Book 08: EUDR Commodity Verticals

All 7 EUDR-regulated commodities (coffee, cacao, palm, soy, cattle, wood, rubber). Coffee/Colombia mapped in v1.0. Other verticals added in v1.1+.

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Coffee — Colombia

Full EUDR Article 9 mapping for coffee in Colombia (v1.0)

EUDR Coffee — Regulation Overview

commodity	coffee
regulation	EU Regulation 2023/1115 (EUDR)
article9_fields	geolocation, supplier_identification, deforestation_free_date, due_diligence_statement
cutoff_date	2020-12-31
enforcement_large	2024-12-30
enforcement_sme	2025-06-30
primary_country	Colombia
schema_version	1.1
last_updated	2026-05-27

Scope of the EUDR for Coffee

EU Regulation 2023/1115 — the European Union Deforestation Regulation (EUDR) — entered into force on 29 June 2023. It targets seven commodity groups linked to global deforestation: cattle, cocoa, coffee, oil palm, rubber, soya, and wood. For coffee, the regulation covers all forms placed on the EU market: green (unroasted) beans, roasted beans, ground coffee, soluble/instant coffee, coffee extracts and concentrates, and coffee husks and skins. The Combined Nomenclature (CN) codes covered include 0901 (coffee, whether or not roasted or decaffeinated), 2101 11 (extracts, essences, and concentrates of coffee), and associated derivative codes.

Article 9 — Mandatory Due Diligence Information

Article 9 of the EUDR specifies the information that operators and traders must collect, verify, and retain before placing coffee on the EU market or exporting it from the EU. The mandatory fields are:

- **Geolocation of production plots:** For plots larger than 4 hectares, a polygon boundary (set of latitude/longitude coordinate pairs) is required. For plots equal to or smaller than 4 hectares, a single GPS point (latitude/longitude with sufficient decimal precision — at least 5 decimal places, ~1.1 m accuracy) is acceptable. This is the field that presents the greatest compliance challenge for smallholder coffee producers in Colombia, where the average finca cafetera is 1.5–2.0 hectares.
- **Supplier identification:** Name, address, and where applicable, registration/tax identification number of each actor in the supply chain — from finca to exporter. In Colombia, the FNC's cédula cafetera (coffee farmer ID card) serves as a farm-level identification instrument that can map to this requirement.
- **Deforestation-free verification:** Evidence that the production land was not subject to deforestation (conversion of forest to agricultural use) or forest degradation after the cutoff date of 31 December

2020. Verification may use satellite imagery (Sentinel-2, Planet Labs, Landsat), national monitoring systems (IDEAM/SMBYC in Colombia), or third-party audits.
- **Due diligence statement (DDS):** A formal declaration submitted through the EU Information System (TRACES or the dedicated EUDR IT platform) before the product enters the EU market. The DDS must reference the geolocation data, confirm deforestation-free status, and be linked to the specific consignment.
- **Legality:** Confirmation that production complied with the relevant laws of the country of production, including land use, environmental protection, labour rights, tax obligations, and indigenous/community land rights (FPIC — Free, Prior, and Informed Consent).

Enforcement Timeline

The regulation applies in two phases based on operator size:

- **Large operators (non-SMEs):** Enforcement from 30 December 2024. This covers the major EU importers (e.g., Neumann Kaffee Gruppe, VOLCAFE, Sucafina, Louis Dreyfus Company) and large roasters (Nestlé, JDE Peet's, Lavazza, illycaffè).
- **SME operators and traders:** Enforcement from 30 June 2025. This phase brings smaller importers, specialty roasters, and trading houses into scope.

After enforcement, any operator placing non-compliant coffee on the EU market faces penalties determined by each EU Member State, which must be "effective, proportionate and dissuasive." Penalties may include fines proportional to environmental damage and market value, confiscation of products, temporary exclusion from public procurement, and prohibition from using the simplified due diligence procedure.

Country Benchmarking System

The European Commission will classify producer countries into three risk tiers:

- **Low risk:** Simplified due diligence (reduced documentation requirements). Countries with negligible deforestation rates and robust governance frameworks may qualify.
- **Standard risk:** Full due diligence as described in Article 9. This is the default tier and where Colombia is expected to be classified initially.
- **High risk:** Enhanced due diligence with additional verification requirements, increased sampling rates for checks, and more frequent audits. Countries with high deforestation rates and weak enforcement may be classified here (e.g., parts of the Amazon frontier in Peru or Brazil).

The benchmarking assessment considers: rate of deforestation and forest degradation, rate of expansion of agriculture for relevant commodities, production trends, and information from indigenous peoples and local communities. The initial country benchmarking list was expected by 30 December 2024 but has been subject to delays. Colombia's classification will significantly impact the compliance burden on its ~540,000 coffee-farming families.

Interaction with Existing Certification Schemes

The EUDR explicitly states that existing voluntary sustainability certifications (Rainforest Alliance, UTZ — now merged into Rainforest Alliance, 4C, FairTrade International) do not automatically confer EUDR compliance. However, these certifications may partially satisfy due diligence requirements — particularly around farm-level traceability, environmental management plans, and audit trails. Operators using certified supply chains still need to independently verify geolocation and deforestation-free status against satellite data for the post-2020 cutoff date.

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EUDR Coffee — Colombia Supply Chain Profile

commodity	coffee
regulation	EU Regulation 2023/1115 (EUDR)
article9_fields	geolocation, supplier_identification, deforestation_free_date, due_diligence_statement
cutoff_date	2020-12-31
enforcement_large	2024-12-30
enforcement_sme	2025-06-30
primary_country	Colombia
schema_version	1.1
last_updated	2026-05-27

Colombia's Coffee Sector at a Glance

Colombia is the world's third-largest arabica coffee producer and the second-largest global exporter of washed arabica. The sector comprises approximately 540,000 coffee-farming families (caficultores) spread across roughly 853,000 hectares in 22 departments and 590 municipalities. The average farm size is 1.5–2.0 hectares, making Colombia's coffee sector overwhelmingly smallholder-based — a structural characteristic that creates both compliance challenges (fragmented geolocation data) and opportunities (high traceability potential through cooperative networks).

Key Production Departments

Coffee production is concentrated in the Andean highlands between 1,200 and 2,000 metres above sea level. The six leading departments by production volume are:

- **Huila:** Colombia's #1 coffee department by volume. Located in the southern Andean corridor. Known for micro-lot specialty coffees. Altitude ranges from 1,200–1,900 masl. Approximately 83,000 coffee farms. Municipalities of Pitalito, Acevedo, and La Plata are flagship origins. Relatively low deforestation risk in core coffee zones, though frontier expansion toward the Amazon foothills (Caquetá border) warrants satellite monitoring.
- **Nariño:** Second-largest producer, bordering Ecuador. Extreme altitude coffee (1,600–2,300 masl) with slow cherry maturation yielding high cup quality. About 40,000 farms. The departments of Buesaco, La Unión, and Sandoná are key. Deforestation risk is moderate — the Pacific lowlands adjacent to coffee zones are biodiversity hotspots under pressure from illicit crops and cattle ranching.
- **Antioquia:** Historic coffee heartland. Includes the Eje Cafetero municipalities of Andes, Jardín, Ciudad Bolívar. Approximately 78,000 farms. Established infrastructure and cooperative networks make traceability relatively mature. Deforestation risk is lower in core zones but elevated in northeastern Antioquia (Bajo Cauca region).

- **Cauca:** High-altitude specialty origin. Inzá and Popayán micro-regions produce competition-grade lots. About 95,000 farms (many indigenous and Afro-Colombian communities). FPIC considerations under EUDR Article 9 legality requirements are particularly relevant here.
- **Tolima:** Central Andean corridor. Planadas, Ataco, and Rioblanco are key municipalities. Approximately 63,000 farms. Historically affected by armed conflict; post-peace-agreement land formalization processes intersect with EUDR land tenure verification requirements.
- **Caldas:** Part of the traditional Eje Cafetero (Coffee Axis). Manizales, Chinchiná, and Palestina are major origins. Mature cooperative infrastructure (Cooperativa de Caficultores de Manizales). Lower deforestation risk due to long-established coffee landscapes and protected areas (Los Nevados National Park buffer zone).

The FNC and Colombia's Coffee Institutional Framework

The Federación Nacional de Cafeteros (FNC) is a private entity with public functions, representing Colombia's coffee growers since 1927. For EUDR purposes, the FNC's institutional infrastructure is highly relevant:

- **Cédula Cafetera (Coffee ID):** A farmer-level identification card linked to farm plots registered in SICA. This can serve as the supplier identification field required by Article 9. Each cédula links to farm location, area planted, variety, and estimated production.
- **SICA (Sistema de Información Cafetera):** The FNC's comprehensive coffee information system containing georeferenced data on over 540,000 farms. SICA holds GPS coordinates of farm centroids and, for many farms, plot boundaries. This is Colombia's single most valuable existing dataset for EUDR geolocation compliance. However, SICA data quality varies — older records may have lower GPS precision (3–4 decimal places instead of the 5+ required), and boundary polygons are not available for all farms.
- **FNC Extension Service (Servicio de Extensión):** Over 1,500 extensionistas (field agents) who visit farms regularly. This network provides a ground-truth verification mechanism that, combined with satellite data, could form a robust MRV (Monitoring, Reporting, Verification) system for EUDR compliance.
- **Almacafé:** The FNC's logistics arm managing dry mills and export warehousing. Almacafé's lot tracking systems can link exported consignments back to cooperative purchase points and, through SICA, to individual farms.

EU Export Flows and Market Share

The European Union is Colombia's largest coffee export destination. Key EU market dynamics:

- **Germany:** Receives approximately 25% of Colombian green coffee exports. Hamburg is the primary entry port. Major importers include Neumann Kaffee Gruppe (via subsidiary Racafé in Colombia), VOLCAFE, and Bernhard Rothfos.
- **Belgium:** Antwerp serves as a re-export hub for coffee entering the broader EU market. Significant volumes are processed in Belgium for distribution across Northern Europe.
- **Italy:** Major destination for Colombian coffee destined for espresso blends. Lavazza, illycaffè, and Segafredo are key buyers. Italy values Colombian washed arabica for its clean cup profile and blend compatibility.
- **Spain:** Growing market for Colombian origin coffee, both commodity and specialty segments.

Total Colombian coffee exports to the EU typically represent 35–40% of the country's annual production of approximately 12–14 million 60-kg bags. At current market prices (C-price plus Colombian differential), the EU-bound volume represents USD 1.5–2.0 billion in annual export revenue — illustrating the economic stakes of EUDR compliance for Colombia.

Deforestation Risk Zones in Colombian Coffee Landscapes

While Colombia's core coffee zones (Eje Cafetero, northern Huila) are long-established agricultural landscapes with low recent deforestation, several frontier zones present elevated risk:

- **Caquetá-Huila border (Amazonian foothills):** Coffee expansion into previously forested areas at lower altitudes. IDEAM's SMBYC (Forest and Carbon Monitoring System) flags this corridor as an active deforestation frontier driven by cattle ranching, with coffee sometimes following as a secondary crop.
- **Putumayo:** Southern frontier department with both coffee production and active deforestation linked to road expansion and colonization.
- **Norte de Santander:** Border department with Venezuela. Deforestation driven by illicit crops and mining. Coffee zones in the Catatumbo region are adjacent to high-deforestation areas.
- **Sierra Nevada de Santa Marta:** Unique high-altitude origin with both indigenous territories and deforestation pressure from encroaching agriculture.

For EUDR compliance, operators sourcing from these higher-risk sub-regions will need to provide more robust satellite evidence and possibly third-party field verification to demonstrate that their specific plots were not deforested after 31 December 2020.


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EUDR Coffee — Geolocation & Traceability Requirements

commodity	coffee
regulation	EU Regulation 2023/1115 (EUDR)
article9_fields	geolocation, supplier_identification, deforestation_free_date, due_diligence_statement
cutoff_date	2020-12-31
enforcement_large	2024-12-30
enforcement_sme	2025-06-30
primary_country	Colombia
schema_version	1.1
last_updated	2026-05-27

Geolocation Specifications Under Article 9

The EUDR's geolocation requirement is the most technically demanding element of compliance for the coffee sector. The regulation distinguishes two cases based on plot area:

- **Plots > 4 hectares:** A polygon boundary is required — a set of latitude/longitude coordinate pairs (WGS84 datum) defining the perimeter of the production area. The polygon must be sufficiently precise to enable satellite-based deforestation monitoring. For Colombian coffee, this applies primarily to larger estates (haciendas) in departments like Caldas, Quindío, and parts of Antioquia.
- **Plots ? 4 hectares:** A single geolocation point (latitude, longitude) is sufficient. Given that the vast majority of Colombian coffee farms are under 4 hectares, the point-based requirement applies to the bulk of the sector. However, precision matters: coordinates must have at least 5 decimal places (approximately 1.1-metre accuracy at the equator) to enable meaningful satellite cross-referencing.

GPS Data Collection Methods for Smallholder Coffee Farms

Collecting geolocation data from 540,000 Colombian coffee farms requires scalable, cost-effective methods:

- **Smartphone GPS (assisted GPS/A-GPS):** Modern smartphones achieve 3–5 metre horizontal accuracy under open sky conditions. The FNC's extensionistas can use mobile apps (e.g., ODK Collect, KoBoToolbox, or custom apps) to record GPS waypoints during farm visits. Challenges: canopy cover in shade-grown coffee can degrade GPS accuracy to 10–15 metres; multipath errors in mountainous terrain are common.

- **Handheld GPS receivers:** Dedicated devices (Garmin eTrex, Trimble R1) offer 2–3 metre accuracy with SBAS correction. More expensive than smartphones but more reliable under canopy. Already used by some FNC extensionistas for SICA updates.
- **RTK/PPK GNSS:** Real-Time Kinematic or Post-Processed Kinematic systems achieve centimetre-level accuracy. Overkill for EUDR point requirements but valuable for polygon boundary mapping of larger plots. High equipment cost (USD 5,000–15,000) limits deployment to cooperatives or aggregation points.
- **Drone-based photogrammetry:** UAVs equipped with RTK GNSS can map plot boundaries with centimetre precision. Useful for polygon generation on medium-to-large farms. Regulatory constraints (Colombian CAA/Aerocivil drone regulations) and cost limit broad deployment.
- **Satellite-derived boundaries:** Using very high-resolution (VHR) optical imagery (Planet SkySat at 50 cm, Maxar WorldView at 30 cm) to digitize farm boundaries. Scalable but requires manual or AI-assisted delineation. The EU Joint Research Centre (JRC) is developing tools for this approach.

SICA as a Geolocation Foundation

The FNC's SICA database represents the most comprehensive existing geolocation resource for Colombian coffee. SICA contains:

- Farm centroid coordinates for over 540,000 registered fincas
- Parcel-level data including area planted to coffee (hectares), coffee variety (Castillo, Caturra, Colombia, Typica, Bourbon), plant age, and shade tree species
- Historical update records from extensionista visits

SICA's limitations for EUDR compliance include: variable coordinate precision (some older records use 3–4 decimal places), incomplete polygon coverage (most farms have centroids only, not boundaries), and update frequency (some records may not reflect recent changes in planted area). Upgrading SICA to EUDR-grade precision is a priority project that several CLP-affiliated startups and international development partners are supporting.

