No Deforestation Verification: Methodology Overview

Earthworm Foundation

This document offers an overview of the methodological approach developed with companies committed to end deforestation from agricultural supply chains, with valuable inputs from their suppliers. This document focuses on the No Deforestation Verification (NDV) methodology applied to palm oil supply chains.

Contents:

1. Introduction

In 2010, Earthworm Foundation (formerly The Forest Trust) supported Nestlé to make one of the world's first deforestation free commitments. At the time the commitment focused on palm oil, following years of sustained pressure from concerned stakeholders that palm oil expansion was driving deforestation and other related environmental and social impacts. Since 2010, over 300 commitments[1] have been made to end deforestation not only from the production of palm oil but many other agricultural commodity crops.

Among many challenges faced by companies that set ambitious No Deforestation commitments is their ability to robustly verify that complex supply chains are truly deforestation free. Three core issues had to be overcome; 1) accurate and up to date land cover and land cover change data, 2) traceability of the supply chain back to the plantations and farms, and 3) a practical and pragmatic approach to assess supply chain data against land cover and land cover change data.

In 2016, Earthworm Foundation partnered with Airbus to develop Starling, with the goal to overcome the first challenge. Currently Starling provides a range of businesses, governments and stakeholders with up to date land cover and land cover change data to use for various applications, including verifying No Deforestation commitments.
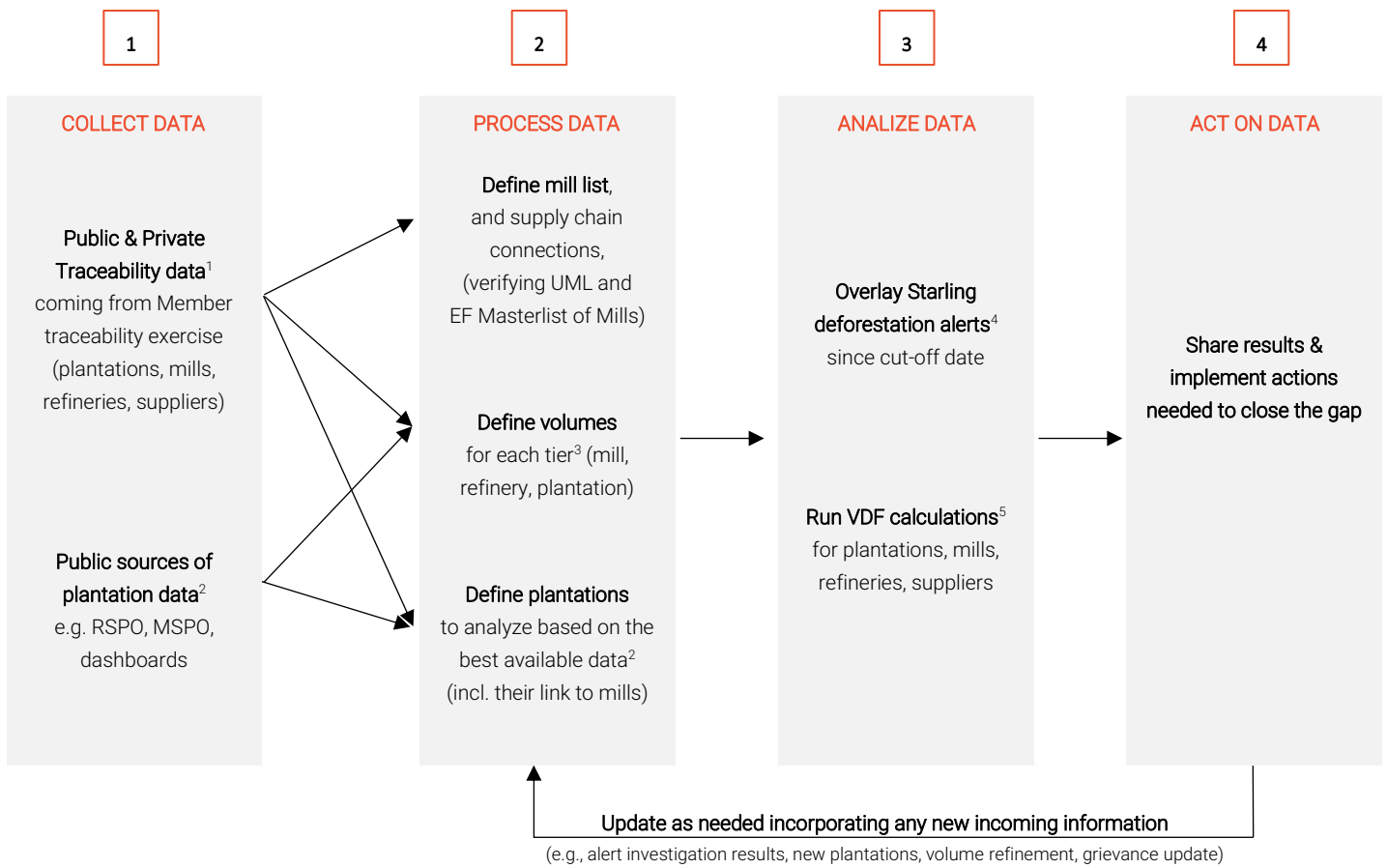
Since 2010, Earthworm Foundation has been supporting businesses build transparency and traceability of their supply chains. This work is fundamental to any responsible sourcing commitment, including the elimination of deforestation from global supply chains.

