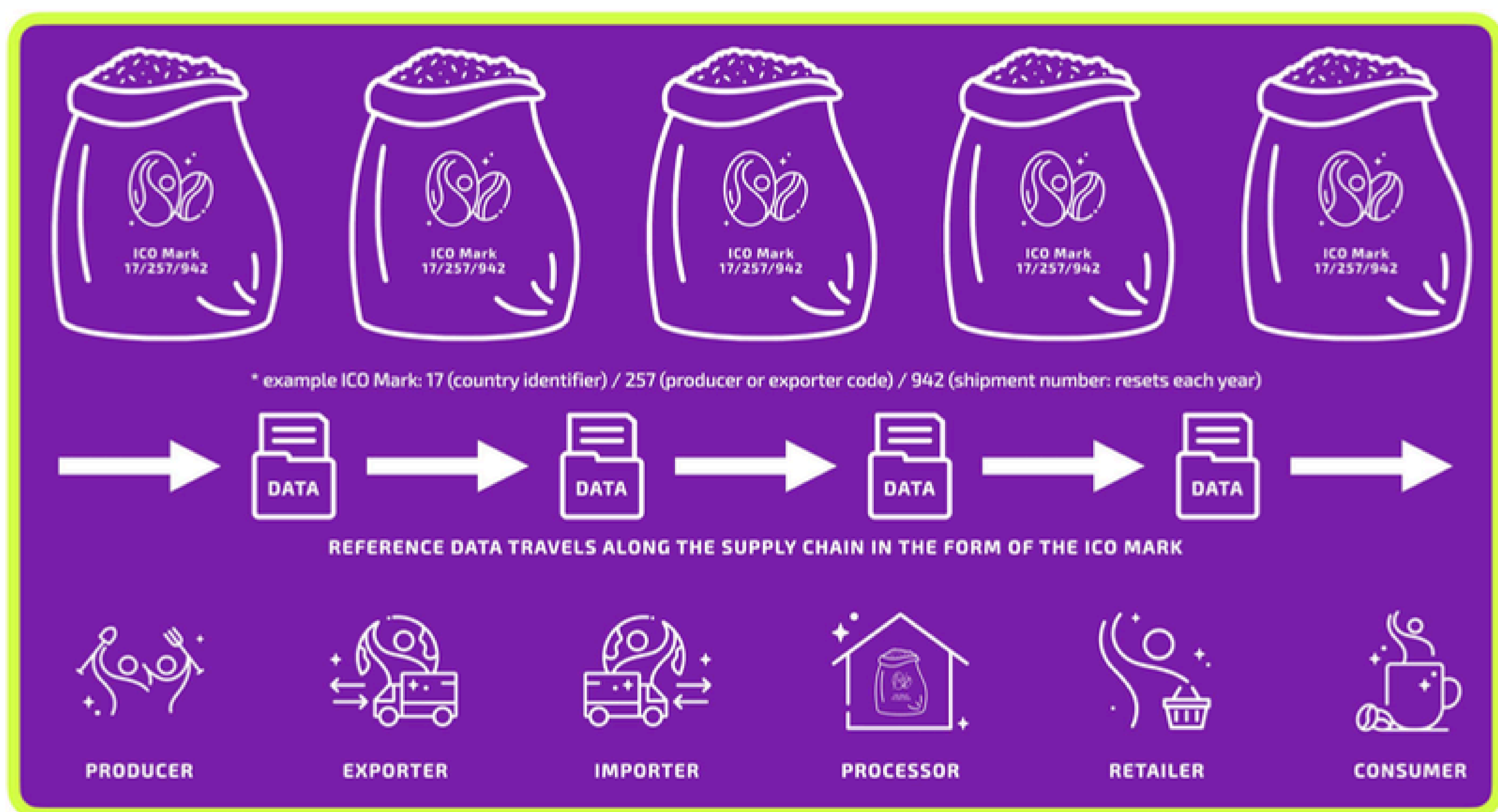


Figure 5: How the ICO Mark travels along the coffee supply chain carrying reference data

Bananas

Extensive physical traceability already exists in banana supply chains, but interoperability is complicated by commercial sensitivities and gaps between logistics references.