Satellite Verification for Deforestation-Free Status

The deforestation-free verification step requires comparing the geolocated plot against historical satellite imagery to confirm no forest loss occurred after the 31 December 2020 cutoff. Key platforms and data sources:

- **Global Forest Watch (GFW):** Operated by the World Resources Institute (WRI). Provides annual tree cover loss data based on Landsat imagery (30 m resolution). Free and publicly accessible. The GFW API can be queried programmatically with geolocation coordinates to check for alerts. Limitation: 30 m resolution may miss small-scale deforestation on fragmented smallholder plots.
- **IDEAM/SMBYC:** Colombia's Instituto de Hidrología, Meteorología y Estudios Ambientales operates the Sistema de Monitoreo de Bosques y Carbono. SMBYC produces quarterly deforestation bulletins at 12.5-metre resolution (using Sentinel-1 SAR data) — significantly more granular than GFW. The Early Warning System (AT-D) provides near-real-time alerts. IDEAM data is the authoritative national source and should be the primary reference for Colombian coffee EUDR compliance.
- **Copernicus/Sentinel-2:** EU's own satellite constellation providing 10-metre multispectral imagery with a 5-day revisit time. Free data via Copernicus Open Access Hub. Sentinel-2 NDVI time series can detect forest-to-agriculture conversion. The EU may require Sentinel-2 as the baseline verification source given it is an EU-operated system.
- **Planet Labs (PlanetScope):** Commercial constellation providing daily 3-metre imagery globally. High temporal frequency enables detection of rapid land use change. Planet's Forest Carbon Diligence product is specifically designed for EUDR-style verification. Cost: commercial subscription required.

- **NICFI (Norway's International Climate and Forests Initiative):** Provides free access to high-resolution Planet basemaps (4.77 m) for tropical countries, including Colombia. Monthly mosaics since September 2020 — almost exactly aligned with the EUDR cutoff date. NICFI data is the most cost-effective high-resolution source for Colombian coffee EUDR verification.

Traceability Architecture: From Farm to Port

EUDR compliance requires an unbroken chain of custody linking the exported consignment to the geolocated production plot. For Colombian coffee, this chain typically involves:

1. **Farm level:** Caficultor harvests cherry, performs wet processing (despulpado, fermentation, washing) on-farm. Parchment coffee (café pergamino) is dried. The farm is identified by cédula cafetera number and SICA GPS coordinate.
2. **Purchase point (punto de compra):** Parchment coffee is sold to a cooperative, private buyer (comercializador), or directly to the FNC at a guaranteed minimum price (precio de sustentación). The purchase transaction records the seller's cédula cafetera, volume (kg), and quality grade. This is the critical aggregation point where farm-level traceability must be maintained.
3. **Dry mill (trilladora):** Parchment is hulled to produce green (excelso) coffee. Almacafé operates the FNC's trilladoras. Lot identity must be preserved or, if blending occurs, the lot must carry geolocation data for all contributing farms.
4. **Export warehouse:** Green coffee is graded, sampled, and prepared for shipment. The ICO (International Coffee Organization) export certificate and Colombian export documentation (DEX — Declaración de Exportación) are prepared.
5. **Port (Buenaventura, Cartagena, Santa Marta, Barranquilla):** Container loading. The DDS (Due Diligence Statement) must be submitted to the EU Information System before the shipment clears EU customs.

Blockchain and digital platforms (Farmer Connect, IBM Food Trust, iFinca) can create tamper-evident records at each step. However, the critical weak link remains the purchase point, where parchment from multiple farms may be commingled. Maintaining lot segregation or digital mass-balance at this node is essential for EUDR compliance.


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EUDR Coffee — Due Diligence & Compliance Pathways

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enforcement_large	2024-12-30
enforcement_sme	2025-06-30
primary_country	Colombia
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The Three-Step Due Diligence Framework

Article 8 of the EUDR establishes a mandatory three-step due diligence process that every operator must complete before placing coffee on the EU market. This is not optional due diligence — it is a legal prerequisite for market access.

Step 1: Information Collection

The operator must collect all Article 9 information for the specific consignment:

- Geolocation coordinates (point or polygon) of every production plot that contributed to the consignment
- Description and quantity of the product, including Combined Nomenclature (CN) code
- Country of production (and, if applicable, parts thereof — i.e., department/municipality in Colombia)
- Supplier identification: name, postal/email address, and where applicable, registration number for each actor in the supply chain
- Buyer identification: name, postal/email address for the entity receiving the product in the EU
- Date or time range of production (harvest season)
- Adequately conclusive and verifiable information that the products are deforestation-free
- Adequately conclusive and verifiable information that the production was in compliance with the relevant legislation of the country of production

Step 2: Risk Assessment

Based on the collected information, the operator must assess the risk that the coffee is non-compliant. The risk assessment must consider:

- **Country or sub-national risk:** The Commission's benchmarking classification (low/standard/high risk) for the country or region of production. For Colombia, this may vary sub-nationally — Eje Cafetero is

inherently lower risk than the Caquetá-Amazon frontier.
- **Prevalence of deforestation:** Historical deforestation rates in the specific sourcing area, assessed using satellite data (GFW, IDEAM/SMBYC, Sentinel-2).
- **Concerns related to the country of production:** Governance quality, enforcement capacity, corruption indices, land tenure formalization status, conflict-related displacement.
- **Complexity of the supply chain:** More intermediaries increase the risk of traceability breaks. Direct-trade and cooperative-channel supply chains present lower risk than spot-market purchases through multiple brokers.
- **Risk of circumvention:** Whether the product may have been mixed with non-compliant coffee, re-exported through a third country to disguise origin, or had fraudulent documentation.
- **Complementary information:** Satellite imagery analysis, existing certifications (Rainforest Alliance, 4C, FairTrade), third-party verification reports, and information from civil society organizations.

Step 3: Risk Mitigation

If the risk assessment reveals anything other than negligible risk, the operator must take adequate and proportionate risk mitigation measures. These may include:

- Requesting additional information or documentation from suppliers
- Commissioning independent third-party audits or field verification
- Obtaining satellite imagery analysis for the specific production plots for the post-2020 period
- Engaging with local stakeholders or civil society for ground-truth information
- For blended lots: obtaining geolocation and deforestation-free evidence for each contributing farm

Only when risk is assessed as negligible (after mitigation if initially elevated) may the operator proceed to submit the Due Diligence Statement.

The Due Diligence Statement (DDS)

The DDS is the formal declaration that the operator submits to the EU's EUDR Information System before the product enters the EU market. Key requirements:

- The DDS must be submitted electronically through the designated EU IT platform
- It must reference all Article 9 information and confirm that due diligence has been exercised
- The DDS receives a unique reference number that must accompany the product through EU customs
- Operators must retain all supporting documentation for at least 5 years from the date of the DDS
- Competent authorities in EU Member States may inspect the DDS and underlying documentation at any time during the retention period
- False or misleading DDS submissions constitute a violation subject to the full penalty regime

The Role of FNC's Cédula Cafetera in Compliance

Colombia has a structural advantage over many coffee-producing countries: the FNC's cédula cafetera system already provides a farm-level identification and registration mechanism that maps closely to EUDR requirements. A compliance pathway leveraging the cédula cafetera would work as follows:

1. The caficultor's cédula cafetera number serves as the supplier identification (linked to the national ID — cédula de ciudadanía)
2. SICA provides the geolocated farm data associated with that cédula cafetera
3. At the purchase point, the cooperative records the cédula cafetera number against the parchment coffee purchased, creating the first traceability link

4. Through the dry mill and export chain, the cédula cafetera-linked lot data flows forward
5. The exporter cross-references the farm's SICA coordinates against IDEAM/SMBYC and GFW data to verify deforestation-free status
6. If verification passes, the DDS is submitted with the geolocation data and cédula cafetera-based supply chain record

This pathway is viable for the ~70% of Colombian coffee that flows through FNC-affiliated cooperatives. For the ~30% that moves through private channels (comercializadores privados), parallel traceability systems must be established.

Simplified Due Diligence for Low-Risk Countries

If the European Commission classifies Colombia (or specific sub-regions) as low risk, operators sourcing from those areas would benefit from simplified due diligence: reduced information requirements, lower verification intensity, and faster DDS processing. This creates a strong incentive for Colombia to invest in national-level deforestation monitoring and EUDR compliance infrastructure — as a low-risk classification would reduce the compliance burden on all 540,000 coffee families and maintain market competitiveness relative to other origins.

Third-Party Verification and Audit Frameworks

Several third-party verification frameworks are emerging or adapting to serve EUDR compliance needs:

- **Rainforest Alliance (RA):** Updated its 2020 standard to include geolocation data collection and deforestation monitoring. RA's farm data can partially satisfy EUDR Article 9 requirements, but operators must independently verify the data and cannot rely solely on RA certification as EUDR compliance.
- **4C (Common Code for the Coffee Community):** Provides a baseline sustainability standard with some traceability elements. Less granular than RA for EUDR purposes but covers a larger share of the global coffee trade.
- **Proforest/3PRCL:** Emerging EUDR-specific verification services offering satellite-based deforestation risk assessment integrated with supply chain data.
- **SGS, Control Union, Bureau Veritas:** Traditional auditing firms developing EUDR compliance verification products, including field audits and documentary review.


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EUDR Coffee — Technology & MRV Solutions

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enforcement_large	2024-12-30
enforcement_sme	2025-06-30
primary_country	Colombia
schema_version	1.1
last_updated	2026-05-27

Satellite Monitoring for Deforestation Detection

Satellite-based monitoring is the backbone of EUDR deforestation-free verification. The technology stack for coffee compliance combines multiple sensor types:

- **Sentinel-2 (Copernicus):** EU-operated optical satellite constellation with 10-metre spatial resolution and 5-day revisit time. Freely available. Band combinations (B8-NIR, B4-Red, B3-Green) enable NDVI (Normalized Difference Vegetation Index) time series analysis for detecting forest-to-agriculture conversion. Cloud cover is the main limitation in tropical Andean coffee zones — wet-season imagery may have 60–80% cloud cover in departments like Nariño and Cauca.
- **Sentinel-1 (SAR — Synthetic Aperture Radar):** All-weather, day/night imaging. C-band SAR penetrates cloud cover, making it essential for tropical monitoring. IDEAM's SMBYC uses Sentinel-1 as its primary data source for quarterly deforestation bulletins. Radar backscatter changes indicate forest loss regardless of cloud conditions. 12-day revisit cycle at 10-metre resolution.
- **Planet Labs (PlanetScope):** Commercial constellation of 200+ CubeSats providing daily 3-metre optical imagery globally. High temporal frequency enables detection of rapid land use change between Sentinel-2 passes. Planet's Forest Carbon Diligence product packages time-series analysis specifically for EUDR-type verification. NICFI agreement provides free access to Planet basemaps (4.77 m monthly mosaics) for tropical countries.
- **Maxar (WorldView):** Very high-resolution (30–50 cm) optical imagery for targeted verification of specific plots. Too expensive for blanket monitoring but valuable for investigating flagged alerts or disputed cases. Can distinguish individual coffee plants from forest trees.
- **Landsat (NASA/USGS):** 30-metre resolution, 16-day revisit. The source data for GFW's annual tree cover loss product. Long archive (1984–present) provides historical context for land use change analysis. Lower resolution limits utility for smallholder-scale verification.

AI and Machine Learning for Deforestation Detection

Raw satellite imagery requires processing to detect deforestation events. Machine learning models are increasingly central to this processing:

- **Random Forest / Gradient Boosting classifiers:** Traditional ML approaches for land cover classification using multi-spectral band features. Widely used in national monitoring systems including IDEAM/SMBYC. Require hand-crafted features but are computationally efficient and well-understood.
- **Convolutional Neural Networks (CNNs):** Deep learning models (U-Net, DeepLabV3+) trained on labelled satellite imagery for pixel-level land cover segmentation. Can distinguish coffee plantations from primary forest, secondary growth, and other crops. Require substantial labelled training data — the JRC and WRI are building labelled datasets for tropical land use.
- **Change Detection Algorithms:** Bi-temporal or time-series algorithms that compare satellite imagery across dates to identify forest loss events. BFAST (Breaks For Additive Season and Trend) and LandTrendr are established approaches. Applied to EUDR: compare a baseline image from before the 31 December 2020 cutoff with current imagery to detect changes.
- **SAR-optical fusion:** Combining Sentinel-1 SAR (cloud-penetrating) with Sentinel-2 optical data for robust all-weather deforestation detection. Research from IDEAM and international partners has demonstrated improved accuracy in cloud-prone regions like the Colombian Pacific and western Andes.

Traceability Platforms and Digital Solutions

Several technology platforms are positioning themselves for EUDR coffee traceability:

- **Farmer Connect:** Swiss-based platform using blockchain (Hyperledger Fabric) to create transparent supply chains from farm to cup. Already deployed with major roasters. The platform's "Thank My Farmer" consumer-facing app enables end-to-end traceability. EUDR adaptation involves adding geolocation fields and deforestation verification to existing supply chain records.
- **IBM Food Trust:** Enterprise-grade blockchain platform for food supply chain transparency. Coffee was an early use case, with pilot deployments in Colombia and Brazil. IBM Food Trust can store and share EUDR Article 9 data across supply chain participants with permissioned access.
- **iFinca:** Colombian-developed platform specifically designed for Colombian coffee traceability. Integrates with FNC cooperative systems. Mobile app for farm-level data capture including GPS coordinates, quality assessments, and transaction records. Strong alignment with EUDR requirements due to Colombia-specific design.
- **Yara Digital (FarmGo):** Agricultural input company Yara's digital farming platform includes GPS-enabled farm mapping and input tracking. While primarily designed for precision agriculture, the geolocation and farm data infrastructure is adaptable for EUDR compliance.
- **Sourcemap:** Supply chain mapping platform that visualizes multi-tier supply chains and integrates satellite deforestation data. Used by several large consumer goods companies for commodity traceability.
- **Meridia (Cadasta Foundation):** Land documentation platform that helps smallholder farmers establish GPS-verified land boundaries and digital land records. Relevant for the EUDR legality requirement, particularly in Colombian departments where land tenure is informal or disputed.

Blockchain for Tamper-Evident Compliance Records

Blockchain technology offers specific advantages for EUDR compliance data management:

- **Immutability:** Once geolocation data and deforestation verification results are recorded on-chain, they cannot be retroactively altered — important for the 5-year documentation retention requirement.
- **Interoperability:** Multi-party supply chains (farmer, cooperative, exporter, importer, roaster) can share a common, trusted record without relying on a single centralized database.
- **Auditability:** EU competent authorities can verify compliance records without depending on any single actor's data systems.

However, blockchain alone does not solve the "garbage in, garbage out" problem — if the initial GPS coordinate or deforestation assessment is incorrect, the immutable record simply preserves incorrect data. Ground-truth verification and satellite cross-referencing remain essential inputs.

IoT Sensors and Precision Agriculture

Internet of Things (IoT) devices are emerging as supplementary tools in the EUDR compliance ecosystem:

- **GPS-enabled soil/weather sensors:** Devices deployed on coffee farms that continuously record location (confirming the farm is where it claims to be) along with agronomic data (soil moisture, temperature, rainfall). Can serve as supplementary geolocation evidence.
- **Smart weighing scales at purchase points:** Connected scales that record the weight of parchment coffee purchased, linked to the seller's cédula cafetera and GPS timestamp. Automating the purchase-point data capture reduces manual data entry errors — a critical vulnerability in traceability chains.
- **Cold-chain and logistics sensors:** Temperature and humidity loggers in export containers that create a continuous record from warehouse to port to EU destination, supporting chain-of-custody documentation.

CLP Startup Ecosystem for EUDR Traceability

The CleanTech Hub's Climate Launchpad (CLP) program has identified and supported startups developing EUDR-relevant technologies in LATAM. This ecosystem includes ventures working on satellite-based monitoring tools adapted for smallholder contexts, mobile-first traceability apps designed for low-connectivity rural areas, AI models trained on Colombian landscape data for coffee-specific land cover classification, and digital cooperative management platforms that integrate EUDR data collection into existing workflows. These startups represent a local innovation layer that complements the large-platform solutions and can address Colombia-specific challenges like SICA integration, cédula cafetera linkage, and the unique characteristics of Andean shade-grown coffee landscapes.