This document provides an overview of key definitions and steps Earthworm Foundation takes to collect traceability data and how this is used to assess and verify No Deforestation in a supply chain.

At the core of this document is the methodology that Earthworm Foundation uses to combine traceability data and land cover/land cover change data to assess and verify Deforestation Free supply chains. The document starts by describing aspects of traceability, followed by how traceability data is assessed and scored against deforestation data. In the following sections, the definition of No Deforestation is stated, as well as the steps that are used to assess this definition and generate scores for palm oil supply chains. Figure 1 below provides an overview of the main steps that will be described in this document.

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[1] https://www.supply-change.org/#remove

Figure 1. Main steps undertaken in assessing and verifying deforestation free palm oil supply chains

1 COLLECT DATA	2 PROCESS DATA	3 ANALIZE DATA	4 ACT ON DATA
Public & Private Traceability data[1] coming from Member traceability exercise (plantations, mills, refineries, suppliers) **Public sources of plantation data**[2] e.g. RSPO, MSPO, dashboards	**Define mill list**, and supply chain connections, (verifying UML and EF Masterlist of Mills) **Define volumes** for each tier[3] (mill, refinery, plantation) **Define plantations** to analyze based on the best available data[2] (incl. their link to mills)	**Overlay Starling deforestation alerts**[4] since cut-off date **Run VDF calculations**[5] for plantations, mills, refineries, suppliers	**Share results & implement actions needed to close the gap**

Update as needed incorporating any new incoming information
(e.g., alert investigation results, new plantations, volume refinement, grievance update)

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[2] See section Accepted sources of data - Sources of Refineries, Mills and Plantation attributes

[3] See section Types of Geospatial Data for plantations

[4] See section Sources of Volume data

[5] See section Starling Deforestations & Alerts Categorization

[6] See section Calculating NDV Scores

2. Definition of Deforestation Free

Along with the majority of companies in the palm oil value chain, EF defines No Deforestation as:

1. All Fresh Fruit Bunches (FFB) origins supplying a mill are recorded and geolocation data available.
2. Any FFB origins supplying a mill that were established after the cut-off date[7], completed a High Carbon Stock (HCS) assessment prior to planting and the HCS assessment has been accepted by the peer review process of the High Carbon Stock Approach (HCSA)
3. Any FFB origin supplying a mill that was established after the cut-off date, completed a High Conservation Value (HCV) assessment prior to planting and the HCV assessment has been approved by the High Conservation Value Network (HCVN)
4. All FFB origins supplying a mill that was established prior to the cut-off date do not have deforestation events after the cut-off date.

The use of the HCS toolkit and to a lesser extent the HCV toolkit also seeks to ensure that local communities have been respected in the development of the plantation area through the application of each toolkits requirements on Free, Prior & Informed Consent (FPIC).

EF is aware that a large proportion of production is coming from smallholder farmers and that for the majority of current and future smallholder palm oil farmers that implementing HCS and HCV studies is not possible. There are efforts within the HCSA and the HCVN to make available simplified tools for these assessments at landscape/jurisdictional level, as well as, at smallholder farmer level. In parallel to the development and deployment of these tools, EF has used a risk-based approach to assess deforestation linked to palm oil expansion that is potentially associated with smallholders. Requirements for mills or smallholders located in low risk regions may vary from the above.

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[7] EF recommendation follows the palm oil industry-wide accepted cut-off date of 31 December 2015

3. Assessing No-Deforestation Supply Chains

The assessment of No Deforestation supply chains involves a number of key steps, including the mapping of the supply chain back to plantations and farms, calculation volumes exchanged in the supply chain when volume data is absent, assessing plantation and farm geolocation data against deforestation alerts and calculating the No Deforestation score across the various tiers in the supply chain. Each of these steps are described below.

