

# Palm oil Traceability : Blockchain meets supply chain



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Cultivation of oil palms has **expanded** more in the past ten years than cultivation of any other crop. Because oil palms grow only in a tropical climate, large areas of rainforest are often cut down to make way for palms.

Consumers, governments and NGOs are demanding more and more visibility and assurance in the sustainability of the supply chain.

Yet, there is no reliable digital mechanism that tracks the physical movement of goods in the Palm Oil Industry.

# Traceability and emerging technologies

- “The ability to access any or all information relating to that which is under consideration, throughout its entire lifecycle, by means of recorded identifications”. (Olsen & Borit, 2013)



- Emerging technologies, such as blockchain, a distributed ledger, can transform supply chain traceability as we know it and bring more transparency through the value chain, creating value to stakeholders

# Is Blockchain THE solution?

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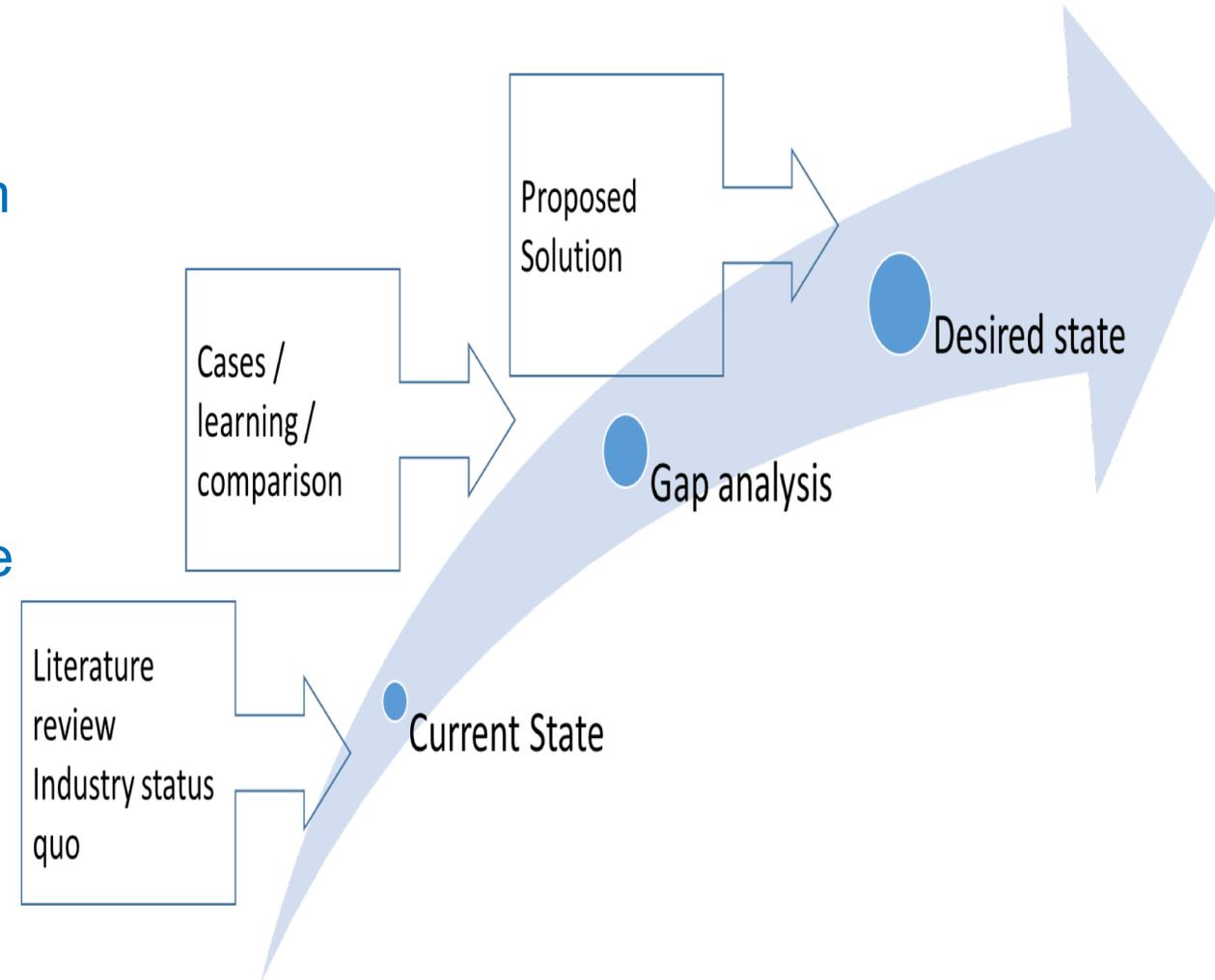
# NO