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EUDR Coffee — LATAM Country Exposure

commodity	coffee
regulation	EU Regulation 2023/1115 (EUDR)
article9_fields	geolocation, supplier_identification, deforestation_free_date, due_diligence_statement
cutoff_date	2020-12-31
enforcement_large	2024-12-30
enforcement_sme	2025-06-30
primary_country	Colombia
schema_version	1.1
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LATAM Coffee Producers and EUDR Exposure

Latin America dominates global coffee production and is disproportionately affected by the EUDR. The region accounts for approximately 55–60% of global coffee output and an even higher share of EU imports. Four LATAM countries illustrate the range of EUDR exposure levels, compliance readiness, and deforestation risk profiles.

Colombia — Medium Risk, High Readiness

Colombia's EUDR exposure profile is characterized by a large, fragmented smallholder base combined with relatively strong institutional infrastructure for compliance.

- **Farm count:** ~540,000 coffee families across 853,000 hectares in 22 departments
- **Average farm size:** 1.5–2.0 hectares (virtually all below the 4-hectare polygon threshold)
- **EU export share:** 35–40% of annual production (~12–14 million 60-kg bags total)
- **Deforestation risk:** Medium overall. Core coffee zones (Eje Cafetero, Huila highlands) are long-established with low recent deforestation. Frontier zones (Caquetá border, Putumayo, Norte de Santander) present elevated risk. IDEAM reports approximately 171,000 hectares of national deforestation annually (all causes, all commodities), with coffee directly responsible for a small fraction.
- **Compliance readiness:** High relative to peers. SICA provides geolocated farm data for most registered farms. FNC cooperative network covers ~70% of production with existing traceability systems. Cédula cafetera provides supplier identification. IDEAM/SMBYC offers authoritative national deforestation monitoring. Key gaps: SICA GPS precision upgrades needed, polygon mapping incomplete, private-channel traceability (~30% of production) underdeveloped.
- **Expected benchmarking classification:** Standard risk (initial). Potential for sub-national differentiation if the Commission allows regional benchmarking.

Peru — Higher Risk, Lower Readiness

Peru is Latin America's second-largest coffee exporter and faces more acute EUDR compliance challenges than Colombia.

- **Farm count:** ~223,000 coffee families across approximately 425,000 hectares, primarily in the selva alta (high jungle) and ceja de selva (jungle brow) ecological zones
- **Key regions:** Junín (Satipo, Chanchamayo — Peru's largest coffee zone), San Martín (Moyobamba, Lamas, Tarapoto), Cajamarca (Jaén, San Ignacio), Amazonas (Rodríguez de Mendoza, Bagua), Cusco (La Convención/Quillabamba)
- **Average farm size:** 2–5 hectares, larger than Colombia's average, with more farms potentially requiring polygon mapping
- **Deforestation risk:** HIGH. Peru's Amazon deforestation is the highest in the Andean region. The Junín and San Martín departments — Peru's top coffee zones — are also among the country's highest deforestation areas. Coffee expansion into primary forest is documented in Junín (Ene-Apurímac-Mantaro valley), where farmers clear forest for new coffee plantings at lower altitudes. SERFOR (Peru's forest authority) and MINAM (environment ministry) monitoring systems exist but are less mature than Colombia's IDEAM.
- **Compliance readiness:** LOWER than Colombia. Peru lacks an equivalent to SICA — there is no comprehensive national coffee farm registry with GPS coordinates. Cooperatives (e.g., Cooperativa Agraria Cafetalera Pangoa, CAC La Florida) maintain some farm data, but coverage is fragmented. SENASA (national agricultural health service) has some farm registration data, but it was not designed for EUDR-grade traceability. JNC (Junta Nacional del Café) is coordinating national response but lacks the institutional density of FNC.
- **Expected benchmarking classification:** Standard to high risk, depending on the sub-national assessment. San Martín, with its REDD+ program experience, may score better than Junín.

Guatemala — Mixed Risk by Region

Guatemala is Central America's largest coffee producer and a significant EU supplier, particularly to Germany and Belgium.

- **Farm count:** ~125,000 coffee producers across approximately 305,000 hectares
- **Key regions:** Huehuetenango (Highland specialty, 1,500–2,000 masl — very low deforestation risk in established coffee zones), Antigua Guatemala (volcanic soils, historic coffee landscape, minimal deforestation), Cobán/Alta Verapaz (lower altitude, significant deforestation driven by cattle and palm oil — coffee is secondary), Fraijanes, San Marcos, Atitlán
- **Deforestation risk:** Mixed. Highland zones (Huehuetenango, Antigua, Atitlán) are established coffee landscapes with low deforestation. Lowland zones (Petén border, Alta Verapaz, Izabal) have high deforestation driven primarily by cattle ranching and palm oil, with coffee sometimes present as an adjacent crop. Guatemala lost approximately 61,000 hectares of tree cover annually in recent years (GFW data).
- **Compliance readiness:** Moderate. Anacafé (Asociación Nacional del Café) maintains some farm registry data, but coverage and GPS precision are uneven. Guatemala's specialty coffee sector (Huehuetenango, Antigua) has relatively mature traceability through direct-trade relationships. The commodity segment moving through larger fincas and intermediaries has weaker traceability infrastructure. INAB (Instituto Nacional de Bosques) provides forest monitoring, but with less granularity than IDEAM.
- **FPIC considerations:** Significant indigenous population (Maya) in coffee-producing highlands. EUDR legality requirement includes compliance with indigenous peoples' rights and land tenure. Guatemala's complex land tenure history (post-conflict) adds compliance layers.

El Salvador — Low Risk, Specialty Focus

El Salvador is a small but notable coffee producer with one of the lowest deforestation risk profiles in the LATAM coffee sector.

- **Farm count:** ~20,000 coffee producers across approximately 140,000 hectares
- **Key regions:** Apaneca-Ilamatepec (highest-quality zone, volcanic soils), El Bálsamo-Quetzaltepec, Chinchontepec, Tecapa-Chinameca, Cacahuatique. All are long-established shade-grown coffee systems.
- **Deforestation risk:** LOW. El Salvador is one of the most deforested countries historically (only ~12% forest cover remaining), but current deforestation rates are among the lowest in Central America. Coffee in El Salvador is almost entirely shade-grown under existing forest canopy — meaning coffee production actually conserves rather than threatens forests. The Bourbon, Pacamara, and Pacas varieties grown under traditional shade systems make El Salvador's coffee inherently aligned with EUDR deforestation-free requirements.
- **Compliance readiness:** Moderate to high for the specialty segment. CSC (Consejo Salvadoreño del Café) provides institutional coordination. Farm sizes are larger on average (many traditional estates — beneficios), simplifying geolocation data collection. The specialty/direct-trade segment (a large share of El Salvador's small export volume) already has strong traceability. EU export volume is relatively small, reducing the total compliance infrastructure needed.
- **Market access implication:** El Salvador could be an early beneficiary of the low-risk country benchmarking classification, which would confer simplified due diligence and make Salvadoran coffee particularly attractive to EU operators seeking lower compliance costs.

Comparative Risk Matrix

Country	Coffee Farms	EU Export Exposure	Deforestation Risk	Compliance Readiness	Expected Benchmarking
Colombia	~540,000	High (35–40% of production)	Medium (frontier zones elevated)	High (SICA, FNC, IDEAM)	Standard
Peru	~223,000	High (EU major destination)	High (Amazon frontier expansion)	Lower (no unified farm registry)	Standard to High
Guatemala	~125,000	Moderate to High	Mixed (low in highlands, high in lowlands)	Moderate (Anacafé partial coverage)	Standard
El Salvador	~20,000	Low (small volume, specialty)	Low (shade-grown, minimal deforestation)	Moderate to High (specialty traceability)	Low (potential)

Market Access Implications

The EUDR creates asymmetric market access conditions based on compliance readiness. Countries and supply chains that achieve compliance early gain competitive advantage — EU roasters and importers will preferentially source from "EUDR-ready" origins to minimize regulatory risk and compliance costs. This dynamic could reshape coffee trade flows:

- **Premium for compliance:** EUDR-compliant coffee may command a quality-neutral premium as EU operators pay for regulatory certainty. Early estimates suggest a 2–5 cent/lb compliance premium could emerge, especially in the transition period.
- **Supply chain consolidation:** Larger cooperatives and exporters with existing traceability infrastructure will absorb market share from smaller actors unable to meet EUDR requirements. This could accelerate consolidation in Colombian coffee exports.
- **Trade diversion risk:** Non-compliant coffee may be diverted from the EU market to non-EUDR destinations (USA, Japan, South Korea), creating a two-tier market. However, since the EU represents 35–40% of Colombian coffee demand, market diversion is not a viable long-term strategy for major

origins.
- **National compliance investment:** Countries that invest in national-level compliance infrastructure (farm registries, satellite monitoring integration, DDS facilitation platforms) will reduce per-farm compliance costs and maintain market access. Colombia's existing SICA/FNC/IDEAM infrastructure positions it well for this investment.


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Cacao

EUDR mapping for cacao — v1.1

Cacao EUDR Overview — Colombia

EUDR Context

Field	Value
eudr_commodity	cacao
country_focus	Colombia
eudr_article9_field	deforestation_risk_assessment
eudr_evidence_type	primary_field_data
deforestation_risk	medium
last_updated	2026-05-26

Overview

Cacao is one of seven commodities regulated under the EU Deforestation Regulation (EUDR, Regulation 2023/1115). Under Article 2, operators and traders placing cacao or cacao-derived products on the EU market must ensure the product is deforestation-free (no deforestation after 31 December 2020), legally produced in the country of origin, and covered by a due diligence statement submitted to the EU Information System. Binding compliance deadlines are 30 December 2026 for large and medium operators, and 30 June 2027 for micro and small operators.

Article 9 due diligence obligations require operators to collect high-precision geolocation coordinates linking cacao to specific plots of land. For plots exceeding 4 hectares, polygon mapping using WGS-84 (EPSG-4326) projection in GeoJSON format is required. Operators must conduct risk assessments considering the prevalence of deforestation in the sourcing region, corruption indices, land-tenure security, and the presence of indigenous or local communities. Compliant cacao must be stored and transported separately from cacao of unknown or non-compliant origin.

Colombia is the world's third-largest cacao exporter and a strategically important origin for EU buyers. In 2024, Colombia achieved its highest-ever cacao production of 67,678 tonnes, with exports growing over 100%. Unlike West African origins, Colombian cacao is not a major driver of deforestation. The country signed the Cocoa, Forests and Peace agreement and is the only Latin American pilot country in the FAO/GIZ-led EUDR digital tools initiative. This positions Colombia favorably for the EUDR country benchmarking system, though challenges remain in smallholder geolocation and informal land tenure.

Colombian Context

Colombia's cacao sector is dominated by smallholder farmers, with approximately 93% of the estimated 180,000 cacao-farming families cultivating an average of 3 hectares each. Santander is the leading production department, contributing 28,044 tonnes (41% of national production) in 2024, followed by Antioquia with 7,154 tonnes (11%) and Arauca with 6,993 tonnes (10%). Other significant producing departments include Huila, Tolima, and Nariño. Fedecacao (National Federation of Cacao Growers) coordinates extension services, traceability efforts, and international market access through the National Cacao Fund.

Key challenges include an estimated 6,000 tonnes of smuggled cacao annually, limited digital infrastructure in remote producing regions like Tumaco (Pacific coast), and the need to upgrade from single-point GPS coordinates to polygon mapping for thousands of smallholder plots. The Colombian government, through the Ministry of Agriculture and Fedecacao, is investing in genetic improvement, plantation renovation, and digital traceability systems to meet EUDR requirements.

Cleantech Taxonomy Nodes

Relevant existing nodes: CT-AF-001 (Land and Soil — deforestation-free proof for cacao plots), CT-AF-002 (Forests — shade-grown cacao and deforestation monitoring), CT-AF-008 (Crops — cacao varietal improvement and yield optimization), CT-EX-014 (Remote sensing — satellite monitoring of cacao regions), CT-EX-016 (Supply chain traceability — farm-to-port tracking), CT-EX-019 (Due diligence platforms — EUDR operator compliance).

Proposed new extension nodes: CT-EX-022 (Cacao plot-level geolocation and polygon mapping), CT-EX-023 (Cacao agroforestry carbon and biodiversity monitoring), CT-EX-024 (Cacao origin certification and mass balance systems), CT-EX-025 (Cacao smallholder digital inclusion platforms), CT-EX-026 (Cacao climate adaptation and varietal resilience), CT-EX-027 (Cacao landscape-level deforestation risk scoring).

Cacao Geolocation & Traceability

EUDR Context

Field	Value
eudr_commodity	cacao
country_focus	Colombia
eudr_article9_field	geolocation
eudr_evidence_type	primary_field_data
deforestation_risk	medium
last_updated	2026-05-26

Overview

The EUDR mandates that operators provide geolocation data for every plot of land where a regulated commodity was produced. For cacao, this means that each farm or parcel must be identified with latitude and longitude coordinates to at least six decimal digits of precision. Plots exceeding 4 hectares require polygon mapping that accurately traces the perimeter using multiple GPS points, submitted in GeoJSON format with WGS-84 (EPSG-4326) projection through the EU Information System.

Traceability in cacao supply chains requires linking each physical batch of cacao beans to its specific plot of origin, maintaining this identity from farm gate through aggregation points, fermentation and drying facilities, domestic transport, port loading, and EU customs entry. Operators must ensure that compliant cacao is never mixed with cacao of unknown or non-compliant origin. All geolocation data, risk assessments, and chain-of-custody records must be retained for a minimum of five years.

For cacao specifically, traceability is more fragmented than for commodities like palm oil or soy because most cacao is cultivated on small, often unregistered plots by families with informal land tenure. National cadastral and mapping systems in producer countries frequently lack coverage of remote cacao-growing areas, making farm-level geolocation both costly and technically challenging.

Colombian Context

Colombia's cacao traceability landscape is shaped by the dominance of smallholder production (93% of farmers on plots averaging 3 hectares) and the geographic dispersion of cacao across mountainous terrain in Santander, humid lowlands in Arauca, and conflict-affected Pacific coast zones in Tumaco and Nariño. Fedecacao has been advancing a national cacao traceability system, but coverage gaps remain, particularly in remote departments where basic digital infrastructure is limited.

Colombia is the only Latin American country participating in the FAO/GIZ-led EUDR pilot initiative, which deploys open digital tools — specifically the WHISP (World Heritage Information System for Plants) and GROUND platforms — to support geolocation and traceability. During pilot workshops, local organizations in Tumaco reported significant challenges in digitizing farm records and geolocating plots in areas with poor connectivity and limited GPS device access. Fedecacao presented its traceability progress alongside these remaining infrastructure gaps.

Since most Colombian cacao plots are under 4 hectares, single-point GPS coordinates (rather than full polygon mapping) may suffice for EUDR compliance, which reduces the technical burden on smallholders. However, aggregation at cooperative collection points still requires robust batch-level traceability systems to maintain the farm-to-port chain of custody. GIZ has highlighted Colombia's potential to become a regional reference in the use of interoperable digital traceability tools.

Cleantech Taxonomy Nodes

Directly relevant existing nodes: CT-EX-014 (Remote sensing and satellite deforestation monitoring — provides the satellite imagery layer for deforestation verification of geolocated plots), CT-EX-016 (Supply chain traceability platforms — blockchain and IoT infrastructure for cacao chain of custody), CT-EX-017 (Precision agriculture data platforms — field-level data collection for smallholder cacao farms).

