



Strengthening the Fight Against Illegal Timber in the Wood Products Supply Chain

Using RFID, Bar Codes & Digital Traceability to Authenticate Forestry Chain of Custody White Paper

Executive Overview

Illegal logging and the trade of illegally harvested timber remain significant challenges for governments, forest managers, manufacturers, retailers, and consumers. Once illegally harvested wood enters a legitimate supply chain, it can be difficult to distinguish from legally sourced material—particularly when products are aggregated, transformed, or traded through multiple intermediaries.

Digital traceability technologies such as [RFID](#), [bar codes](#), [mobile computers](#), [automated scanning](#), and [centralized databases](#) can help reduce this risk by creating a verifiable chain of identity and custody from forest to finished product. Research identifies RFID, bar codes, and other digital identification technologies as practical tools for tracking wood through harvesting, transportation, processing, and distribution.

These technologies do not, by themselves, prove that timber was legally harvested. Rather, they create the digital infrastructure necessary to document where material originated, who handled it, where it was processed, and how it was transformed, making unexplained substitutions and undocumented material substantially more difficult to introduce into the legitimate value stream.



**INTERNATIONAL
BAR CODING**
SYSTEMS & CONSULTING

Phone: 250 493 3201

Website: www.ibcworld.net

Email: sales@ibcworld.net



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The Traceability Challenge

Illegal timber can enter legitimate commerce through document fraud, inaccurate declarations of origin, unauthorized harvesting, substitution of species, commingling with legally sourced material, or weaknesses at points where custody changes hands.

A traditional paper-based system may record that a load was received, but it may not provide a reliable digital connection between the physical material and its source. Once logs are mixed in a yard or transformed into lumber, tracing an individual unit back to its origin becomes increasingly difficult.

Modern regulatory frameworks recognize the importance of supply-chain traceability. For example, European timber rules have required supply-chain participants to retain information about suppliers and customers, while supply-chain control systems emphasize the ability to trace timber from harvesting or legal import through subsequent stages.

The objective, therefore, is not simply to "barcode lumber." It is to establish a **digital chain of custody**.

Building a Digital Chain of Custody

1. Digitally Identify the Source

The process can begin at the forest. Each harvest area, timber lot, truckload, or individual log can receive a unique digital identity. Depending on the operation, this may involve 1D/2D bar codes, RFID tags, GPS coordinates, harvest permits, supplier information, species information, volume, and harvest dates. The resulting digital record can establish the initial identity of the material before it enters the commercial supply chain. Research examining timber tracking systems identifies RFID, bar codes, microchips, and other digital technologies as increasingly important methods for recognizing and monitoring wood products.

2. Track Material Through Transportation

When logs leave the forest, their digital identities can be captured at loading and receiving points.

Mobile RFID or barcode equipment can associate a load with:

- Supplier
- Harvest location
- Timber lot
- Truck or shipment
- Species
- Quantity or volume
- Date and time
- Supporting documentation

Each subsequent transaction becomes another digital event in the chain of custody.



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3. Prevent Unexplained Material From Entering Inventory

One of the most important applications occurs at the receiving point.

An automated receiving system can require every incoming load to have an identifiable source record before it is accepted into inventory. Material without the expected identification, documentation, or supplier record can be flagged for investigation rather than being automatically incorporated into legitimate inventory.

This creates a critical control point between **unknown material and accepted inventory**.

The European Commission's supply-chain control guidance similarly emphasizes identifying supply-chain operators and stages and establishing methods to identify product origin and prevent mixing with timber from unknown sources.

RFID and Bar Codes: Complementary Technologies

RFID and bar codes serve different but complementary purposes.

Bar codes are inexpensive, highly standardized, and effective where a scanner can obtain line-of-sight access to the identifier. They work particularly well for lumber bundles, cases, pallets, paperwork, and finished products.

RFID can provide automatic identification without requiring direct visual alignment. Fixed [RFID portals](#) can automatically record material moving through receiving docks, production lines, inventory areas, and shipping points.

Mobile RFID computers can also be used for cycle counting and inventory verification.

Research specifically examining RFID in forestry supply chains describes its potential for tracking material from tree marking through transportation and processing, while identifying benefits including improved traceability and combating illegal logging.

A hybrid system can therefore use RFID for automated movement detection and bar codes for economical identification at fixed or mobile workstations.

Connecting Raw Material to Finished Products

Traceability becomes particularly powerful when digital identities survive the transformation process. For example:

Forest → Harvest Lot → Log → Sawmill → Production Batch → Lumber Bundle → Pallet → Distributor → Retailer

A sawmill can digitally record which logs entered production and associate them with the resulting production batch. The resulting lumber can then receive a new barcode or RFID identity while maintaining a digital relationship to the original raw-material records.

This creates a **parent-child relationship** between raw materials and finished products.

Research has demonstrated the feasibility of combining RFID-based physical traceability with digital information systems to follow wood from standing trees through harvesting and sawmilling to finished products.



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Creating an Audit Trail

A robust traceability platform should capture every significant transaction:

- Who received the material
- Where it came from
- When it arrived
- Where it was stored
- Who moved it
- When it entered production
- What products were produced
- Where those products were shipped

The result is an electronic audit trail that can be analyzed when discrepancies occur.

If a shipment of questionable timber is discovered, an organization can potentially move **backward** through the chain to identify its source, or move **forward** to determine which products, customers, or retail locations may have received material from the affected lot.

From Compliance to Risk Management

Digital traceability should not be viewed as a guarantee that illegal timber cannot enter a supply chain. Technology cannot replace legitimate harvesting permits, supplier due diligence, inspections, certification, or regulatory enforcement. Instead, digital systems create **evidence and control points** that make the supply chain more transparent and auditable.

A 2024 review of timber traceability research found that commonly used approaches include bar codes, RFID, NIRS, blockchain, stable isotopes, wood marking, certification, and other methods, with researchers increasingly recommending combinations of methods rather than reliance on a single technology.

The strongest approach is therefore layered:

Verified sourcing + digital identification + automated tracking + physical controls + audit trails + risk assessment



2D Datamatrix Bar Code on Pack of Finished Wood Products



RFID & 1D Bar Code on Pack of Finished Wood Products



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Conclusion

Illegal timber thrives where supply chains contain gaps in information, accountability, and verification. RFID, bar codes, mobile computing, automated scanning, and centralized traceability software can help close those gaps by creating a persistent digital identity for wood as it moves through the value chain.

For manufacturers and retailers, the objective is not simply better inventory management. A properly designed traceability platform can provide the ability to demonstrate **where material came from, how it moved, what happened to it, and where it ultimately went.**

As regulatory expectations for timber legality, deforestation, and supply-chain transparency continue to increase, digital traceability can become an important component of responsible sourcing and risk management. When combined with supplier due diligence and independent verification, these technologies can make it significantly harder for undocumented or illegally sourced material to disappear into legitimate inventory, and easier to identify when something does go wrong.

Scholarly References

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