3.1. Collecting and processing traceability data

Traceability is defined as knowing all palm sources within one's supply chain all the way to plantation level (including dealers and smallholder farmers) [8]. A traceability exercise refers to the practice documenting the different stages of the supply chain and recording the involved stakeholders: from the location where the raw material is grown (e.g., estates, plantations, smallholders), through the processing and aggregation points (e.g., mills, bulking and refineries), until final product buyer. Figure 2 below provides a generalized overview of the palm oil supply chain, the main stages and the typical palm product that is exchanged.

No Deforestation Verification of supply chains is only possible where traceability exists. Most importantly this verification is only possible where Traceability To Plantation (TTP) data is made available for analysis using land cover and land cover change datasets. Traceability To Mill (TTM) is also important since this is the first major aggregation point in the supply chain.

Traceability data is collected from suppliers in a dynamic way. This is important since new supply chain data is continuously being collected, especially plantations, estates and smallholder locations. The No Deforestation methodology EF continuously integrates this new traceability data so that buyers and suppliers have the most updated analysis of their supply chains and have insights into where additional effort is required to close traceability data gaps or address evidence of deforestation occurring in the supply chain.

Figure 2. Generalised palm oil supply chain

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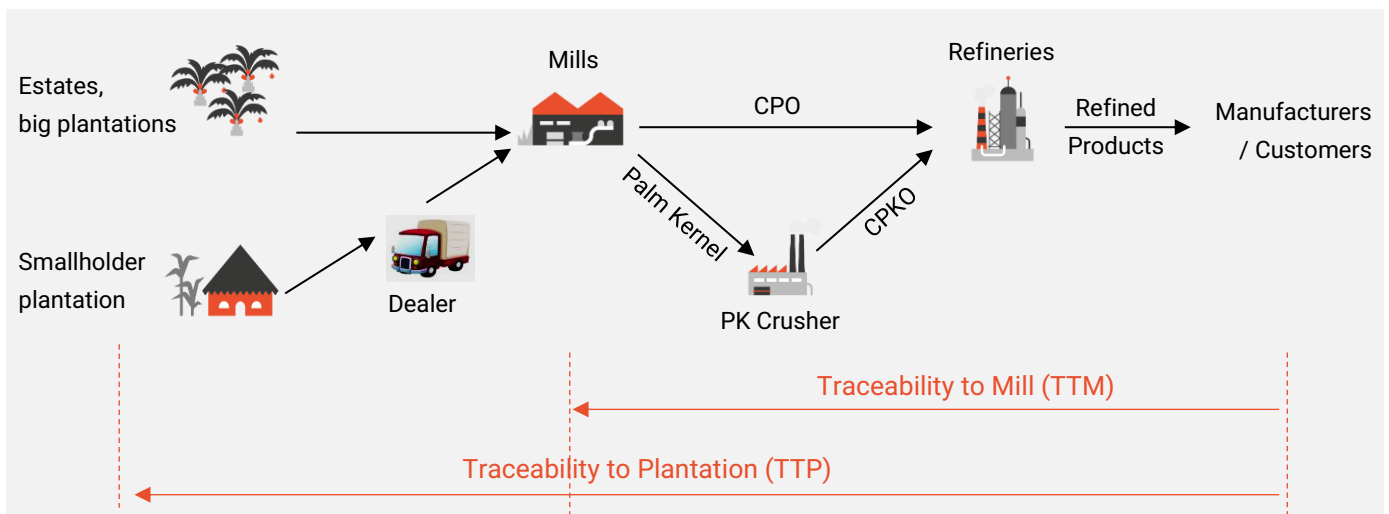
[8] Palm Oil Traceability Working Group (TWG), 2016

3.2. Traceability requirements for mills

A palm oil mill is defined as traceable where the following data points are made available:

- Mill name
- Parent and Group company name of the mill
- Geolocation coordinates of the mill location

The volume the mill supplies into the supply chain is important information and highly encouraged by suppliers to declare this information. However, this often present a significant issue for supplier due to confidentiality. Where volume data of each mill is not declared then an estimation of the volume is made. This estimation method is described in Section 3.5.