Proposed new node: CT-EX-022 (Cacao plot-level geolocation and polygon mapping) — covers the specific tools and processes for collecting, validating, and submitting geolocation data for cacao plots under EUDR, including mobile GPS tools, polygon digitization for plots over 4 hectares, and integration with the EU Information System. Also relevant: CT-EX-025 (Cacao smallholder digital inclusion platforms) for addressing connectivity and device access gaps in remote cacao regions.

Cacao Deforestation Risk Assessment

EUDR Context

Field	Value
eudr_commodity	cacao
country_focus	Colombia
eudr_article9_field	deforestation_risk_assessment
eudr_evidence_type	satellite_verification
deforestation_risk	medium
last_updated	2026-05-26

Overview

Under the EUDR, operators must assess whether the cacao they source is deforestation-free, meaning no forest loss or degradation occurred on the plot of production after 31 December 2020. The risk assessment must consider factors including: the prevalence of deforestation and forest degradation in the sourcing country and region, the reliability of land-use and forest-cover data, governance indicators including corruption and rule-of-law indices, the complexity of the supply chain, and the presence of indigenous peoples or local communities whose rights may be affected.

For cacao specifically, deforestation risk profiles vary dramatically by origin. West African cocoa (Cote d'Ivoire, Ghana) is historically associated with high deforestation rates driven by shade-tree removal for full-sun monoculture. Latin American origins, including Colombia, present a more nuanced risk profile: cacao itself is not a primary deforestation driver, but cacao expansion can occur in landscapes already fragmented by cattle ranching, coca cultivation, and illicit land clearing.

The EU country benchmarking system will classify producing countries and sub-national regions as high, standard, or low risk. This classification directly affects the level of due diligence scrutiny required: operators sourcing from high-risk regions face enhanced checks, while those sourcing from low-risk regions may benefit from simplified procedures. Colombia's benchmarking outcome will significantly impact the compliance burden on its cacao exporters.

Colombian Context

Colombia's deforestation dynamics are complex. A CIAT baseline study found that cacao cultivation is not a significant direct driver of deforestation in Colombia. However, cacao-growing regions overlap with active deforestation fronts driven by other forces. The Catatumbo region (Norte de Santander), bordering Venezuela, experiences forest loss from coca cultivation and armed-group land clearing. The Pacific coast (Tumaco, Nariño) faces deforestation from illegal mining, coca, and logging. The Amazon arc (Caqueta, Guaviare, Putumayo) has seen post-peace-agreement deforestation driven by cattle ranching expansion, land speculation, and in-migration.

Santander, the largest cacao-producing department, has relatively lower deforestation risk because most cacao there is grown in established agroforestry systems on land that was converted long before the 2020 cutoff date. Arauca and parts of Antioquia present moderate risk due to proximity to the agricultural frontier. The most sensitive areas for EUDR risk assessment are emerging cacao zones in Caqueta and Putumayo, where cacao is promoted as a peace-crop substitute for coca but is expanding into recently deforested landscapes.

Satellite monitoring of Colombian cacao areas is supported by national systems including IDEAM's Forest and Carbon Monitoring System and international platforms like Global Forest Watch. Fairtrade has partnered with Satelligence to scale up satellite monitoring of forested areas around Fairtrade cocoa farms across Latin America, with full georeferencing data targeted for completion by end of 2025.

Cleantech Taxonomy Nodes

Key existing nodes: CT-AF-002 (Forests and Woodlands — deforestation monitoring and forest preservation technology), CT-EX-014 (Remote sensing and satellite deforestation monitoring — the primary technical infrastructure for EUDR deforestation risk assessment), CT-AF-001 (Land and Soil — land-use change detection on cacao plots).

Proposed new node: CT-EX-027 (Cacao landscape-level deforestation risk scoring) — covers tools and methodologies for assessing deforestation risk at the landscape scale around cacao production areas, integrating satellite data, land-tenure information, governance indicators, and proximity to deforestation fronts. This is distinct from plot-level geolocation (CT-EX-022) because it addresses the contextual risk of the broader landscape rather than the specific farm boundary.

Cacao Certification & Compliance

EUDR Context

Field	Value
eudr_commodity	cacao
country_focus	Colombia
eudr_article9_field	compliance_statement
eudr_evidence_type	certification
deforestation_risk	medium
last_updated	2026-05-26

Overview

Voluntary sustainability certifications play a critical role in EUDR compliance for cacao, though they do not automatically satisfy regulatory requirements. The EUDR explicitly states that certifications alone are not sufficient evidence of deforestation-free production — operators must still conduct their own due diligence. However, certification schemes provide structured data, audit trails, and traceability infrastructure that significantly reduce the compliance burden.

The Rainforest Alliance (which merged with UTZ in 2018, absorbing the world's largest cocoa certification programme) has upgraded its certification system to include EUDR-aligned requirements. Approximately 50% of Rainforest Alliance certificate holders in the coffee and cocoa sectors have opted into these additional EUDR requirements. The Rainforest Alliance system offers complete traceability options and allows buyers to identify certificate holders who comply with EUDR-aligned standards, including farm-level geolocation and deforestation monitoring.

Fairtrade International, the second-largest certification scheme in cocoa, focuses on empowering farmers through better prices and decent working conditions. Fairtrade has partnered with Satelligence to scale satellite monitoring of forested areas around certified cocoa farms, with a target to complete georeferencing of all Fairtrade cocoa farms in Latin America by end of 2025. Other relevant schemes include organic certification (which prohibits deforestation by definition but may lack geolocation precision) and origin-specific certifications like Cacao de Colombia (Denominacion de Origen).

Colombian Context

Colombian cacao benefits from a favorable certification landscape. The country's fine-flavor cacao (approximately 95% of production is classified as fine or flavor cacao by ICCO) commands premium prices in specialty markets, providing economic incentive for certification. Major Colombian cacao exporters — including Luker Chocolate (Casa Luker), Compania Nacional de Chocolates (Grupo Nutresa), and cooperative federations — maintain Rainforest Alliance and Fairtrade certifications across their supply chains.

For EUDR compliance mapping, certification evidence serves as a supporting layer rather than a standalone proof. Operators must cross-reference certification data with: (1) geolocation coordinates from the certified farm, (2) satellite imagery confirming no forest loss after December 2020, and (3) legal production documentation including land title or recognized tenure. The Rainforest Alliance's origin matching and mass balance systems for cocoa are designed to support this cross-referencing at scale.

A key gap for Colombian smallholders is that many produce certified cacao through cooperatives but lack individual farm-level certification records. The cooperative-level aggregation model, while efficient for marketing, can obscure plot-level traceability. Technical assistance programs (see CT-EX-020) are addressing this by helping cooperatives disaggregate their traceability records to the individual farm level required by the EUDR.

Cleantech Taxonomy Nodes

Primary existing node: CT-EX-018 (Deforestation-free certification services — Rainforest Alliance, UTZ/merged, Fairtrade, and other certification services directly applicable to cacao). Also relevant: CT-EX-019 (Supply chain due diligence platforms — the operator-side platforms that ingest certification data as evidence), CT-EX-021 (EUDR operator documentation services — documentation services that compile certification evidence into due diligence statements).

Proposed new node: CT-EX-024 (Cacao origin certification and mass balance systems) — covers the specific mechanisms for maintaining certified cacao identity through mass balance, identity preserved, and segregated supply chain models, including the Rainforest Alliance cocoa origin matching system and cooperative-level disaggregation tools. This is distinct from general certification (CT-EX-018) because it addresses the cacao-specific challenge of maintaining certification identity through complex multi-stage processing chains (fermentation, drying, roasting, grinding).

Cacao Agroforestry & Climate Adaptation

EUDR Context

Field	Value
eudr_commodity	cacao
country_focus	Colombia
eudr_article9_field	deforestation_risk_assessment
eudr_evidence_type	satellite_verification
deforestation_risk	low
last_updated	2026-05-26

Overview

Cacao is inherently an understory crop that evolved under tropical forest canopy, making shade-grown agroforestry the production system most aligned with both EUDR objectives and climate resilience. Cacao agroforestry systems integrate cacao trees with upper-canopy timber species, fruit trees, and nitrogen-fixing shade species, creating multi-strata systems that maintain forest-like structure. These systems are characterized by high structural and floristic diversity, with common companion species including timber trees (Cordia alliodora, Cedrela odorata), fruit trees (avocado, citrus), nitrogen fixers (Inga spp., Erythrina spp.), and native canopy species.

From an EUDR perspective, shade-grown cacao agroforestry represents a low-deforestation-risk production model because it preserves tree cover, maintains carbon stocks, and does not require forest clearing. Satellite-based deforestation monitoring systems can distinguish between shaded agroforestry (which retains canopy cover) and full-sun monoculture (which removes it), providing an additional verification layer for EUDR compliance. Research in the Colombian Amazon has demonstrated that cacao agroforestry landscapes store significantly more carbon per hectare than pastureland, contributing to both EUDR compliance and climate mitigation.

Climate adaptation is critical for cacao's long-term viability. A 2026 study warned that Colombia may lose one-fifth of its suitable cacao areas by 2050 due to rising temperatures, with northern Colombia, parts of the Orinoquia plains, and scattered Pacific coast zones facing the steepest declines. Shade-grown agroforestry systems provide natural climate buffering through canopy microclimate regulation, reduced soil moisture evaporation, and wind protection — making them more resilient to temperature extremes than full-sun systems.

Colombian Context

Colombia's cacao agroforestry tradition is strong, particularly in Santander where most cacao is grown under shade canopy alongside timber and fruit trees. The Cocoa, Forests and Peace agreement (signed in 2018) promotes cocoa agroforestry models that limit the agricultural frontier and protect forest margins. In the Colombian Amazon (Caqueta, Putumayo), the World Cocoa Foundation has supported sustainable cacao as an alternative livelihood to coca cultivation, using agroforestry models that integrate native tree species.

Research at CIAT (now part of the Alliance of Bioversity International and CIAT) has mapped cacao production system types across Colombia, finding that multifunctional agroforestry systems deliver acceptable cacao yields while contributing to food security, economic diversification, and climate resilience. Key cacao varieties cultivated in Colombia include regional clones selected for fine-flavor profiles and disease resistance (particularly to frosty pod rot, Moniliophthora roreri), as well as improved clones from Corpoica (now AGROSAVIA) breeding programs.

The intersection of cacao agroforestry with silvopastoral systems is particularly relevant in Colombia's agricultural frontier zones, where cattle ranching is the primary deforestation driver. Integrating cacao agroforestry corridors into silvopastoral landscapes creates tree-cover connectivity that supports both EUDR compliance and biodiversity conservation. This landscape-level approach links cacao production directly to the existing taxonomy node CT-EX-007 (Silvopastoral systems).

Cleantech Taxonomy Nodes

Key existing nodes: CT-AF-002 (Forests and Woodlands — the forest preservation dimension of shade-grown cacao), CT-EX-005 (Community-led reforestation and agroforestry — smallholder cacao agroforestry as a reforestation pathway), CT-EX-007 (Silvopastoral systems — landscape integration of cacao agroforestry with cattle areas), CT-EX-001 (Drought-resistant crop varieties — climate-adapted cacao genetics), CT-EX-003 (Heat adaptation for agriculture — shade canopy as heat mitigation).

Proposed new nodes: CT-EX-023 (Cacao agroforestry carbon and biodiversity monitoring) — covers tools for measuring and verifying the carbon storage and biodiversity outcomes of cacao agroforestry systems, supporting both carbon credit generation and EUDR evidence of forest-positive production. CT-EX-026 (Cacao climate adaptation and varietal resilience) — covers genetic improvement programs, climate-smart varietal selection, and adaptation strategies to maintain cacao productivity under changing climate conditions.

Cacao Smallholder Technical Assistance

EUDR Context

Field	Value
eudr_commodity	cacao
country_focus	Colombia
eudr_article9_field	compliance_statement
eudr_evidence_type	primary_field_data
deforestation_risk	medium
last_updated	2026-05-26

Overview

The EUDR recognizes the disproportionate compliance burden on smallholder producers through its amended provisions (Regulation 2025/2650), which allow small and micro primary operators in low-risk countries to submit simplified one-time declarations instead of full due diligence. However, even simplified compliance requires geolocation data, legal production evidence, and basic traceability — capabilities that many cacao smallholders lack without external technical assistance.

Technical assistance for EUDR compliance encompasses several dimensions: farm registration and geolocation (GPS data collection, plot boundary mapping), production documentation (harvest records, sales receipts, cooperative membership), legal compliance verification (land tenure documentation, environmental permits), and digital literacy (using mobile applications for data submission and record-keeping). For cacao smallholders, the most critical gap is typically the combination of informal land tenure and absence of georeferenced farm records.

The cost of EUDR compliance for smallholders is a major concern. Research indicates that compliance costs — including GPS device acquisition, data collection time, cooperative system upgrades, and third-party verification — can be significant relative to smallholder income. Without technical assistance and shared infrastructure (through cooperatives and sector organizations), many smallholders risk being excluded from EU supply chains entirely, redirecting their production to less regulated markets at lower prices.

Colombian Context

Colombia has approximately 180,000 cacao-farming families, with 93% classified as smallholders cultivating an average of 3 hectares. Fedecacao, through the National Cacao Fund (Fondo Nacional del Cacao), coordinates the primary technical assistance infrastructure for these farmers, including extension services, agronomic training, genetic improvement programs, and increasingly, EUDR compliance support. The Ministry of Agriculture and strategic allies provide additional funding and coordination.

The FAO/GIZ EUDR pilot initiative in Colombia is specifically designed to build institutional capacity for smallholder compliance, deploying open digital tools (WHISP and GROUND platforms) for geolocation and deforestation verification. This initiative positions Colombia as a potential regional model for how producer countries can build public infrastructure that reduces per-farmer compliance costs. Key challenges identified during pilot workshops include: limited internet connectivity in remote cacao zones (particularly Tumaco and parts of Caqueta), low digital literacy among older farmers, informal land tenure (many farmers lack formal title), and the cost of upgrading cooperative-level data systems to support individual farm traceability.

Engagement with supply chain buyers (exporters and EU importers) is also critical. Operators can support compliance by investing in cooperative-level data systems, financing GPS device distribution, training local technicians, and funding independent verification. Luker Chocolate and Compania Nacional de Chocolates have invested in upstream traceability programs that combine certification requirements with EUDR compliance data collection, reducing duplication of effort for farmers. Community-based organizations and NGOs (including the World Cocoa Foundation's programs in Caqueta and Putumayo) complement government and industry efforts by providing localized, culturally appropriate technical assistance.

Cleantech Taxonomy Nodes

Primary existing node: CT-EX-020 (Smallholder technical assistance for EUDR — the core node for EUDR technical assistance programs, currently focused on coffee but directly applicable to cacao). Also relevant: CT-AF-006 (Smart Farming — digital tools and data platforms that smallholders need to access), CT-EX-017 (Precision agriculture data platforms — the data infrastructure underpinning farm-level compliance).

Proposed new node: CT-EX-025 (Cacao smallholder digital inclusion platforms) — covers the specific platforms, tools, and programs designed to bring cacao smallholders into digital traceability systems, including mobile-first farm registration apps, offline-capable GPS tools for areas without connectivity, cooperative data management systems, and integration with national cadastral systems. This extends CT-EX-020 (general smallholder TA) with the cacao-specific digital infrastructure dimension that is the primary bottleneck for Colombian smallholder EUDR compliance.