# Is Blockchain **Part** of the solution?

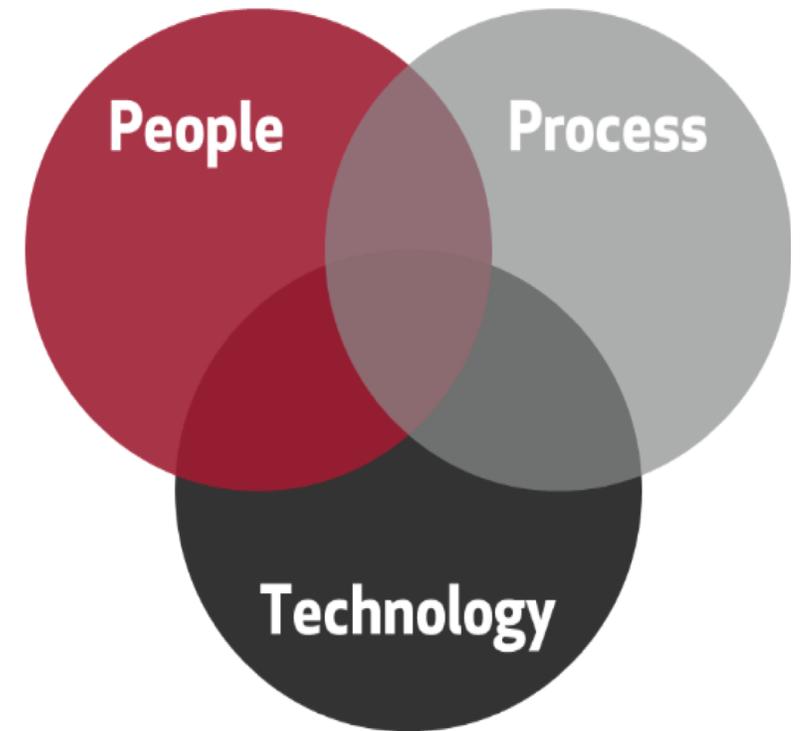
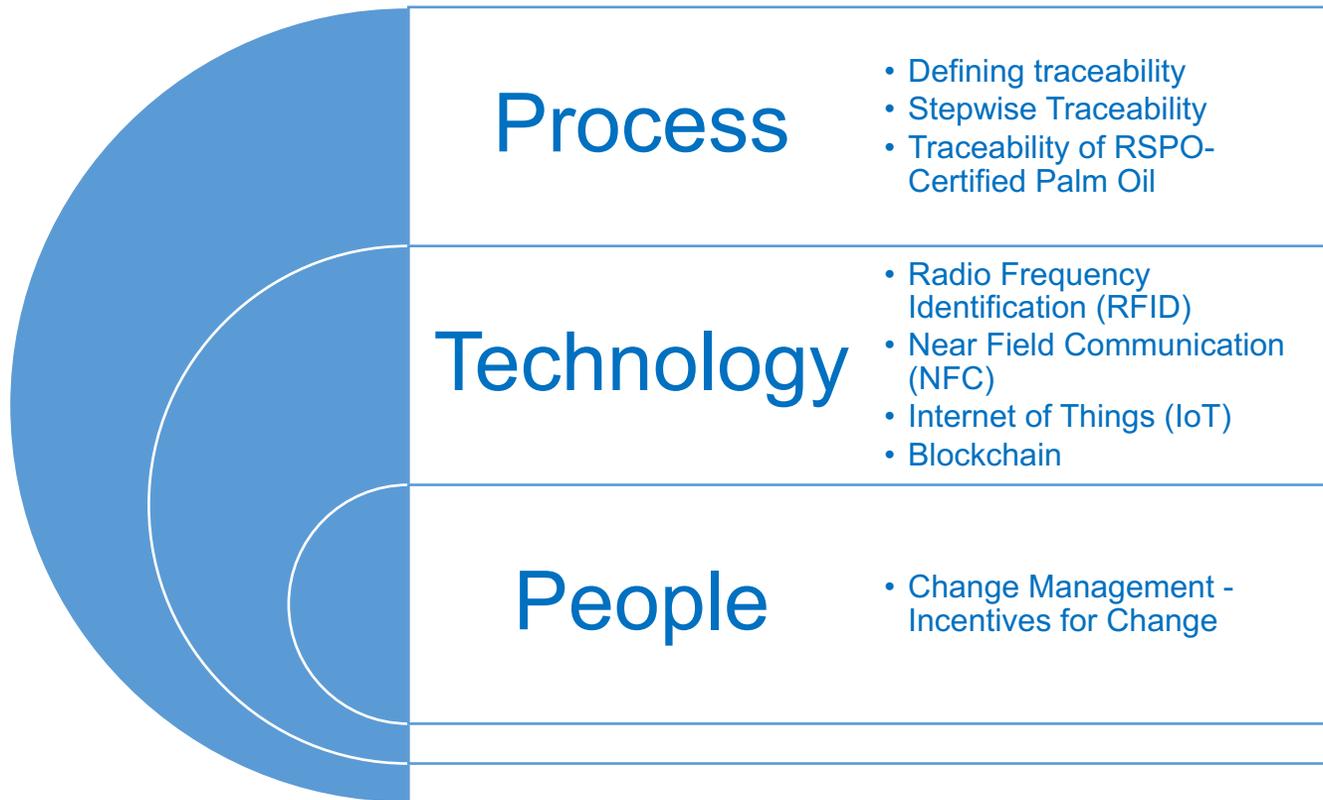
# Yes