When mill traceability data is submitted to EF, each mill's details are checked and validated against the EF Masterlist of mills, which aligns with the Universal Mill List (UML)[9]. Additional to the suppliers declaring the supply mills in their supply chain, EF also uses a range of other data sources to support mill level traceability analysis. These other data sources include certification scheme websites (e.g. RSPO providing mill information on public summary documents of audits), company websites (e.g. refinery dashboard providing mill list), and Government or NGO's websites.

Once the analysis of each mill is completed, a score of Traceable To Mill (TTM) is calculated. The score can be generated any tier of the supply chain downstream of the mill, e.g. a kernel crusher, a refinery, or a consumer goods company.

3.3. Traceability requirements for plantations, estates and smallholders

Traceability To Plantation (TTP) is a score that is initially allocated to a palm oil mil and is then used to calculate TTP scores at any tier in the supply chain. For a mill to obtain a TTP score the following data points must be made available:

- Name of plantation or estate or smallholder
- Parent and Group company name of the plantation or estate
- Geolocation data, at a minimum the coordinates of the plantation, estate or smallholder

Geolocation data of plantations, estates and smallholders has been a significant challenge for the supply chain to declare. There are three main reasons for this: 1) in many cases traceability data is not recorded by palm oil mills, 2) the palm oil industry has concerns about producing country government positions on sharing plantation boundary data, and 3) in the case of smallholders there is limited work being done to capture at a minimum GPS data of the farms. To overcome these challenges and ultimately support both buyers and suppliers evidence No Deforestation, EF uses a methodology to accept a range of data that can either accurately identify the plantation, estate or smallholder boundary or the approximate location of the boundaries. This range of data is presented in Section 3.5.

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[9] https://data.globalforestwatch.org/documents/gfw::universal-mill-list/about

Beyond the declaration of plantation traceability data made by suppliers and their supplying mills, EF also uses a range of other data sources to support traceability to plantation level analysis. These other data sources include certification scheme websites (e.g. RSPO audit public summaries that indicate plantation data), company websites (e.g. mill websites providing plantation data), and Government or NGO's websites.

Similarly, to palm oil mill traceability, volume data declaring the tons of FFB from each supplying plantation, estate or smallholder is requested but not required. In the absence of this data, EF estimates the volume sourced from each supplying plantation, estate or smallholder. This estimation method is described in Section 3.5.

Once the analysis and validation of each supplying plantation, estate or smallholder is completed a TTP score is calculated for each mill, which can then be used to calculate aggregated scores for any tier in the supply chain, e.g. a kernel crusher, a refinery, or a consumer goods company.

3.4.   Traceability To Plantation Data

As outlined above, due to a range of reasons the exact boundary of the supplying plantation, estate or smallholder is not always available for analysis. Despite this limitation, EF uses what is available to support buyers and suppliers with identifying where the supply chain is No Deforestation and where additional data collection or follow up is required. Figure 3 below outlines the typical types of plantation boundary data that is available, as well as, indicating the area of analysis that is used in the assessment of if the plantation, estate or smallholder location is No Deforestation.