Cattle

EUDR mapping for cattle — v1.1

Cattle EUDR Overview — Colombia

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	geolocation — establishment-level for each farm in animal lifetime
eudr_evidence_type	satellite_verification, primary_field_data
deforestation_risk	HIGH
last_updated	2026-05-26

Overview

Cattle is one of seven commodities regulated under the EU Deforestation Regulation (EUDR, Regulation 2023/1115), alongside coffee, cacao, palm oil, soy, wood, and rubber. The regulation covers a broad scope of cattle-derived products including beef, leather, tallow, and other processed goods. Operators placing these products on the EU market must demonstrate that the commodities were not produced on land subject to deforestation or forest degradation after 31 December 2020, and were produced in compliance with the laws of the country of production.

Under Article 9, cattle has a unique geolocation requirement: rather than requiring the perimeter of a production plot, the EUDR requires at least one latitude/longitude coordinate with six decimal digits for each establishment where the animal was kept during its lifetime. This reflects the reality that cattle move between farms, feedlots, and slaughterhouses during their production cycle — making cattle traceability fundamentally different from crop-based commodities like coffee or cacao.

The legally binding start date is 30 December 2026 for large and medium operators, and 30 June 2027 for micro and small operators. Country benchmarking will classify Colombia's cattle sector risk level, with strong likelihood of a HIGH risk designation given the well-documented deforestation-cattle nexus.

Colombian Context

Colombia holds the fourth-largest cattle herd in Latin America with over 29.5 million head (2024 ICA/Fedegan census) distributed across more than 620,000 farms. The cattle sector is a dominant economic force, particularly in departments like Antioquia, Meta, Casanare, Caqueta, and Cordoba. The sector is responsible for an estimated 60-80% of national deforestation, driven by the phenomenon of praderizacion — the conversion of forest to pasture for extensive ranching and land speculation.

Colombia's beef and leather exports to the EU are modest but growing, and the EUDR will require Colombian operators to provide establishment-level geolocation data for all cattle movements, deforestation risk assessments for associated ranch lands, and compliance documentation meeting EU due diligence standards. The SINIGAN traceability system managed by Fedegan and ICA provides the institutional backbone, though significant gaps remain in farm-to-slaughterhouse tracking, especially for animals that pass through multiple establishments during their lifetime.

Cleantech Taxonomy Nodes

Primary relevant nodes: CT-AF-007 (Livestock and Fisheries — directly covers cattle technology), CT-EX-007 (Silvopastoral systems), CT-AF-002 (Forests and Woodlands — deforestation monitoring). EUDR compliance infrastructure nodes CT-EX-014 (Remote sensing), CT-EX-016 (Supply chain traceability), CT-EX-018 (Certification services), CT-EX-019 (Due diligence platforms), CT-EX-020 (Smallholder technical assistance), and CT-EX-021 (Operator documentation) all require eudr_cattle=Y flags. New extension rows needed for cattle-specific traceability via SINIGAN integration, pasture-to-forest restoration technology, cattle methane reduction, and landscape-level deforestation monitoring.

Cattle Geolocation & Land Use Tracking

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	geolocation — single coordinate per establishment, all establishments in animal lifetime
eudr_evidence_type	satellite_verification, primary_field_data, geospatial_analysis
deforestation_risk	HIGH
last_updated	2026-05-26

Overview

EUDR Article 9 establishes specific geolocation requirements for cattle that differ from crop-based commodities. For cattle, operators must provide at least one latitude/longitude coordinate with six decimal digits for each establishment where the animal was kept during its lifetime. This establishment-level approach contrasts with the plot-perimeter requirement for crops grown on areas larger than four hectares, reflecting the mobile nature of cattle production where animals transit through birth farms, fattening operations, feedlots, and slaughterhouses.

Satellite monitoring plays a critical role in verifying that ranch lands associated with cattle production have not undergone deforestation after the December 31, 2020 cutoff date. Technologies including Sentinel-2, Landsat, and NICFI Planet imagery enable detection of pasture expansion into forest areas. For Colombia, the deforestation monitoring system operated by IDEAM provides national-level forest change data, while Global Forest Watch and MapBiomas Amazonia offer complementary independent verification layers.

The integration of geolocation data with deforestation alert systems is essential: each ranch coordinate must be cross-referenced against forest cover change datasets to produce the deforestation risk assessment required under EUDR due diligence. The temporal dimension is critical — cattle may spend only months at a given establishment, but that establishment's land use history across the full post-2020 period must be verified.

Colombian Context

Colombia's deforestation hotspots for cattle-driven land clearing are concentrated in the Amazonian departments of Caqueta, Guaviare, and southern Meta, as well as the Orinoquia plains and Pacific coast lowlands. In 2024, Caqueta recorded approximately 25,263 hectares deforested, Guaviare 16,908 hectares, and Meta 21,107 hectares — with cattle pasture expansion as the primary driver in all three regions. The phenomenon of praderizacion involves clearing forest to establish pasture, often as a mechanism for informal land claims rather than productive ranching.

Monitoring challenges include cloud cover in tropical forest regions which limits optical satellite revisit effectiveness, large ranch sizes in the Llanos Orientales where a single property may span thousands of hectares, and the prevalence of informal land tenure where property boundaries are poorly defined. The SINIGAN system records farm locations but does not systematically integrate satellite deforestation verification, creating a gap that EUDR compliance will require closing.

Cleantech Taxonomy Nodes

Directly relevant: CT-EX-014 (Remote sensing and satellite deforestation monitoring — requires eudr_cattle=Y), CT-AF-001 (Land and Soil — geolocation for ranch lands), CT-AF-006 (Smart Farming — precision data feeds for cattle geolocation). New extension needed: CT-EX-028 (Cattle establishment geolocation and movement tracking) to cover the unique multi-establishment geolocation challenge specific to cattle EUDR compliance.

Cattle Deforestation Risk Assessment

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	deforestation_risk_assessment
eudr_evidence_type	satellite_verification, risk_classification
deforestation_risk	HIGH
last_updated	2026-05-26

Overview

The cattle sector is the single largest driver of tropical deforestation globally, and Colombia is no exception. The EUDR requires operators to conduct risk assessments demonstrating that cattle products were not linked to post-2020 deforestation. For cattle, this assessment must cover every establishment in the animal's lifetime — a far more complex requirement than for stationary crops. The risk assessment must evaluate both direct deforestation (clearing forest for new pasture) and indirect deforestation (displacement effects where cattle ranching pushes into forest frontiers).

Colombia's cattle sector is estimated to be responsible for 60-80% of national deforestation. The country lost approximately 113,000 hectares of forest in 2024, with armed groups and cattle ranchers identified as the primary drivers of a 35% year-on-year increase. The three major deforestation fronts are the Amazonian arc (Caqueta, Guaviare, Putumayo), the Orinoquia transition zone (Meta, Vichada), and the Pacific lowlands (Choco, Narino). Each front has distinct deforestation dynamics, but praderizacion for cattle is the common driver.

The EUDR country benchmarking system will classify countries as low, standard, or high risk. Given Colombia's deforestation trajectory and the documented cattle-deforestation nexus, a high-risk classification for cattle is highly probable, triggering enhanced due diligence requirements including more detailed geolocation data, larger sample sizes for verification, and more frequent compliance checks.

Colombian Context

Praderizacion — the systematic conversion of forest to cattle pasture — is deeply embedded in Colombia's land colonization patterns. In many frontier regions, clearing forest and introducing cattle is used as a mechanism to establish de facto land ownership, particularly on public lands (baldios) and in areas affected by armed conflict. National parks including Sierra de la Macarena, Tinigua, and Cordillera de los Picachos have documented thousands of head of cattle grazing illegally, with over 24,000 cattle reported in protected areas in 2023.

Land titling challenges compound the problem: much of Colombia's cattle frontier operates without formal land titles, making it difficult to assign responsibility for deforestation to specific operators. The intersection of armed conflict, coca cultivation, and cattle ranching in departments like Caqueta and Guaviare creates a complex risk landscape where deforestation drivers are interlinked. EUDR compliance for Colombian cattle will require untangling these dynamics at the individual establishment level.

Cleantech Taxonomy Nodes

Directly relevant: CT-AF-002 (Forests and Woodlands — deforestation risk monitoring, needs eudr_cattle=Y), CT-EX-014 (Remote sensing — satellite deforestation detection, needs eudr_cattle=Y), CT-EX-019 (Due diligence platforms — risk assessment tools, needs eudr_cattle=Y). New extension needed: CT-EX-029 (Pasture-driven deforestation monitoring and risk classification) covering the specific dynamics of cattle-linked deforestation including praderizacion detection, illegal pasture encroachment into protected areas, and landscape-level risk scoring for cattle supply chains.

Cattle

Silvopastoral Systems & Sustainable Ranching

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	deforestation_risk_assessment, compliance_statement
eudr_evidence_type	primary_field_data, certification
deforestation_risk	MEDIUM (reduced through silvopastoral conversion)
last_updated	2026-05-26

Overview

Silvopastoral systems integrate trees with pasture and livestock, offering a pathway to reconcile cattle production with forest conservation. These systems reduce or eliminate the need for pasture expansion into forests by intensifying production on existing land while simultaneously sequestering carbon, improving soil health, and increasing biodiversity. For EUDR compliance, silvopastoral farms represent lower deforestation risk profiles and may serve as demonstration cases for sustainable cattle production that meets EU market access requirements.

Colombia has been a global pioneer in silvopastoral adoption through the Ganaderia Colombiana Sostenible (GCS) project, a landmark initiative supported by the Global Environment Facility, the World Bank, The Nature Conservancy, Fedegan, and CIPAV. The project operated on 4,100 farms across 87 municipalities in 12 departments, establishing 38,390 hectares of silvopastoral systems and sequestering 1.56 million tonnes of CO2 equivalent. The project demonstrated that silvopastoral conversion can increase stocking rates, improve farm productivity, and deliver measurable environmental co-benefits.

Colombia's NDC targets the agricultural sector for 13.46 MtCO2e/year in emissions reductions by 2030. Good pasture management and silvopastoral systems could deliver up to 77% of this agricultural NDC target, making cattle sector transformation a cornerstone of Colombia's climate commitments. The NDC includes specific targets for 69,000 hectares of livestock landscape restoration through intensification and silvopastoral conversion.

Colombian Context

Fedegan promotes silvopastoral adoption through its sustainable cattle programs, offering technical assistance and financial incentives for ranchers transitioning from extensive to intensive systems. Key silvopastoral models in Colombia include leucaena-based intensive silvopastoral systems in the tropical lowlands, scattered-tree silvopastures in the Andean foothills, and living fence systems that connect forest fragments across cattle landscapes.

Challenges to scaling include upfront investment costs for tree establishment, a 2-3 year lag before silvopastoral systems reach full productivity, limited availability of suitable tree seedling nurseries in frontier regions, and the need for technical assistance to manage complex tree-pasture-animal interactions. The GCS project demonstrated viable business cases but nationwide adoption remains below 5% of total cattle area. The EUDR could accelerate adoption by creating market-access incentives for sustainably produced beef and leather.

Cleantech Taxonomy Nodes

Directly relevant: CT-EX-007 (Silvopastoral systems — already exists, needs eudr_cattle=Y), CT-AF-007 (Livestock and Fisheries — needs eudr_cattle=Y for sustainable ranching technology). New extension needed: CT-EX-030 (Pasture restoration and livestock intensification technology) covering degraded pasture recovery, rotational grazing systems, carrying capacity optimization, and the technology platforms that support the transition from extensive to intensive cattle production.

Cattle Supply Chain Traceability

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	supplier_identification, geolocation
eudr_evidence_type	primary_field_data, self_declaration, digital_traceability
deforestation_risk	HIGH
last_updated	2026-05-26

Overview

Cattle supply chain traceability presents unique challenges compared to crop commodities. A single animal may pass through 3-5 establishments during its lifetime — birth farm, calf-rearing operation, fattening ranch, feedlot, and slaughterhouse — each requiring geolocation data and deforestation verification under the EUDR. The leather supply chain adds further complexity, as hides may be aggregated from multiple slaughterhouses and processed through tanneries before reaching EU markets, making origin traceability particularly difficult.

Effective cattle traceability requires individual animal identification (ear tags, RFID, or digital systems), movement recording at each transfer between establishments, and integration with geolocation databases that enable deforestation risk assessment for each farm in the animal's history. The challenge is compounded by informal market channels: in many producing countries, a significant share of cattle transactions occurs outside formal traceability systems, particularly for animals sold at rural livestock markets or moved between farms without official documentation.

Digital traceability platforms using blockchain, IoT sensors, and mobile-based data capture are emerging as solutions. These systems can create immutable records of animal movements and link them to satellite-verified geolocation data, providing the evidence chain that EUDR due diligence requires. However, connectivity gaps in rural cattle regions and low digital literacy among smallholder ranchers remain barriers to adoption.

Colombian Context

Colombia's SINIGAN system (Sistema Nacional de Identificacion, Informacion y Trazabilidad Animal) is the institutional backbone for cattle traceability. Created by Law 914 of 2004 and managed by Fedegan under ICA oversight, SINIGAN was originally designed with a sanitary focus — recording vaccination campaigns and animal movements for disease control, particularly foot-and-mouth disease prevention. The system was recently

upgraded to SINIGAN V6, a comprehensive digital platform that incorporates a mobile application, institutional interoperability, mandatory digital registration, automatic verification, and real-time data availability.

Despite these advances, SINIGAN was built in a fragmented manner with multiple disconnected platforms: SINIGAN itself, SNIITA, sanitary transport guides (Guias Sanitarias de Movilizacion), and the Forest Monitoring System operate as separate systems without effective interoperability. For EUDR compliance, Colombia must bridge these silos to create a unified traceability chain from birth farm to export point, with deforestation verification integrated at each step. The gap between SINIGAN's sanitary traceability and the environmental traceability required by the EUDR represents a significant technical and institutional challenge.

Cleantech Taxonomy Nodes

Directly relevant: CT-EX-016 (Supply chain traceability platforms — needs eudr_cattle=Y), CT-AF-006 (Smart Farming — precision data for cattle), CT-EX-019 (Due diligence platforms — needs eudr_cattle=Y). New extension needed: CT-EX-028 (Cattle establishment geolocation and movement tracking) specifically covering individual animal identification technology, multi-establishment movement recording, SINIGAN integration platforms, and digital solutions bridging sanitary and environmental traceability for cattle.

Cattle Certification & Compliance

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	compliance_statement
eudr_evidence_type	certification, self_declaration
deforestation_risk	HIGH
last_updated	2026-05-26

Overview

The EUDR does not recognize voluntary certification schemes as sufficient evidence of compliance — operators must conduct their own due diligence regardless of certifications held. However, certification systems provide structured frameworks, verified data, and audit trails that can significantly reduce the due diligence burden. For cattle, the certification landscape is less mature than for commodities like coffee or palm oil, creating both a gap and an opportunity for the development of cattle-specific deforestation-free standards.

Rainforest Alliance launched a cattle certification program, but after eight years it had achieved only minimal adoption — fewer than a dozen certified operations across Brazil and Colombia. The Sustainable Agriculture Network (SAN) standard has been applied to some cattle operations, and the Global Roundtable for Sustainable Beef (GRSB) provides principles but not farm-level certification. The Leather Working Group certifies tanneries for environmental performance but does not address deforestation at the raw material level, creating a traceability gap in leather supply chains.

The EUDR is likely to catalyze development of more rigorous cattle certification standards that incorporate the regulation's specific requirements: establishment-level geolocation, deforestation-free verification for all farms in an animal's lifetime, and legality of production. Existing certification bodies will need to retrofit their cattle standards to meet these requirements, or new specialized cattle-EUDR certification services will emerge.

Colombian Context

Colombia's ICA administers the Buenas Practicas Ganaderas (BPG) certification — a quality and food safety assurance system for primary livestock production covering animal health, welfare, nutrition, environmental management, and worker safety. Between 2010 and 2013, Fedegan conducted 191 Field Schools promoting BPG across Regional Livestock Development Units. However, adoption remains uneven: many ranchers lack awareness of or interest in BPG certification, particularly in frontier regions where EUDR compliance will be most critical.