# Methodology

1. A comprehensive literature review of current traceability models in the palm oil industry, identifying key technological solutions and reviewing different people-oriented challenges that arise with implementing a traceability solution.
2. A gap analysis of the status quo of the palm oil industry. The analysis is based on NGO reports, company sustainability reports, and industry interviews.
3. Content analysis of 5 selected cases
4. Development of proposed solution.



# Literature review



# Gap analysis: Limitations of current RSPO processes

Leading brands have pledged to commit to a **100%** sustainable certification

Only **19%** of global palm oil production is certified as sustainable

**The key obstacle to traceability in the palm oil value chain lies in its first component, the smallholders/plantations**

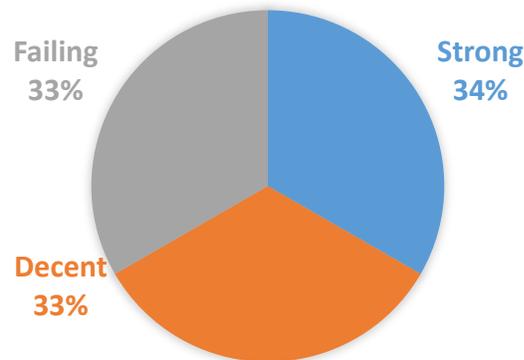
# Gap analysis: Industry Status Quo and brand assessment

No company reached a perfect score

One brand was able to trace back their palm oil back to the plantation. There is a considerable amount of work to be done before companies have deforestation-free supply chains.