Figure 2. Type geospatial data used to assess No Deforestation.
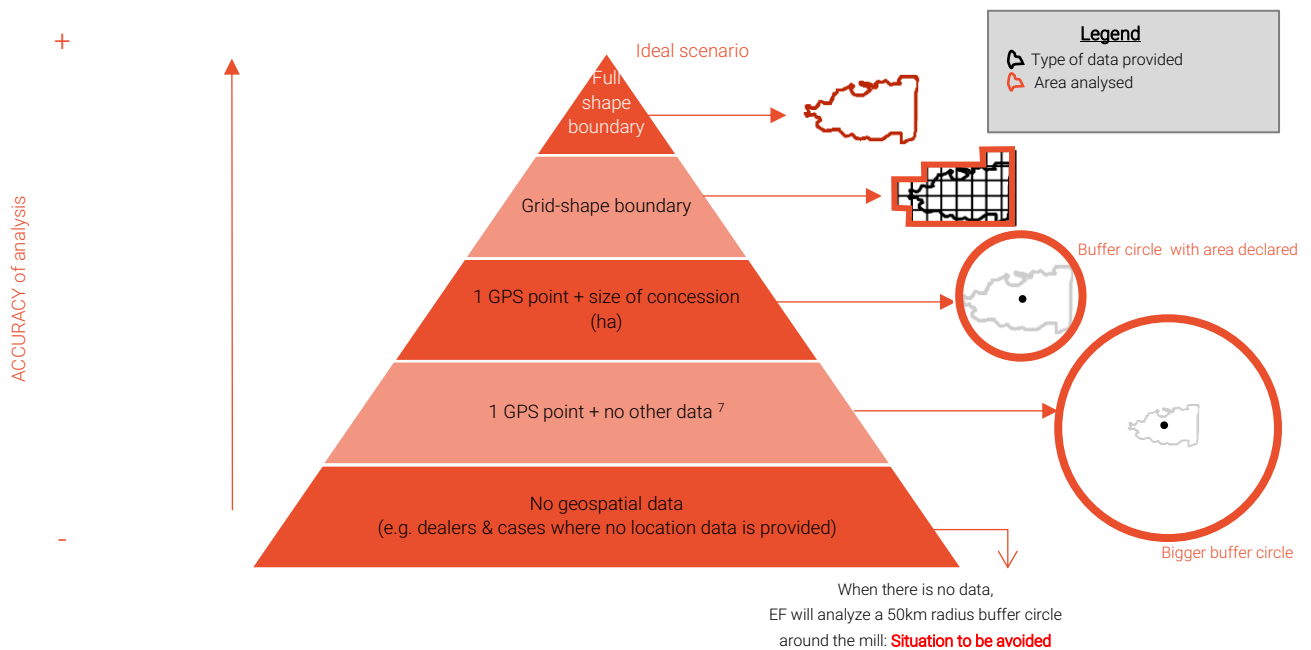
Overall, the accuracy of the geolocation of the plantation areas increases the accuracy of the analysis. Therefore, the ideal geolocation data is the boundary of the plantation area owned by the estate, plantation or smallholder. In the worst-case scenario, EF uses a 50km radius around a palm oil mill. This approach is avoided as much as possible since this provides little actionable insights, nor can No Deforestation Verification function with such an approach.

3.5. Collecting and processing volume information

In order to run the NDV calculations, it is needed to define volume information for each step of the supply chain, since a No Deforestation score is a statement of the tonnes of palm oil product that meet the No Deforestation definition stated in Section 2. The accuracy of the volume information increases the accuracy of the score attributed to each tier of the supply chain, impacting directly the results (i.e. the NDV scores, as well as TTP and TTM calculations). There are 2 general sources of volume information, as listed below in point 1 and 2, and in cases where this information is not available, a volume estimation is calculated as describe under point 3:

1. Volume declared by companies via EF traceability exercise, or following their own traceability

2. Volume available on public domain sources (e.g., RSPO certificates, MPOCC MSPO trace)

3. Volume data unavailable, in which the following estimations are made:

   a) *If refinery volume is unknown*, each refinery supplying the above Tier is assigned an equal volume

   $$Refinery\ to\ Tier1\ Volume\ (\%) = \frac{Total\ Tier\ 1\ volume}{Qty\ Refineries\ supplying\ the\ Tier\ 1}$$

   b) *If mill volume is unknown,* each mill supplying the above Refinery is assigned an equal volume

   $$Mill\ to\ Refinery\ Volume\ (\%) = \frac{Total\ Refinery\ volume}{Qty\ mills\ supplying\ the\ Refinery}$$

   c) *If plantation volume is unknown, but the area (ha) is declared,* a volume is estimated on the basis of the declared area, the regional annual average yield and the annual mill capacity:

   $$Plantation\ to\ Mill\ Volume\ (\%) = \frac{Area\ (ha) \times Yield\ (MtFFB \times \frac{Year^{-1}}{area\ (ha)})}{Mill\ capacity\ (MtFFB \times Year^{-1})}$$

   d) *For mills where all plantations are declared but incomplete area (ha) and volume is communicated;* equal volumes are attributed to each plantation E.g.: If 5 plantations supply 100% of the mill consumption, each one will be attributed 20%.

   $$Plantation\ to\ Mill\ Volume\ (\%) = \frac{Total\ volume\ \%\ coming\ from\ plantations\ declared}{Qty\ of\ plantations\ declared}$$

3.6. Analysis of TTP data against deforestation alerts

After TTP data has been collected and validated, EF runs an analysis of this data against deforestation alerts to determine the status of each plantation, estate or smallholder location.

Deforestation alerts are generated by Starling. In 2016 Airbus and Earthworm Foundation collaborated to create Starling. Starling is a web portal that provides a company, government or other stakeholder with up to date land cover data and near real time alerts of forest loss. Starling uses a range of input data to annually map land cover and land cover change and constantly monitor for forest change. Additional technical details on Starling can be made available on request.