Agrolonja SAS achieved Colombia's first Rainforest Alliance cattle certification, demonstrating that sustainable ranching can deliver both environmental benefits and improved market access through premium pricing. However, scaling certification across Colombia's 620,000+ cattle farms — the vast majority of which are smallholder operations — requires dramatic expansion of technical assistance capacity, simplification of certification processes, and financial mechanisms to cover compliance costs for small producers.

Cleantech Taxonomy Nodes

Directly relevant: CT-EX-018 (Deforestation-free certification services — needs eudr_cattle=Y), CT-EX-021 (EUDR operator documentation services — needs eudr_cattle=Y), CT-EX-020 (Smallholder technical assistance for EUDR — needs eudr_cattle=Y). New extension needed: CT-EX-031 (Cattle-specific deforestation-free verification and certification) covering BPG-EUDR alignment tools, cattle-specific audit methodologies, leather supply chain certification, and multi-establishment verification protocols unique to cattle.

Cattle-Coffee Landscape Integration

EUDR Context

Field	Value
eudr_commodity	cattle (cross-commodity with coffee)
country_focus	Colombia
eudr_article9_field	geolocation, deforestation_risk_assessment
eudr_evidence_type	satellite_verification, primary_field_data
deforestation_risk	HIGH (cattle component); MEDIUM (coffee component)
last_updated	2026-05-26

Overview

The EUDR regulates cattle and coffee as separate commodities, but in practice many Colombian farms produce both. Mixed cattle-coffee farms are common throughout the Andean foothills and transitional zones between highland coffee regions and lowland cattle areas. A single farm may have coffee plots on steeper slopes and cattle pasture on flatter areas, creating a situation where the same landowner must comply with EUDR requirements for two distinct commodities simultaneously.

This landscape integration has important implications for EUDR compliance. A landscape-level approach to deforestation risk assessment can serve both commodity supply chains: the same satellite monitoring that verifies deforestation-free status for coffee plots also covers cattle pastures on the same or neighboring farms. Shared geolocation infrastructure, technical assistance programs, and certification services can reduce per-commodity compliance costs when both cattle and coffee operate within the same landscape.

Conversely, the deforestation risk profiles differ significantly between the two commodities. Coffee cultivation in shade-grown agroforestry systems may actively support forest conservation, while cattle pasture on the same farm may be associated with historical forest clearing. The EUDR requires commodity-specific due diligence, meaning operators cannot use coffee compliance to substitute for cattle compliance on mixed farms — each commodity must independently meet all Article 9 requirements.

Colombian Context

The Colombian Andes host a gradient from highland coffee zones (1,200-1,800 meters) to mid-elevation mixed farming zones to lowland cattle areas. In departments like Huila, Tolima, Antioquia, and Caldas, the transition zone supports thousands of mixed cattle-coffee farms. The Colombian Coffee Growers Federation (FNC) estimates that a significant portion of coffee-producing families also raise cattle, using livestock as an economic buffer against coffee price volatility and as a form of savings.

For EUDR compliance, the integration point offers efficiency gains: organizations already providing EUDR technical assistance to coffee farmers (through FNC, cooperatives, or certification bodies) can extend services to cover the cattle component on the same farms. This reduces the marginal cost of cattle EUDR compliance and leverages existing trust relationships and data infrastructure built for coffee. However, it requires cross-commodity traceability platforms that can manage both crop-based geolocation (plot perimeters for coffee) and establishment-based geolocation (single points for cattle) within a unified system.

Cleantech Taxonomy Nodes

Directly relevant: CT-AF-007 (Livestock and Fisheries — cattle component), CT-AF-008 (Crops — coffee component), CT-EX-005 (Community-led reforestation and agroforestry — landscape integration). New extension needed: CT-EX-032 (Cross-commodity EUDR landscape compliance) covering integrated deforestation monitoring for multi-commodity landscapes, shared geolocation infrastructure, and compliance platforms that manage both cattle and crop EUDR requirements on mixed farms.

Cattle Smallholder & Family Ranch Challenges

EUDR Context

Field	Value
eudr_commodity	cattle
country_focus	Colombia
eudr_article9_field	compliance_statement, supplier_identification
eudr_evidence_type	primary_field_data, self_declaration
deforestation_risk	HIGH
last_updated	2026-05-26

Overview

The EUDR grants micro and small operators an extended compliance deadline (30 June 2027 vs 30 December 2026) and reduced due diligence requirements, but the fundamental obligations remain: all cattle products entering the EU market must be traceable to deforestation-free production regardless of the operator's size. For producing countries like Colombia where the cattle sector is dominated by smallholders, this creates a systemic compliance challenge — the EUDR's requirements must ultimately be met at the level of hundreds of thousands of individual farms, most of which lack the technical capacity, digital infrastructure, or financial resources to independently generate EUDR-compliant documentation.

The cost of EUDR compliance for a smallholder cattle farmer includes individual animal identification and registration, geolocation recording for the farm, participation in a traceability system, and documentation of legal land use. These costs are proportionally much higher for small operations — a rancher with 20 head of cattle faces similar fixed compliance costs as one with 2,000 head, making per-unit compliance costs prohibitive without external support. The risk of market exclusion is real: smallholders who cannot demonstrate compliance may be cut from export supply chains by downstream operators seeking to minimize their own regulatory risk.

Aggregation models — where cooperatives, associations, or landscape-level programs provide shared compliance infrastructure — are essential for making cattle EUDR accessible to smallholders. These models can spread fixed costs across many producers, provide centralized technical assistance, and leverage group-level traceability systems that reduce the per-farm burden. Without such models, EUDR implementation risks concentrating cattle exports among large-scale operations while marginalizing the smallholder majority.

Colombian Context

Colombia has over 620,000 cattle farms and more than 600,000 livestock farmers, with the vast majority operating at small scale. Average herd sizes outside of the large Llanos ranches are modest, and many smallholder ranchers lack formal land titles — a prerequisite for demonstrating legal land use under the EUDR. In conflict-affected regions like Caqueta, Meta, and Guaviare, land tenure is particularly complex, with overlapping claims from traditional communities, displaced populations, and informal colonizers.

Technical assistance infrastructure for cattle ranchers is thin compared to the coffee sector, where FNC and the cooperative network provide extension services to over 500,000 families. Fedegan operates Regional Livestock Development Units and BPG field schools, but coverage is limited relative to the total number of cattle farms. The EUDR compliance gap for Colombian cattle smallholders spans digital literacy (ability to use SINIGAN and mobile traceability apps), legal documentation (land titles, environmental permits), technical capacity (understanding of EUDR requirements), and financial resources (cost of compliance activities).

A just transition approach is critical: EUDR implementation must avoid displacing smallholder ranchers from formal markets while failing to address the structural drivers of cattle-linked deforestation. Integrated programs combining EUDR compliance support with silvopastoral conversion, land formalization, and market access improvements offer the most promising pathway.

Cleantech Taxonomy Nodes

Directly relevant: CT-EX-020 (Smallholder technical assistance for EUDR — needs eudr_cattle=Y, description update to include cattle ranchers alongside coffee farmers), CT-EX-021 (EUDR operator documentation — needs eudr_cattle=Y). New extension needed: CT-EX-033 (Cattle rancher cooperative compliance and aggregation models) covering group-level EUDR compliance platforms, shared traceability infrastructure for smallholder cattle associations, land formalization technology support, and just transition mechanisms for cattle smallholders.

Palm Oil

EUDR mapping for palm oil — v1.1

Palm Oil EUDR Overview — Colombia

EUDR Context

Field	Value
eudr_commodity	palm
country_focus	Colombia
deforestation_risk	medium
last_updated	2026-05-26

Overview

Oil palm is one of Colombia's most significant agricultural commodities under the EU Deforestation Regulation (EUDR). Colombia ranks as the fourth largest palm oil producer globally and the leading producer in the Western Hemisphere, with approximately 596,000 hectares under cultivation distributed across 161 municipalities in 21 of 32 departments. In Q1 2026, Colombia produced 560,000 metric tons of palm oil, representing a 3% gain over the same period in 2025. Fedepalma projects total annual production could reach 2.5 million metric tons by 2028 if sustainable aviation fuel markets develop.

The EUDR classifies palm oil as one of seven regulated commodities (Article 1), requiring all operators placing palm oil or derived products on EU markets to demonstrate that production did not contribute to deforestation after December 31, 2020. For Colombian exporters, this creates both compliance challenges and competitive advantages given the country's relatively strong sustainability track record compared to Southeast Asian producers.

More than 6,000 oil palm growers operate across Colombia's four production zones (North, East, Central, and South-West), with 85% classified as small-scale producers cultivating fewer than 50 hectares each. The sector generates over 177,000 jobs and has been a critical engine of rural development, though concerns about land concentration and displacement in conflict-affected regions persist.

Colombian Context

Colombia's palm oil sector is concentrated in the Llanos Orientales (Meta, Casanare), the Caribbean coast (Cesar, Magdalena), and the Pacific lowlands around Tumaco (Nariño). The Tumaco corridor is the most sensitive from a deforestation standpoint, as expansion has historically occurred at the forest frontier and in areas affected by armed conflict and forced displacement. In the eastern plains, palm plantations have largely replaced

degraded pastureland rather than primary forest, presenting a lower deforestation risk profile.

Fedepalma, the national federation of oil palm growers, coordinates sustainability efforts through 68 production centers (núcleos palmeros) and actively promotes RSPO certification. Over 20% of Colombian palm oil production is RSPO-certified, and the sector claims that 99% of certified crops are verified deforestation-free. Colombia's 44-million-hectare agricultural frontier—of which only 15% is currently cultivated—positions the country as one of eight nations capable of expanding agricultural output without additional deforestation, though this potential requires rigorous land-use planning.

EUDR Compliance Requirements

Operators exporting palm oil to the EU must comply with the following under the EUDR:

- **Geolocation mapping**: Provide polygon coordinates for all plantations supplying the export chain, traceable to individual plots.
- **Deforestation-free verification**: Demonstrate via satellite imagery or equivalent monitoring that no deforestation occurred on the sourced land after December 31, 2020.
- **Legality proof**: Confirm production complied with Colombian national law, including environmental permits, land titles, and labor regulations.
- **Due diligence system**: Maintain a documented due diligence process covering risk assessment, risk mitigation, and annual reporting.
- **Traceability to mill**: Map supply chains from plantation through extraction mills to export, ensuring no mixing with non-compliant sources.

Fedepalma has been working with supply chain members since 2018 to build traceability infrastructure. The main compliance challenges for Colombia are managing the large number of smallholder suppliers (who may lack formal land titles) and ensuring transparency across the estimated 68 mill catchment areas. High-oleic hybrid varieties, which now cover 110,000+ hectares (18.5% of planted area), represent an emerging premium segment where EUDR compliance can command price premiums in European markets.

Palm Oil Traceability & Certification

EUDR Context

Field	Value
eudr_commodity	palm
country_focus	Colombia
deforestation_risk	medium
last_updated	2026-05-26

Overview

Traceability and certification are the operational backbone of EUDR compliance for Colombia's palm oil sector. The supply chain runs from approximately 6,000 growers through 68 extraction mill clusters (núcleos palmeros) to refineries, exporters, and ultimately EU importers. Each link in this chain must be mapped and documented to satisfy the regulation's due diligence requirements. Colombia's relatively consolidated mill infrastructure—compared to the highly fragmented structures in West Africa—provides a structural advantage for building traceable supply chains.

The Roundtable on Sustainable Palm Oil (RSPO) is the dominant voluntary certification scheme operating in Colombia. Over 20% of national production is RSPO-certified, and the standard's chain-of-custody models (Identity Preserved, Segregated, Mass Balance) provide a foundation that can be adapted for EUDR compliance. However, RSPO certification alone does not satisfy the EUDR, which requires plot-level geolocation data and a December 2020 deforestation cutoff date that may differ from RSPO's audit timelines.

Fedepalma's "Uniendo Eslabones" (Joining Links) strategy, operational since 2018, has invested in digital traceability platforms connecting smallholder producers to mills and international buyers. This three-year initiative developed classification and traceability protocols for raw materials from plantation to finished product, creating data infrastructure that aligns well with EUDR requirements.

Colombian Context

Colombia's palm oil supply chain has four distinct stages that must be traced: plantation (finca), extraction mill (planta extractora), refinery/processing, and export. Approximately 85% of producers are smallholders cultivating fewer than 50 hectares, which creates a significant data collection challenge. Many smallholders lack formal land titles (particularly in conflict-affected zones like Tumaco), complicating the legality proof required under EUDR

Article 3.

Solidaridad and Satelligence have partnered with Colombian supply chain actors to deploy satellite-based deforestation monitoring at the mill catchment level. This technology enables mills to verify that their sourcing areas remain deforestation-free, providing the evidence base needed for EUDR due diligence statements. The Daabon Group, one of Colombia's leading organic palm oil producers, has pioneered full traceability from plantation to export for its EU-bound products.

RSPO-certified operations in Colombia have demonstrated that achieving traceability is feasible: 99% of certified hectares are verified deforestation-free. The challenge lies in extending this model to the remaining 80% of production that is not yet RSPO-certified, particularly in the Pacific coast zone where informal land tenure and conflict dynamics complicate data collection.

EUDR Compliance Requirements

For traceability and certification to satisfy the EUDR, Colombian palm oil operators must:

- **Plot-level registration**: Register every supplying plantation with GPS polygon coordinates (not just centroid points), linked to a unique identifier in the operator's due diligence system.
- **Chain-of-custody documentation**: Maintain records showing the flow of fresh fruit bunches (FFB) from registered plantations to specific extraction mills, with batch-level segregation or at minimum mass-balance tracking.
- **Satellite monitoring integration**: Use remote sensing data (Sentinel-2, Planet, or equivalent) to verify no forest loss on registered plots after the December 31, 2020 cutoff.
- **Legality verification**: Document that each plantation holds valid environmental permits (licencias ambientales), complies with Colombian forest reserve restrictions, and meets labor law requirements.
- **Periodic review**: Update risk assessments annually and respond to new deforestation alerts within the sourcing base.

Existing RSPO certification provides a strong starting point but requires supplementation: operators must add geolocation data at the precision level required by EUDR implementing acts, apply the 2020 cutoff date consistently, and include Colombian legal compliance documentation that goes beyond RSPO's scope. The high-oleic hybrid segment (110,000+ ha) is particularly well-positioned for premium EUDR-compliant channels given its newer plantings and better documentation.

Palm Oil & Deforestation in Colombia

EUDR Context

Field	Value
eudr_commodity	palm
country_focus	Colombia
deforestation_risk	medium
last_updated	2026-05-26

Overview

The relationship between palm oil expansion and deforestation in Colombia is complex and regionally differentiated. Unlike Southeast Asian palm oil—where expansion into tropical peatland forests has been the primary driver of biodiversity loss—Colombian palm oil has followed diverse trajectories depending on the production zone. Research from the University of Wisconsin's GLUE program found that the majority of Colombian palm expansion between 2002 and 2018 occurred on previously cleared land (pasture, degraded areas), with direct forest conversion accounting for a smaller share of new plantings. However, this national average masks significant regional variation.

The EUDR's deforestation-free requirement (Article 3) applies a December 31, 2020 cutoff date, meaning that any palm oil linked to land that was forested before that date and subsequently cleared is non-compliant regardless of local legality. For Colombian producers, this creates a clear incentive to document the pre-2020 land use status of all supplying plantations—a task that is straightforward for established operations in the eastern plains but challenging in recently expanded areas near the Pacific coast.