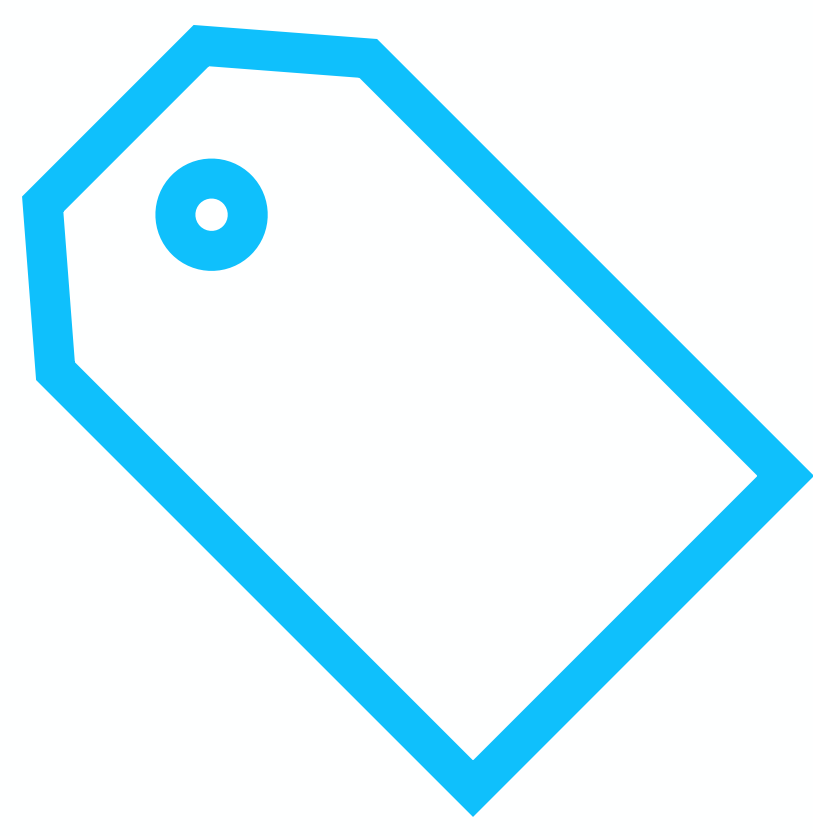
Bananas are already highly traceable operationally, but the identity of the producer can become lost as logistics references change along the supply chain.

We found that packing lists can connect producer organisations and shipped volumes, while pallet identifiers such as the Serial Shipping Container Code (SSCC) already travel through export, import and ripening operations. So rather than creating a new identifier, we see an opportunity to connect the commercial information in the packing list with the SSCC attached to the product.

The next step is to explore whether the relationship between the packing list and the SSCC could be maintained through the ripening stage and used to reconnect downstream banana volumes to the producer of origin, without requiring commercially sensitive sourcing information to travel openly through the chain.

What bananas taught us

Physical traceability is not enough. Interoperability depends on maintaining the digital links between the references already used by businesses. Unlike coffee and cocoa, bananas are not covered by the EUDR, so the immediate regulatory incentive for interoperable sustainability information exchange is different.



At-a-glance: testing the use of Operational Traceability Anchors in coffee, cocoa and banana supply chains



Figure 6: Traceability anchors tested by commodity

How to read the graphics:

Information flows along the supply chain from producer to end user are indicated by horizontal left to right arrows.

The tested digital information connections are shown along the bottom, with vertical arrows pointing to each stage of the supply chain.

Summary: what we learned

Trusted interoperability does not mean standardising every commodity around one identifier. We found three different pathways:

- Reusing a shared reference where one exists — for coffee, the ICO Mark can act as a common reference across systems although we also identified governance and validation limitations.
- Connecting multiple references where traceability is fragmented — for cocoa, connecting these references preserves continuity between producer deliveries, export lots and shipment references, which is well-suited to segregated and mass-balance chains.
- Preserving existing links where operational traceability is already strong — for bananas, this means connecting packing-list information with logistics identifiers such as the Serial Shipping Container Code so producer attribution is not lost downstream.

As we continue to stress-test our approach, we fully acknowledge our model is neither complete nor universally applicable. Rather, it is a practical, evolving framework built on Fairtrade's experience, and we invite others to help us develop it further.