When Starling identifies a forest loss event inside of a plantation boundary, this alert is reviewed both by computer algorithms and by Starling technical staff. The purpose of this double verification is to 1) confirm that forest has indeed been lost within a plantation, and 2) assess whether the forest loss is likely connected to production of the commodity in question, and record any relevant information.

The process of assessing alerts is defined by the Alerts Decision Tree (see Annex 1). This has been developed together with companies committed to end deforestation from agricultural supply chains. It contains valuable inputs from their suppliers, and works to continuously align with other decision trees developed in the industry, in particular related to palm oil supply chains.

Implementing the decision tree has three possible outcomes:

Confirmed Alerts

When, following review it is established that forest was cleared inside the estate, plantation or smallholder area for the purpose of the production of the commodity in question, the alert will be *confirmed*.

In such cases the plantation owner may choose to implement a restoration plan to compensate for the forest loss. Successful implementation of an appropriate restoration plan may result in the connected alerts not counting toward the deforestation score, and recorded on a separate category: 'recovery plan'. [10]

Not Connected Alerts

The purpose of the verification process is to establish a connection between a particular deforestation event and a given commodity such as palm oil, rubber or Cocoa (etc.). Therein lies the difference with a straightforward measure of forest loss: in the event that it is confirmed that forest *has* been lost, but it is also established that this forest loss is not connected to the production of the commodity in question, the alert is discarded. One example would be deforestation for purposes not connected to the development of palm oil, such as the construction of high voltage power lines. Such *Not Connected Alerts* are kept for future analysis, but no longer impact NDV scores for his particular commodity.

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[10] More details regarding restoration plans are provided in the relevant section of this document.

False Alerts

While rare, it may happen that the Starling technical staff judges that the alert is a false positive. For example, temporary loss of foliage due to a drought might have been incorrectly classified as clearing of forest. When such cases are identified, the alerts in question are (re-)classified as *false alerts* and removed from any analysis.

3.7.   Calculating NDV scores

Once each plantation, estate and smallholder location are assessed against deforestation alerts the boundary is allocated into a category. EF use a "Red, Amber and Green" (RAG) classification to categorise each area. Below is an outline of the main rules that are used to assign a boundary into one of these categories:

- **Green**
  - Sourcing boundary mapped and no deforestation alerts since cut-off date
  - Missing sourcing boundaries but low risk of smallholder-linked deforestation
  - Sourcing boundary with deforestation addressed by an accepted recovery plan (active)
- **Amber**
  - Sourcing boundary with deforestation alerts which are being investigated
  - Missing sourcing boundaries which are actively being collected
  - Missing sourcing boundaries but low deforestation and peat risk (e.g. 0 deforestation within 20km radius around mill)
- **Red**
  - Sourcing boundary with deforestation alerts which are not being investigated
  - Sourcing boundary with deforestation confirmed, with no recovery plan in place
  - Missing sourcing boundaries (including smallholders and dealers)
  - Volume not traceable to plantation
  - Volume not traceable to mill

3.8. Smallholder risk assessment and categorisation

The above approach to scoring sourcing boundaries is applicable as well for smallholders.

However, EF recognizes the complexity in mapping and verifying origins of hundreds and thousands of smallholders farms and acknowledges that little traceability back to smallholders exists currently. In the absence of traceability data, Earthworm Foundation runs a risk assessment to determine locations where deforestation is more or less likely linked to smallholders expanding palm oil plantations.

This methodology consists in 3 steps:

1. Categorise subdistricts, by analysing trends of small-scale alerts (<5ha) identified in terrain suitable for palm cultivation, and overlaying with the remaining forest area in the subdistrict[11]

2. Categorise mills, by analysing their 50 km radius to determine if the mill is likely to be sourcing from low-risk and/or high-risk sourcing areas.

3. Categorise smallholders and the traceability requirements per mill. Mills classified as 'high risk of smallholder linked deforestation' should be the priority to collect full plantation traceability.