An IUCN Netherlands assessment of Colombian palm oil supply chain risks identified Tumaco and the Pacific zone as the highest-risk areas for EU importers, followed by parts of Cesar and Santander where expansion borders cloud forest transitions. The eastern plains (Meta, Casanare) were rated as lower risk given the predominant conversion pathway from degraded grassland rather than standing forest.

Colombian Context

Three regional deforestation dynamics characterize Colombia's palm oil sector:

- **Pacific Coast / Tumaco (High Risk)**: Oil palm expansion in Nariño's Pacific lowlands has been linked to conflict-driven displacement, where communities were forced off land that was subsequently converted to plantations. A Mongabay investigation documented supply chain connections between deforestation-linked palm in this region and European buyers. The area's high rainfall forests and biodiversity (Chocó bioregion) make any forest conversion particularly damaging ecologically.
- **Llanos Orientales / Eastern Plains (Low-Medium Risk)**: The vast savannas of Meta and Casanare represent the largest palm production zone. Most expansion has occurred on existing cattle pasture or degraded grassland, presenting a favorable deforestation risk profile. However, gallery forests (bosques de galería) along rivers and streams within the savanna landscape require protection.
- **Caribbean / Magdalena Medio (Medium Risk)**: Palm operations in Cesar, southern Bolívar, and Santander have historically been associated with paramilitary-era land concentration. While recent expansion has been more formalized, legacy issues around land tenure and secondary forest regrowth create compliance complexity.

Colombia's national deforestation monitoring system (SMByC), operated by IDEAM, provides annual deforestation data at the municipal level. This system, combined with near-real-time alerts from Global Forest Watch and national early warning bulletins, gives operators access to the monitoring infrastructure needed for EUDR risk assessment. Colombia's overall deforestation rate has been declining since 2023, with the government's Comprehensive Deforestation Containment Plan contributing to reduced forest loss in key departments.

EUDR Compliance Requirements

Operators managing deforestation risk in Colombian palm oil supply chains must:

- **Baseline land-use mapping**: Establish the forest/non-forest status of all sourcing plots as of December 31, 2020, using satellite imagery archives (Landsat, Sentinel-2) at sufficient resolution to detect small-scale clearing.
- **Ongoing monitoring**: Implement continuous or periodic satellite monitoring of the sourcing base to detect any post-2020 forest loss, with protocols for excluding non-compliant supply if deforestation is detected.
- **Regional risk differentiation**: Apply heightened due diligence to sourcing from the Pacific coast and Caribbean zones, where deforestation risk is higher, while documenting the lower risk profile of eastern plains operations.
- **Conflict-sensitive sourcing**: In areas affected by Colombia's armed conflict, verify that land acquisition was not linked to forced displacement or illegal appropriation, as required by both the EUDR's legality clause and Colombian transitional justice frameworks (JEP).
- **Smallholder inclusion**: Develop support mechanisms for the 85% of producers who are smallholders to obtain documentation (land titles, environmental permits, geolocation data) needed for compliance, preventing their exclusion from EU-bound supply chains.

Soy

EUDR mapping for soy — v1.2

Soy EUDR Overview — Colombia

EUDR Context

Field	Value
eudr_commodity	soy
country_focus	Colombia
deforestation_risk	low
last_updated	2026-05-26

Overview

Soy is one of the seven commodities regulated under the EU Deforestation Regulation (EUDR), though Colombia's role in global soy trade is fundamentally different from that of Brazil, Argentina, or the United States. Colombia is a minor soybean producer with fewer than 100,000 hectares under cultivation, but it is a significant importer—particularly of soybean meal for the animal feed industry. This dual position means the EUDR affects Colombia both as a potential producing country (where domestic soy expansion could encroach on forests in the Orinoquía) and as a consumer of imported soy that may carry deforestation risk from origin countries.

The EUDR requires operators to verify that soy products placed on or exported from EU markets were produced on land not subject to deforestation after December 31, 2020. For Colombian domestic production, the primary compliance pathway involves mapping the relatively small number of producing farms in Meta, Vichada, and the eastern plains. For imports, Colombian processors using imported soy in products ultimately destined for EU markets may face indirect due diligence obligations under the regulation's supply chain provisions.

Colombia's government has identified the Orinoquía (Altillanura) as a major agricultural expansion frontier, with UPRA estimating that Meta has approximately 5 million hectares and Vichada 4.7 million hectares suitable for agricultural development. While much of this land is currently degraded savanna rather than forest, expansion in certain corridors risks converting gallery forests and transitional ecosystems that the EUDR would classify as protected.

Colombian Context

Colombia's soybean production is concentrated in the departments of Meta and Vichada within the Orinoquía region, with smaller cultivation areas in Valle del Cauca and Tolima. USDA estimates for MY 2025/2026 project a national yield of approximately 2.94 MT/ha, indicating reasonable productivity but on a limited area base.

Domestic production covers only a fraction of national demand, with the United States being a major soy supplier alongside Brazil and Argentina.

The Orinoquía region presents a nuanced deforestation risk picture. The World Bank's BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL) has been operating the Orinoquía Sustainable Integrated Landscape Program specifically to promote agricultural intensification without deforestation. The program recognizes that the Altillanura's well-drained acid soils can support soy and other crops without requiring forest clearing, provided expansion is directed to existing grasslands and degraded pastures.

Rare's regenerative agriculture program in the Orinoquía is working directly with farmers to protect tropical savannah biodiversity while enabling productive agriculture. These initiatives demonstrate that Colombia's soy expansion can be managed to meet EUDR requirements, but only with deliberate land-use planning that prevents encroachment into the gallery forests, morichales (palm swamps), and forest-savanna transition zones that are ecologically critical.

EUDR Compliance Requirements

For Colombian soy operators targeting EU markets, compliance requires:

- **Farm-level geolocation**: Provide GPS polygon data for all soybean-producing plots, with particular attention to plots near gallery forests, morichales, and forest-savanna boundaries in the Orinoquía.
- **Deforestation-free proof**: Verify through satellite monitoring that no forest conversion occurred on producing land after December 31, 2020. Given the relatively small number of farms involved, individual plot verification is feasible.
- **Savanna conversion distinction**: While the EUDR focuses on deforestation (forest-to-non-forest conversion), operators should document that soy expansion occurred on grassland/degraded pasture rather than on naturally forested land, including secondary growth areas.
- **Import chain due diligence**: Colombian processors who import soy from Brazil/Argentina and re-export processed products to the EU must maintain due diligence records covering the imported soy's origin, even though Colombian territory is not the source of deforestation risk.
- **Livestock-soy rotation documentation**: In areas where cattle ranching and soy farming alternate (common in Meta), document that neither the soy phase nor the cattle phase involved land cleared after the cutoff date.

Soy Deforestation Risk & Monitoring

EUDR Context

Field	Value
eudr_commodity	soy
country_focus	Colombia
deforestation_risk	low
last_updated	2026-05-26

Overview

Colombia's soybean sector presents a relatively low but non-negligible deforestation risk, primarily concentrated in the Orinoquía expansion frontier. Unlike the Brazilian Cerrado or Argentine Gran Chaco—where soy expansion has been a primary deforestation driver—Colombia's limited soy footprint means that direct forest conversion for soybean cultivation has been modest to date. However, the government's ambition to develop the Altillanura as a major agricultural zone creates future risk that monitoring systems must address proactively.

The EUDR's monitoring requirements apply regardless of a country's risk classification tier. Even if Colombia is classified as a "standard" or "low" risk country for soy under the EUDR benchmarking system (Article 29), operators must still conduct due diligence and provide geolocation data for their supply. The key monitoring challenge in Colombia is distinguishing between natural savanna conversion (which does not constitute deforestation under the EUDR's forest definition) and conversion of gallery forests, secondary growth forests, and forest-savanna ecotones that do qualify as deforestation.

The indirect deforestation pathway is also relevant: soy expansion onto cattle pasture can displace livestock production into forested areas, creating deforestation that is causally linked to soy but geographically separated. This livestock-soy displacement dynamic is well-documented in Brazil and is beginning to emerge in Colombia's Orinoquía.

Colombian Context

Three deforestation risk dynamics are relevant to Colombian soy:

- **Orinoquía expansion front**: The departments of Meta and Vichada contain the largest soy-suitable areas. UPRA's agricultural zoning identifies nearly 10 million hectares of potentially arable land across these two departments. While the majority is degraded savanna grassland, patches of gallery forest (bosque de galería) along rivers and streams—plus morichales (Mauritia palm wetlands)—represent protected ecosystems that expansion must avoid. IDEAM's annual deforestation monitoring shows localized clearing along the Meta River corridor.
- **Livestock-soy rotation**: In Meta, farmers commonly alternate between cattle pasture and soy cultivation. This rotation can be EUDR-compliant if the original pasture was not established through post-2020 deforestation. However, operators must document the full land-use history to prove that the rotation cycle does not include any deforestation-linked phase.
- **Imported soy risk transfer**: Colombia imports significant volumes of soybeans and soybean meal from Brazil and Argentina, where deforestation risk is much higher. While imported soy consumed domestically is not directly subject to the EUDR, Colombian companies that process imported soy into products exported to the EU may face supply chain liability.

Colombia's monitoring infrastructure for the Orinoquía includes IDEAM's national deforestation monitoring system (SMByC), the Orinoquía ISFL landscape monitoring, and academic research from institutions including the Alexander von Humboldt Institute, which tracks biodiversity in the region's ecosystems. Frontiers in Sustainable Food Systems research has specifically modeled early warning indicators for agricultural expansion impacts on Orinoquía biodiversity.

EUDR Compliance Requirements

Monitoring and risk management for Colombian soy under the EUDR requires:

- **Ecosystem mapping**: Map all forest types within and adjacent to soy-producing areas, including gallery forests, secondary forests, and transitional woodland-savanna zones, using Colombian forest definitions aligned with IDEAM's national classification.
- **Satellite-based monitoring**: Deploy annual or semi-annual satellite analysis (Sentinel-2, Planet) for all registered soy plots and a buffer zone around them to detect any encroachment into forested areas.
- **Land-use change detection**: Specifically monitor for the savanna-to-cropland conversion pathway, flagging any instances where the converted area contained tree cover exceeding the EUDR's forest definition thresholds (typically >0.5 ha, >5m canopy height, >10% canopy cover).
- **Displacement risk assessment**: Evaluate whether soy expansion in the sourcing area is displacing cattle ranching into forested zones, and document mitigation measures if displacement risk is identified.
- **Data integration with IDEAM**: Leverage Colombia's national deforestation alerts and annual forest monitoring reports as part of the due diligence evidence base, supplemented with higher-resolution commercial imagery where national data is insufficient.

Wood

EUDR mapping for wood — v1.2

Wood & Timber EUDR Overview — Colombia

EUDR Context

Field	Value
eudr_commodity	wood
country_focus	Colombia
deforestation_risk	high
last_updated	2026-05-26

Overview

Wood and timber products are regulated under EUDR Article 2, covering a broad range of products including sawn wood, veneer, plywood, pulp, paper, printed matter, and furniture. Colombia presents one of the most complex compliance landscapes for wood products among Latin American countries, given the scale of its natural forests (approximately 59.1 million hectares, covering 51.8% of national territory), the prevalence of illegal logging, and the diversity of timber species and harvesting contexts involved.

Colombia's forestry sector encompasses two fundamentally different segments: a small formal plantation forestry industry (approximately 427,000 hectares of planted forest, representing just 0.72% of total forest cover) and a large, often informal natural forest extraction sector that operates across the Pacific coast, the Amazon, and the Andean slopes. The formal plantation sector—concentrated in pine, eucalyptus, and teak—is relatively well-documented and presents a manageable EUDR compliance pathway. The natural forest extraction sector, where estimates suggest 40-47% of circulating timber is of illegal origin, represents the core compliance challenge.

The EUDR requires that timber products entering EU markets were harvested from land that was not deforested after December 31, 2020, and that harvesting complied with all applicable laws. For Colombia, where illegal logging has been estimated to drive approximately 10% of national deforestation (with estimates by IDEAM and FAO suggesting that 40-47% of domestically traded wood may come from unauthorized sources), meeting the legality requirement is as challenging as meeting the deforestation-free requirement.

Colombian Context

Colombia's timber sector operates under the regulatory framework of the Código Nacional de Recursos Naturales and is overseen by the Autoridad Nacional de Licencias Ambientales (ANLA) and regional environmental authorities (CARs). Legal timber harvesting requires a forest management plan (plan de manejo forestal)

approved by the relevant CAR, a harvesting permit (permiso de aprovechamiento), and transport permits (salvoconductos) for timber movement. In practice, enforcement is uneven, and the multi-authority governance structure creates gaps that illegal operators exploit.

The Environmental Investigation Agency (EIA) documented in a 2025 report that illegal wood from Colombia's Pacific and Amazon rainforests—including protected species like Dipteryx odorata (cumarú/choibá)—enters both US and EU supply chains. Afro-Colombian and Indigenous communities in the Atrato watershed were found to be both victims and participants in the illegal timber trade, often under conditions described as modern economic exploitation with few legal livelihood alternatives.

Colombia has 223 forestry companies and the sector generates approximately 400,000 jobs. The government has set targets to position the country as Latin America's second forestry powerhouse, though this ambition requires significant improvement in governance, traceability, and legal compliance infrastructure.

EUDR Compliance Requirements

For Colombian timber operators and EU importers, EUDR compliance requires:

- **Harvest origin documentation**: Provide geolocation data (GPS polygons) for the forest compartment where timber was harvested, linked to a valid forest management plan approved by the relevant CAR.
- **Legal harvesting proof**: Document the complete permit chain: forest management plan approval, harvesting permit (aprovechamiento forestal), transport permits (salvoconductos), and processing/transformation records.
- **Deforestation-free verification**: Demonstrate that the harvested area was forested before and after harvesting (i.e., selective logging within a managed forest, not clear-cut conversion), using satellite imagery to confirm forest cover maintenance.
- **Species identification**: Identify timber species using scientific nomenclature, verify that no CITES-listed species are included without proper permits, and ensure that harvesting volumes comply with sustainable yield calculations in the management plan.
- **Chain-of-custody tracking**: Map timber from forest to sawmill to export, with batch-level documentation preventing mixing of legal and undocumented timber—the most critical control point given the estimated 40-47% illegality rate in Colombia's domestic market.

Wood

Illegal Logging & Deforestation Monitoring

EUDR Context

Field	Value
eudr_commodity	wood
country_focus	Colombia
deforestation_risk	high
last_updated	2026-05-26

Overview

Illegal logging is one of the most persistent and structurally embedded drivers of deforestation in Colombia. IDEAM estimates that logging drives approximately 10% of national deforestation, while FAO and IDEAM jointly estimate that 40-47% of all timber circulating in Colombia's domestic market originates from unauthorized harvesting or extraction from forest reserve zones. Between 2008 and 2019, more than 40% of the country's forest product exports were assessed as having illegal origin. This systemic illegality represents the most significant EUDR compliance barrier for Colombian timber entering EU markets.

The geography of illegal logging in Colombia closely tracks the country's deforestation hotspots: the Pacific coast (Chocó bioregion), the Amazonian arc of deforestation (Caquetá, Guaviare, southern Meta), and increasingly the Catatumbo region (Norte de Santander). These areas share common enabling factors: weak institutional presence, armed group control, poverty-driven participation by rural communities, and high-value timber species that incentivize extraction.

Between 2000 and 2020, Colombia lost approximately 3 million hectares of natural forest, with deforestation peaking in 2017 at over 220,000 hectares annually. The government's Comprehensive Deforestation Containment Plan (2023-2026) has contributed to declining rates—preliminary data suggests continued reductions through 2025—but the structural drivers of illegal logging persist in remote, conflict-affected territories.