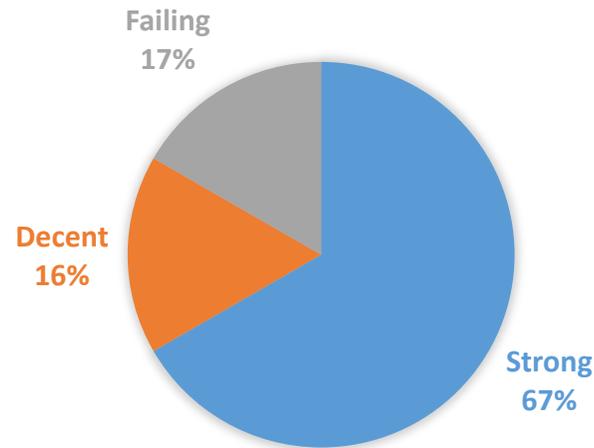
## TRANSPARENCY

COMPANIES' LEVEL OF OPENNESS ABOUT THEIR PALM OIL SUPPLIERS AND BREACH OF THEIR 'NO DEFORESTATION' POLICY



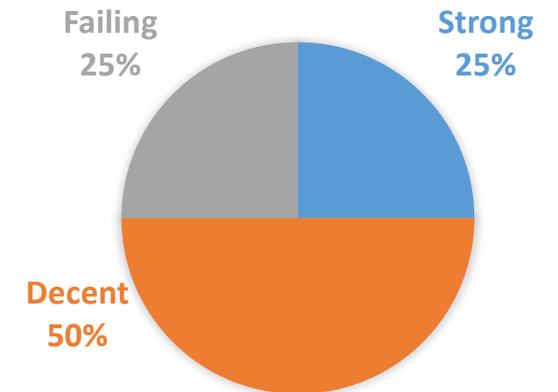
## INDUSTRY REFORM

HOW COMPANIES ARE SUPPORTING WIDER INDUSTRY REFORM



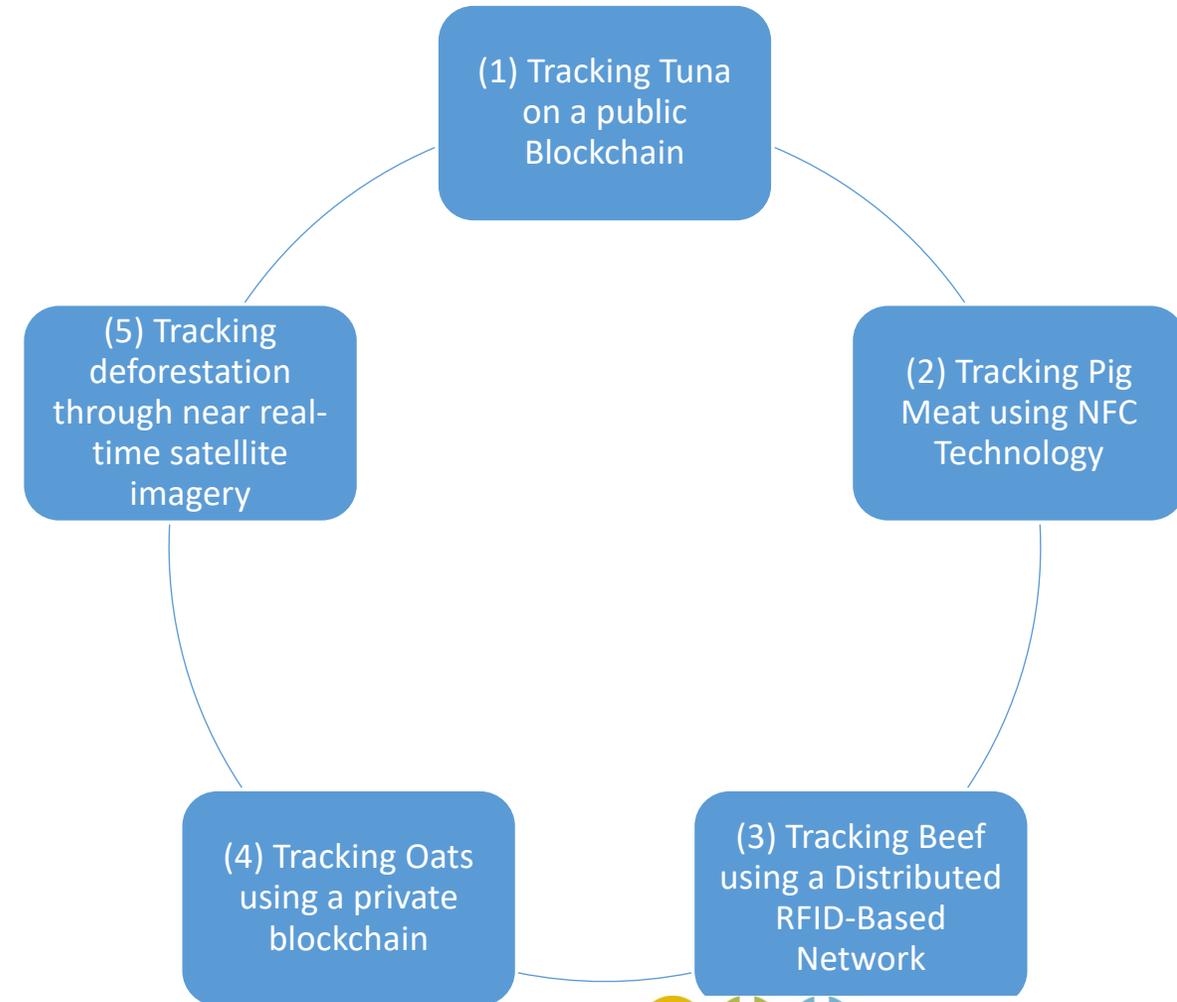
## RESPONSIBLE SOURCING

PRACTICAL STEPS COMPANIES ARE TAKING TO ENSURE THAT THE PALM OIL BOUGHT IS NOT LINKED TO DEFORESTATION.



# Content analysis: 5 case studies

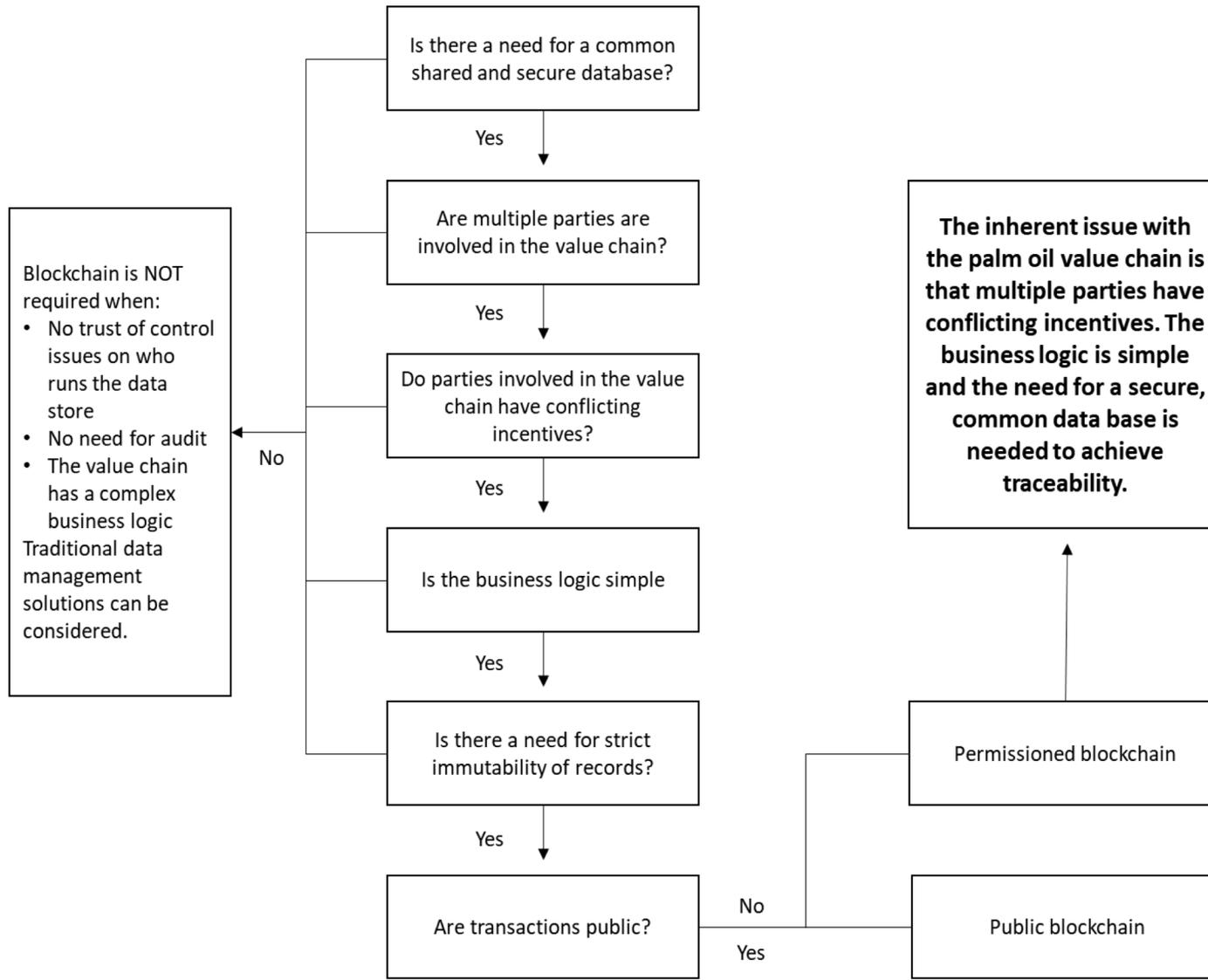
Current status	RSPO certified		Target solution	
Limitations	Smallholders	Buyers	Smallholders	Buyers
Intensive data requirements	Huge time and efforts to collect and maintain data	Buyers have no visibility of the data	Digitally audited in real time.	Permissioned and secure data visibility
Scope for data alteration (misreporting)	High motivation to alter or misreport the data	Buyers have no visibility of on-farm activities	Motivation to misreport high. Ability to misreport is drastically decreased	Near real time visibility of farm activities
Change in behavior	Extremely difficult to change smallholders perception and farming practices	Difficult to evaluate if the behavioral changes are temporary or permanent	Minimal change in behavior. Minimal training needed	Data driven decisions to evaluate behavioral changes
Lack of transparency	N/A	Buyers have no visibility in the overall process.	N/A	Full (permissioned) visibility of value chain, starting from plantation to end user
Huge cost of certification	Uncertainty about the cost and premium for certification	Buyers not sure about smallholders/end-consumers' willingness to pay	Faster payments. Premium for certification	Cost decreased by more efficient process.