Smallholder volume coming from low-risk mills will be categorised as 'low risk of smallholder linked deforestation', even if no further traceability information is provided

Smallholder volume coming from low-risk subdistricts will be categorised as 'low risk of smallholder linked deforestation', regardless of the mill list, even if no further traceability information is provided

Smallholder volume coming from high-risk subdistricts will be categorised as 'high risk of smallholder linked deforestation', and full plantation traceability will be flagged as priority

Smallholder volume coming from high-risk mills where no subdistrict is provided will be categorised as 'high risk of smallholder linked deforestation', and full plantation traceability will be flagged as priority

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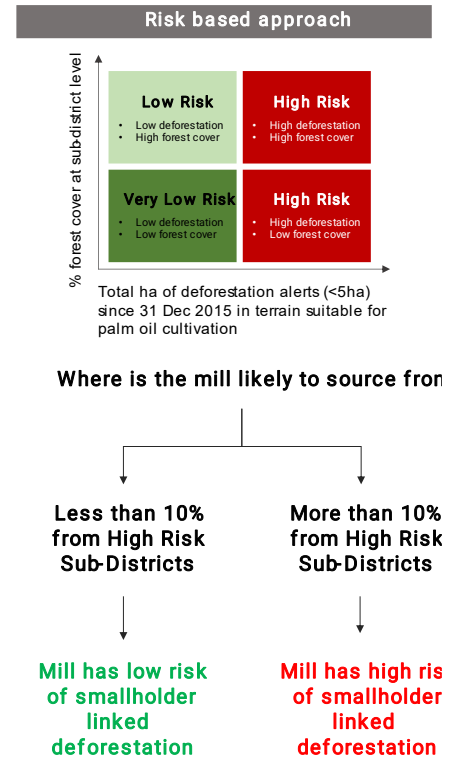
[11] While land suitability is dependent on local conditions and planted cultivars, overall, the suitability of an area is determined by the following factors: temperature, elevation, slope gradient, rainfall, and soil type

Importantly, the recent release of the EU Deforestation Regulation means that all smallholders in the EU supply chain must be mapped either with a GPS point for farms under 4 hectares or the full boundary for farms greater than 4 hectares. These requirements will be considered for supporting businesses with meeting the regulation requirements and for other markets Earthworm Foundation will continue to implement the risk assessment approach.

Figure 4. Smallholder deforestation decision tree.
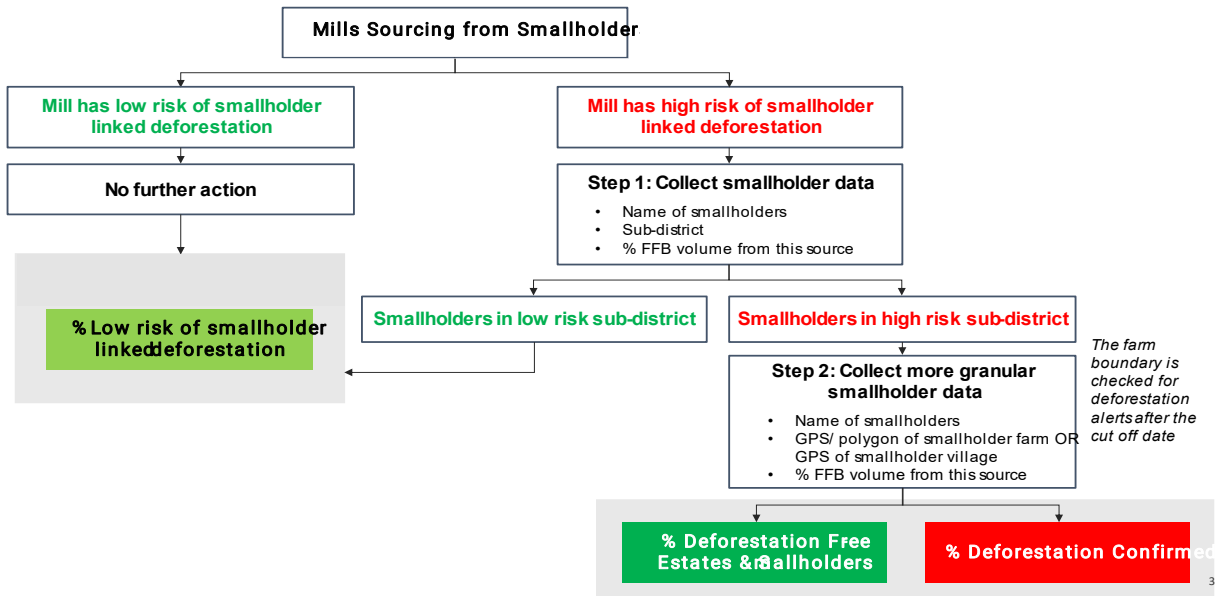
3.9. NDV scoring of the supply chain

Mill level NDV score

Using the estate, plantation and smallholder plantation RAG categorisation and volume, we can attribute an NDV score to the mill. The mill's NDV score is weighted relative to the volume of each supplying estate, plantation or smallholder plantation.