Colombian Context

Three critical deforestation and illegal logging hotspots define the compliance landscape:

- **Chocó / Pacific Coast (Critical Risk)**: The Chocó bioregion is one of the world's most biodiverse ecosystems and a primary source of high-value tropical hardwoods. EIA investigations documented that species like Dipteryx odorata (cumarú/choibá) are harvested illegally from the Atrato watershed and Pacific coast forests, processed through intermediary sawmills, and exported to the US and EU for use in decking and flooring. Local Afro-Colombian and Indigenous communities participate in extraction under economically coercive conditions with few legal alternatives.
- **Amazon Arc / Caquetá-Guaviare (Critical Risk)**: The Colombian Amazon deforestation arc stretches from Caquetá through Guaviare into southern Meta. While cattle ranching is the primary driver, illegal logging often precedes or accompanies land clearing, with valuable timber extracted before pasture conversion. MAAP satellite analysis has documented deforestation encroaching into Chiribiquete National Park and the Llanos del Yarí Indigenous Reserve, with 148 hectares cleared in 2024 and 198 hectares in early 2025 within park boundaries.
- **Catatumbo / Norte de Santander (High Risk)**: Armed group presence and coca cultivation drive deforestation in this region, with timber extraction forming part of the conflict economy. Cross-border dynamics with Venezuela complicate enforcement.

Colombia's monitoring infrastructure centers on IDEAM's Forest and Carbon Monitoring System (SMByC), which produces annual deforestation statistics and quarterly early warning bulletins (Alertas Tempranas de Deforestación). The system uses Landsat and Sentinel-2 imagery to detect forest cover change at 30m resolution. Global Forest Watch provides additional near-real-time alert data. However, monitoring detection is not equivalent to enforcement—detected deforestation events frequently go unaddressed due to limited institutional capacity in remote areas.

EUDR Compliance Requirements

Addressing illegal logging risk for EUDR compliance requires:

- **Supply chain mapping to forest of origin**: Identify the specific forest compartment where each timber batch was harvested, with GPS coordinates, CAR jurisdiction, and permit numbers. This is the most critical and most difficult step given the long and opaque timber supply chains in Colombia.
- **Red-flag screening**: Implement supply chain screening for known high-risk origins (Chocó, Caquetá, Guaviare, Catatumbo), species (Dipteryx, mahogany, cedar), and intermediaries. Any sourcing from these areas requires enhanced due diligence.
- **Satellite-based harvest verification**: Cross-reference claimed harvest locations against satellite imagery to verify that (a) the area was forested at the time of claimed harvest and (b) no clear-cut deforestation occurred—only selective, sustainable extraction consistent with the approved management plan.
- **IDEAM data integration**: Use IDEAM deforestation alerts and annual monitoring data as a primary evidence source in due diligence reports, supplemented by higher-resolution commercial imagery for specific verification.
- **Pacto Madera Legal alignment**: Leverage Colombia's Intersectoral Pact for Legal Timber (PIML), which involves 70 public and private organizations committed to legal timber sourcing, as a governance framework for supply chain compliance. While membership in the PIML does not guarantee EUDR compliance, it signals commitment to the legality verification processes the regulation requires.

Wood

Sustainable Forestry & Certification

EUDR Context

Field	Value
eudr_commodity	wood
country_focus	Colombia
deforestation_risk	high
last_updated	2026-05-26

Overview

Sustainable forestry certification represents the most viable pathway for Colombian timber to access EU markets under the EUDR. While certification alone does not satisfy the regulation's requirements (operators must still provide geolocation data and specific deforestation-free proof), certified timber operations have the management systems, documentation practices, and third-party audit infrastructure that closely align with EUDR due diligence obligations. Colombia's sustainable forestry sector is small but growing, and scaling it up is both a commercial opportunity and a conservation imperative.

The Forest Stewardship Council (FSC) is the primary international certification standard operating in Colombia. FSC-certified operations exist in both the planted forest sector (teak, pine, eucalyptus plantations) and—more critically for EUDR purposes—in natural forest management by community concessions. Community forestry initiatives in the Pacific coast and Amazon have achieved FSC certification through multi-year capacity-building programs supported by international cooperation, demonstrating that even in high-risk regions, sustainable, legal, and traceable timber production is achievable.

The EU's FLEGT (Forest Law Enforcement, Governance and Trade) Action Plan, while distinct from the EUDR, has influenced Colombia's forestry governance framework. Although Colombia does not have a FLEGT Voluntary Partnership Agreement (VPA), the principles of FLEGT—legal verification, stakeholder participation, and trade transparency—have informed domestic initiatives like the Pacto Intersectorial por la Madera Legal (PIML).

Colombian Context

Colombia's sustainable forestry landscape includes several distinct pathways:

- **Plantation forestry**: Approximately 427,000 hectares of planted forest (primarily teak, pine, eucalyptus, and acacia) represent the lowest-risk timber supply for EU markets. These operations are typically well-documented, many are FSC-certified, and the plantation context means the EUDR's deforestation-free requirement is straightforward to verify (the land was converted to plantation before the 2020 cutoff, or was previously non-forested).
- **Community forest management**: Colombia's territorial governance structure gives Afro-Colombian community councils and Indigenous resguardos legal authority over vast forest areas. Successful community forestry programs—supported by organizations including WWF, USAID, and FAO—have built sustainable harvesting practices, low-impact harvesting techniques, and value chain development. Some community operations have achieved FSC certification, though the process is resource-intensive.
- **PIML and the legal timber culture**: The Pacto Intersectorial por la Madera Legal, launched in 2009, brings together 70 public and private organizations to promote legal timber sourcing throughout Colombia's domestic market. The PIML has driven adoption of timber legality verification systems, promoted inter-institutional coordination, and supported the development of a "legal timber culture" among producers, processors, and consumers.

The Colombian government's ambition to become Latin America's second forestry powerhouse (after Chile or Brazil) depends on expanding planted forest area while simultaneously improving governance in natural forest extraction. The 223 forestry companies and 400,000 sector jobs represent a base that could grow significantly if legal, sustainable, and EUDR-compliant supply chains are scaled.

EUDR Compliance Requirements

Certification and sustainable forestry practices contribute to EUDR compliance through:

- **FSC certification as compliance foundation**: FSC-certified operations provide management plans, chain-of-custody documentation, annual audits, and stakeholder consultation records that address most EUDR due diligence elements. Operators must supplement FSC data with EUDR-specific geolocation requirements and the December 2020 cutoff date verification.
- **Community forestry formalization**: Community-managed forests must demonstrate that harvesting occurs under valid permits issued by the relevant CAR, within approved management plan parameters, and with documented free, prior, and informed consent (FPIC) from the governing community council or cabildo.
- **Timber legality verification**: Implement or adopt a timber legality assurance system aligned with PIML standards, ensuring that every batch of timber can be traced from forest of origin through processing to export with complete documentation.
- **Sustainable yield documentation**: Demonstrate through forest inventory data and management plan calculations that harvesting rates do not exceed sustainable yield thresholds, ensuring that the harvested forest maintains its status as forest (avoiding degradation below EUDR forest definition thresholds).
- **Multi-stakeholder governance**: Engage with PIML, CARs, community organizations, and international certification bodies to build the institutional infrastructure needed for long-term EUDR compliance across the Colombian timber sector.

Rubber

EUDR mapping for rubber — v1.2

Rubber EUDR Overview — Colombia

EUDR Context

Field	Value
eudr_commodity	rubber
country_focus	Colombia
deforestation_risk	low
last_updated	2026-05-26

Overview

Natural rubber is the seventh commodity regulated under the EU Deforestation Regulation (EUDR). The regulation covers natural rubber (Hevea brasiliensis latex) and derived products but excludes synthetic rubber, which is petroleum-based. Colombia is a minor natural rubber producer globally, with approximately 55,660 hectares under cultivation distributed across 17 departments, making it a small player compared to Southeast Asian producers (Thailand, Indonesia, Vietnam) that supply over 70% of global natural rubber. Nevertheless, Colombian rubber falls within EUDR scope when exported to EU markets or when used as an input in products destined for Europe.

Colombia's rubber sector has a distinctive social origin: it emerged primarily as an alternative development crop to replace coca cultivation in conflict-affected departments, particularly in Caquetá, Meta, Santander, Guaviare, Putumayo, and southern Bolívar. The National Alternative Development Plan promoted rubber in 42 municipalities as a medium-term economic alternative for rural communities transitioning away from illicit economies. This origin means the sector is overwhelmingly smallholder-based, with many producers holding plots of 5-20 hectares.

From an EUDR compliance perspective, Colombian rubber presents a mixed picture. The smallholder, alternative-development character of the sector means that most plantations were established on previously cleared or degraded land (former coca fields, degraded pasture), which supports a deforestation-free claim. However, the informality of many operations, limited documentation infrastructure, and the remote locations of many plantations create practical challenges for meeting the regulation's due diligence requirements.

Colombian Context

Colombia's rubber cultivation is concentrated in five principal departments: Meta leads nationally with 19,849 hectares (35.7% of the total planted area), followed by Santander (15.7%), Vichada (15.3%), Caquetá (10.4%), and Antioquia (7.6%). In terms of producer distribution, Santander has the highest share of rubber producers (20.5%), followed by Caquetá (19.8%), Antioquia (14.8%), and Córdoba (12.6%).

The sector faces structural challenges: low yields compared to Asian competitors, limited processing infrastructure (only one centrifuged latex plant in the country), and price competition from synthetic rubber. The domestic market absorbs most production, with tire manufacturers and industrial goods companies as primary buyers. Direct exports to the EU are currently limited, though this could change as EUDR compliance creates demand for verified deforestation-free rubber from origins with lower corruption and governance risks than some Southeast Asian suppliers.

The Colombian rubber sector has been proactive on EUDR preparation. Preferred by Nature has worked with the sector since 2018 under the "Uniendo Eslabones" (Joining Links) strategy, which focuses on integrating value chain members and building traceability from plantation to finished product. A milestone achievement was FSC certification for 85 small producers, one centrifuged latex plant, and Colombia's leading balloon manufacturer—demonstrating that smallholder certification is feasible. The sector is also developing a "100% Colombian Natural Rubber" brand as a market differentiation tool.

EUDR Compliance Requirements

For Colombian rubber operators, EUDR compliance requires:

- **Plantation geolocation**: Provide GPS polygon data for all rubber plantations in the supply chain, traceable to individual smallholder plots. Given the smallholder structure (thousands of producers with small plots), mobile-based GPS mapping tools are the most practical approach.
- **Deforestation-free verification**: Demonstrate that rubber plantations were not established on forested land cleared after December 31, 2020. For most Colombian rubber, this is straightforward since the majority of plantations were established before 2020 as alternative development crops on previously cleared land.
- **Legality documentation**: Verify that plantations comply with Colombian agricultural and environmental law, including any required environmental permits and compliance with forest reserve restrictions. Many rubber-growing areas overlap with environmental protection zones where documentation requirements may be complex.
- **Supply chain traceability**: Map latex collection from plantation through intermediate aggregation points to the processing facility and export point. The sector's work on traceability since 2018 provides a foundation, but system coverage must be extended to all producers in the export chain.
- **Smallholder support programs**: Develop affordable compliance pathways for the thousands of smallholder rubber tappers, potentially through group certification models (as demonstrated by the 85-producer FSC group) and digital data collection tools that reduce per-farmer compliance costs.

Rubber Sustainability & Smallholder Challenges

EUDR Context

Field	Value
eudr_commodity	rubber
country_focus	Colombia
deforestation_risk	low
last_updated	2026-05-26

Overview

Natural rubber sustainability in Colombia is fundamentally a smallholder challenge. With the vast majority of the country's approximately 55,660 hectares of rubber managed by small-scale producers, the economics, environmental practices, and EUDR compliance pathways of the sector are shaped by the realities of rural poverty, limited technical assistance, and the legacy of armed conflict. The EUDR's compliance costs risk excluding smallholders from EU-bound supply chains unless cost-effective solutions are developed and deployed at scale.

Globally, approximately 85% of natural rubber is produced by around 6 million smallholder farmers, making rubber one of the most smallholder-dependent commodity supply chains. Colombia mirrors this pattern, with rubber plantations typically ranging from 5 to 20 hectares per family unit. The Global Platform for Sustainable Natural Rubber (GPSNR) has highlighted the tension between EUDR compliance demands and smallholder capacity, noting that without targeted support, deforestation regulations may inadvertently push smallholders out of formal markets and into less regulated channels.

The distinction between natural and synthetic rubber is critical for EUDR scope. Only natural rubber (Hevea brasiliensis latex and derived products) is regulated; synthetic rubber (produced from petroleum) is excluded. In Colombia, domestic consumption relies heavily on synthetic rubber imports for tire manufacturing, while natural rubber production serves both domestic industrial markets and limited export channels. This means EUDR compliance efforts must focus specifically on the natural rubber supply chain.

Colombian Context

Colombian rubber smallholders face a convergence of challenges that affect both sustainability and EUDR readiness:

- **Economic viability**: Natural rubber prices are volatile and often insufficient to cover production costs for smallholders, especially compared to the higher and more immediate returns from coca cultivation that rubber was designed to replace. Many rubber farmers supplement their income with cattle ranching or other crops, creating mixed land-use systems that complicate EUDR documentation.
- **Technical capacity**: Rubber tapping requires specific skills and consistent practice to maintain tree health and optimize yields. Many former coca farmers who transitioned to rubber received initial training but lack ongoing technical support. The "South American Leaf Blight" (SALB, caused by Microcyclus ulei) is a persistent phytosanitary challenge that requires technical management unavailable to many isolated producers.
- **Land tenure**: In conflict-affected departments like Caquetá, Meta, and Putumayo, many smallholders lack formal land titles. The EUDR's legality requirement demands proof that production complies with national law, including land tenure law—a requirement that many smallholders cannot currently satisfy despite decades of occupation and cultivation.
- **Processing infrastructure**: Colombia has only one centrifuged latex processing plant, limiting value addition and creating bottleneck dependence. Most smallholder rubber is sold as coagulated field latex or cup lumps, which fetch lower prices and are harder to trace through the supply chain.

Certification offers a pathway to premium markets and EUDR alignment. The FSC certification achieved by 85 Colombian small producers—facilitated by Preferred by Nature—demonstrated that group certification models can make compliance accessible and affordable. Under this model, certification costs are shared across the group, a group manager handles documentation requirements, and individual producers receive training and monitoring support. Extending this model to more of the estimated 5,000+ rubber producers nationwide is the key scaling challenge.

EUDR Compliance Requirements

Addressing smallholder sustainability for EUDR compliance requires:

- **Group compliance models**: Establish cooperatives or producer associations that can aggregate smallholder data, share compliance costs, and interface with downstream buyers as a single documented entity. The FSC group certification model provides a proven template.
- **Mobile-first data collection**: Deploy smartphone-based tools for GPS mapping, photo documentation, and harvest recording that smallholders can use with minimal training. Data should flow to a central compliance database maintained by the cooperative or an implementing organization.
- **Land tenure formalization support**: Work with Colombia's Agencia Nacional de Tierras and local government to accelerate land title formalization for rubber smallholders, providing the legal foundation needed for EUDR legality compliance.
- **Integrated livelihood approach**: Recognize that rubber alone may not provide sufficient income, and design compliance systems that cover the entire smallholder land-use system (rubber + cattle + other crops), ensuring that no component involves post-2020 deforestation.
- **Buyer-financed compliance**: Encourage EU importers and downstream brands to invest in smallholder compliance infrastructure as part of their EUDR due diligence obligations, sharing the cost of traceability systems rather than passing it entirely to producers who can least afford it.