# Learnings

- Using blockchain in case 1 and 4 was effective from a dependability, performance and practicality perspective.
- 4 of the case studies dealt mainly with products that were discrete and larger. The palm fruit would be similar to these items in that it is identifiable, but as soon as the palm fruit is milled into oil, the oil itself would be impossible to identify individually. Palm oil is similar in this respect to oats in case 4.
- One take-away from case 3 is that it is important to keep the cost low and dependability high throughout the implementation to maintain stakeholder interests.
- Google earth engine's imagery classification system as a low-cost, accessible and user-friendly oil palm detection tool

# Need for a Blockchain (or not)



To identify the need for a blockchain (or not) in increasing transparency in the value chain, I have created a decision tree (Figure 10) that I applied to the palm oil industry. The database needs were acknowledged: Stakeholders have different incentives and a need for a strict immutability of records; the business logic is simple and the records should be kept private. As a result, a permissioned database is recommended.

# Proposed solution

Today, there is a need to introduce traceability solutions that can reduce the smallholders' burden for data collection, reduce the dependency on auditors, make the entire process transparent for the buyers



# TECHNOLOGY

Blockchain Layer

Digital Layer

# PROCESS

Physical Traceability Layer

Conceptual Layer

# TECHNOLOGY

Digital Layer

Blockchain Layer



Blockchain and IoT technology used to create a 'market' to trade sustainable Palm Oil certificates

Certified plantations receive certificates for their sustainable production, which can be sold on an open market

The Book and Claim model allows retailers to purchase certificates and sell their end products as 'sustainable'

Customer purchases from a retailer that is 'certified' sustainable

Certified and uncertified oil is mixed. The sustainability of palm oil is tracked based on mass in a Mass Balance system.

Based on mass, some product of retailer is sold as sustainable.

Certified end product

Uncertified end product

Plantation/ small holders

Wholesaler

Oil Mill

Ship tanks

Refinery

Manufacturer

Retailer

Consumer



Google earth as an imagery classification system to detect and monitor the expansion of oil palm plantations

Traceability of palm oil is tracked based on mass through the process in a Blockchain system



# Proposed solution (2)

## Technology

- Leverages blockchain, geospatial imagery classification, and IoT technologies to keep track of the flow of physical goods and sustainable palm oil certificates

## Process

- Leverage the mass balance, and book and claim traceability models that RSPO has defined

## People

- includes a set of incentive models that could be useful in easing change management efforts

# Next steps

- Identify the “champion” of the implementation
- Identify whether to implement from downstream to upstream or vice versa
- Find ways to scale up the RSPO certification system and introduce it to a free market
- Financial feasibility study to get industry buy in
- Develop detailed incentive model

**Blockchain technology alone will not solve traceability challenges companies face. However, it provides an ideal base layer upon which architectures for robust traceability systems can be built and participated in without ownership by the biggest value chain participant.**