Downstream NDV score

Using the mill's NDV score and volume (estimates or %), and the refinery mill list, we can attribute an NDV score to any refinery, and similarly to any other entity buying from mills and refineries. This aggregated NDV score is weighted relative to the volume of each supplying mill.

Figure 5. Example of NDV score attribution

Example: PO Mill ID 200 – Score calculated based on the Traceability to Plantation & deforestation status

Sourcing Boundary	Type	Deforestation status	Green	Amber	Red	Volume (MT)
Estate 1	Estate	No-Deforestation	X			25
Estate 2	Estate	No-Deforestation	X			25
Estate 3	Estate	Deforestation alerts being investigated		X		25
Estate 4	Smallholder	Missing information on dealers & smallholders			X	25
		Resulting Score for PO Mill ID 200:	50%	25%	25%	100 MT

Example: Refinery ABC – Score calculated based on Mill Level NDV Score

Mills supplying Refinery	Green	Amber	Red	Volume (MT)
PO Mill ID 100	25%	35%	40%	100
PO Mill ID 200	50%	25%	25%	100
PO Mill ID 300	100%	0%	0%	100
Untraceable to mill	-	-	100%	50
Resulting score for Refinery ABC:	50%	17%	33%	350

Total Volume= sum
Total Score = Weighted average (by volume)
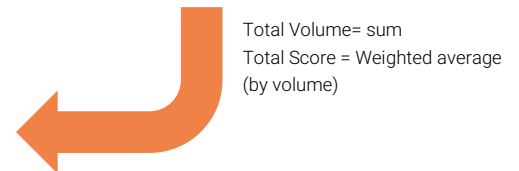
4. Conclusion

The development and use of the methodology outlined above has been an iterative process with buyers and suppliers of palm oil. The approach continues to adapt to feedback and changes that are continuously occurring in the palm oil industry and within relevant industry collaboration groups. EF remains dedicated to the fight to end deforestation and therefore will continue to update the methodology so that it remains robust, practical and credible. EF welcomes any comments, questions and feedback, please do not hesitate to contact us to learn more about the above methodology.

Annex 1 – No Deforestation Alert Decision Tree

August 2023

Supplier Role

Deforestation Alerts In Sourcing Boundaries – Decision Tree

Is the alert inside the sourcing boundary?*

Yes

Is there only a single alert less than 2 hectares in size?

No

No

Alert Not Connected

1

Was this alert detected more than 12 months ago?

Yes

No

1

Yes

Alert Not Connected

False Alert Check EF & Supplier

Yes

Was the deforestation alert caused by land development?

Yes

What land use replaced the forest?

Palm Oil or unknown

Is the alert in a conservation (HCV/HCS) area?

Yes or unknown

Who cleared the land?

Plantation company, owner

Alert confirmed

No

Alert Not Connected

2

No

Natural causes

No

Alert Not Connected

3

Other commodities or infrastructure

While alerts driven by other commodities are considered to be 'true' alerts, these do not impact the scoring of the Palm Oil supply chain. Such land use can be confirmed through Satellite imagery or other evidence provided by supplier

Naturally occurring deforestation events such as flooding, mudslides or forest fires are disconnected from the sourcing boundary. Such natural causes be confirmed through Satellite imagery or other evidence provided by supplier However, if palm oil is subsequently planted in that area the alert will be confirmed.

EF Role

Encroachment

If the plantation owner claims that the deforestation is caused by another party, then evidence must be provided of an engagement plan. This document must address the deforestation event(s) in question and provide a clear plan to work together with the other party to prevent further encroachment and additional deforestation.

Credible evidence must be provided of the plan's implementation.

In the event that engagement cannot or does not prevent continued deforestation and plantation of Oil Palm, a no-buy memorandum can be shared to provide evidence that the FFB from those encroached areas does not enter the supply chain.

Definitions

Not Connected Alerts – alert excluded from deforestation verification but monitored moving forward and re-visited on a quarterly basis.
Alert confirmed – alert cannot be discarded until sufficient evidence is provided to prove otherwise, or if a credible recovery plan is being implemented.
***Inside Sourcing Boundary** – alerts which intersect with the sourcing boundary. Intersections representing less than 10% of the alert's surface area may be disconnected at the discretion of EF GIS officers.

Evidence Required to Discard an Alert

1	**sourcing boundary shapefile** (Updated; full shape)
2	**Satellite imagery and/or Photographic evidence**
3	**HCV/HCS report** (including maps) in accordance with EF minimum requirements